

# IAS1200 TECHNICAL DATASHEET

## Integrated Aquaponics System & Nutrient Refinery

### Core Computational Intelligence

**Processor:** Raspberry Pi 5 High-Speed Edge Controller

**Automation:** Real-time sensor fusion, 5x daily precision feeding, autonomous 18/6 light cycle management, and 30-min cyclical nutrient exchange.

### 1. Aquaculture & Migration Infrastructure

Housing Unit	40-Foot Shipping Container (Modified for Biosecurity/Isolation)
Annual Yield	5,000 lbs Fish / Year (Continuous Harvest Cycle)
Tank 1 (Introduction)	48"W x 48"L x 36"D (50-100g Stage)
Tank 2 (Juvenile)	48"W x 48"L x 48"D (101-220g Stage)
Tank 3 (Harvest)	48"W x 96"L x 48"D (221-680g Stage)
Migration Logic	12" Lateral Interconnects with Gate Valves (Stress-Free Movement)

### 2. Filtration & Nutrient Manufacturing

All modular filters standardized at 32"W x 32"L x 36"D.

Filter 1: Solids Separator	Mechanical capture; 72-hour discharge to Anaerobic Digester.
Filter 2: Biological	Nitrifying bacteria media; Ammonia-to-Nitrate conversion.
Filter 3: Mineralization	Organic compound breakdown; unlocking Ca, K, Fe, and N.
Biosecurity	Integrated UV Sanitizer (Pathogen Neutralization)

### 3. Nutrient Monitoring & Delivery

- Analyzed Elements:** pH, Temp, Nitrogen (N), Potassium (K), Calcium (Ca), Iron (Fe).
- Dosification:** Integrated multi-pump auto-correction system.
- Exchange Protocol:** 60-gallon water swap with plant reservoirs every 30 minutes.
- System Load:** One IAS1200 services up to 180 TS40/TS60 Towers.

### 4. Waste Valorization Link

The IAS1200 acts as the primary fuel source for the facility's circular economy.

- Input:** Organic solids from Filter 1.
- Recipient:** Anaerobic Digester (Zero-Waste Hub).

- **Frequency:** Automated purge every 72 hours.

# GS8 TECHNICAL DATASHEET

Mass-Scale Germination & Microgreens System

## SYSTEM ARCHITECTURE

The GS8 is a high-density vertical germination engine designed to maximize seedling throughput within a minimal footprint. Engineered for modular integration, it serves as the foundational supply line for large-scale vertical and horizontal growing arrays.

## TECHNICAL SPECIFICATIONS

Vertical Height	96 Inches (8 Feet)
System Footprint	28" Wide x 240" Long (20-Foot Run)
Rack Configuration	8 Vertical Racks
Flooding Trays	5 Trays per Rack (24"W x 48"L)   40 Total per Unit
Seeding Capacity	4 x 200-Cell Trays per Flooding Tray (32,000 positions per rotation)
Monthly Throughput	<b>96,000 Plant Positions</b>

## LIGHTING & ENVIRONMENTAL CONTROL

LED Infrastructure	16 x 5' Horizontal LEDs per Rack (128 LEDs per GS8 unit)
Wiring Logic	Daisy-chained in sets of 4 for modular control
Target Spectrum	Early-stage optimized for root strength and hypocotyl regulation

## OPERATIONAL SCALABILITY

### IAS1200 Network Integration:

A single IAS1200 Controller (Raspberry Pi 5 Core) manages the nutrient and irrigation logic for up to **20 GS8 Units** simultaneously, supporting a total nursery capacity of **1,920,000 plant positions monthly**.

## SYSTEM COMPATIBILITY

- **TS40 Support:** One GS8 provides germinated positions for up to 300 TS40 towers.
- **HGS8 Support:** One GS8 provides germinated positions for 2 HGS8 racks.

- **Secondary Use:** Optimized for high-margin commercial Microgreens production.

# TECHNICAL REPORT: TS SERIES

Advanced Vertical Aeroponic Systems | Models TS40 & TS60

## 1. System Identity & Scaling

The TS Series is a modular commercial cultivation system engineered for high-output indoor agriculture. Built on a foundational 6-tower aluminum array, the system scales horizontally to accommodate up to 42 towers per run.

Specification	TS40 (Standard)	TS60 (Extended)
Vertical Height	10 Feet	15 Feet
Planting Sites	40 Sites	60 Sites
LED Configuration	4x 5' Vertical Bars	6x 5' Vertical Bars
Array Density	240 Plants / 6-Tower Unit	360 Plants / 6-Tower Unit

## 2. Hydraulic Dynamics

### Inverted Heavy Rain Delivery

Every tower utilizes a **Senninger i-mini-Wobbler 1/2" Inverted nozzle (1/8" size)**. Unlike traditional misting, this creates a high-kinetic "heavy rain" environment that ensures 100% root zone saturation and high oxygen exchange.

#### The 39 GPM Vacuum Effect:

A 1.5 HP pump delivers 39 gallons per minute to each tower. This creates a powerful internal vacuum that forces environmental CO<sub>2</sub> into the root system, augmenting traditional leaf-based photosynthesis.

### 3. Biological Results

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By optimizing CO<sub>2</sub> intake via the roots and providing highly soluble nutrients, the TS Series achieves a proprietary energy diversion ratio:

- **70% Canopy Growth:** Accelerated development of harvestable biomass.
- **30% Root System:** Minimalist, high-efficiency root mass.

### 4. Reservoir Integration

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A single 180-gallon fiberglass reservoir (48"x72"x16") supports 60 towers. This closed-loop setup is the primary interface for the IAS1200 controller.

# HGS SERIES DATASHEET

Horizontal Growing Systems | High-Density "Ready-to-Eat" Production

## SYSTEM OVERVIEW

The HGS Series is a high-velocity production assembly designed specifically for baby leaf greens and salad mixes. Engineered for rapid 10-day turnover cycles, the HGS units maximize horizontal footprint efficiency through tiered vertical stacking.

## TECHNICAL SPECIFICATIONS

Configuration	HGS4 (Container Model)	HGS8 (High-Ceiling Model)
Vertical Height	8 Feet (4 Tiers)	12 Feet (8 Tiers)
System Length	20 Feet (to accommodate 20' channels)	
Plant Positions	270 per Rack	540 per Rack
Lighting Infrastructure	10 x 5' Vertical LEDs	20 x 5' Vertical LEDs (Daisy-chained)
Harvest Cycle	10 Days (Optimized for RTE Market)	

## AUTOMATION & CONTROL LOGIC

### IAS1200 Network Integration:

A single IAS1200 Controller (Raspberry Pi 5 Core) manages up to **four HGS8 units** simultaneously. This provides 2,160 active plant positions under one centralized "brain" for real-time monitoring of N, P, K, Ca, Fe, pH, and Temperature.

## ENGINEERING FEATURES

- **Precision Valving:** Individual 12" gate valves allow for specific channel isolation.
- **Uniform DLI:** 5 rows of daisy-chained LEDs ensure zero light drop-off across 20-foot spans.
- **Circular Integration:** Designed to receive hyper-mineralized water from the IAS1200 with 30-minute refresh cycles.

### SYSTEM OVERVIEW

The **Aqua-60** is an advanced, high-density incubation station precision-engineered by Ag Tech Manufacturing for commercial fish hatcheries. Purpose-built to handle early-stage incubation, this system is capable of tumbling and hatching up to **60,000 fish eggs per month**.

By utilizing specialized constant-suspend fluid mechanics, the system maintains eggs in a continuous fluid upwelling state. This prevents friction-induced damage, mold colonization, and hypoxic dead zones, ensuring an industry-leading hatching uniformity and survival yield across cohorts.

#### Fluid Dynamic Design

The system relies on a perfectly synchronized hydrodynamic balance. Water flows vertically via precision-calibrated valves into specialized clear vessels to create an ideal vortex, overflowing into individual nursery reservoirs before gravity-dropping into the centralized bioprocessing sump below.

### INTEGRATED HARDWARE & LIFECYCLE ARCHITECTURE

Subsystem	Engineering Specifications & Capabilities
<b>Macdonald Jars</b>	Three (3) heavy-duty clear acrylic hatching jars. Configured with a distinct hemispherical concave base that smoothly redirects vertical water columns into an unbroken, uniform suspension vortex.
<b>Drive Pump Node</b>	High-pressure, low-vibration 1/10 HP industrial water pump. Calibrated to maintain uniform fluid velocities across all three incubation lines without shearing delicate embryos.
<b>Capture Reservoirs</b>	Three (3) clear intermediate collection modules equipped with integrated mesh bulkheads. Automatically houses and segregates swimming larvae immediately post-hatch for easy census and transfer.
<b>UV Sanitization</b>	High-intensity inline UV-C sterilization system mounted directly along the pressurized water loop, continuously eliminating fungal spores and bacterial vectors.
<b>Filtration Array</b>	Integrated multi-stage solid separator and passive biofilter sump tank underneath the frame, removing organic particulate and executing rapid nitrification.

### SYSTEM CAPABILITIES

<b>60,000</b> EGGS / MONTH	<b>1/10 HP</b> PUMP RATING
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### TECHNICAL SPECIFICATIONS

<b>Model Reference</b>	AQUA-60-H1
<b>Incubation Units</b>	3x Macdonald Jars
<b>Output Capacity</b>	60K eggs / month
<b>Sanitization</b>	Inline UV-C Shield
<b>Sensor Telemetry</b>	pH, DO, Temp, Levels
<b>Photoperiod</b>	Smart Programmed Grid
<b>Frame Structure</b>	Structural Welded Alum
<b>Plumbing System</b>	Schedule 40 PVC Form
<b>Sump Footprint</b>	Composite Multi-Stage

### ECOSYSTEM VECTOR

The Aqua-60 acts as the baseline propagation node within Ag Tech Manufacturing's multi-tier food production pipeline:

- Aqua-5000 Nursery Array
- Intelligent Aquaponics (IAS1200)
- Vertical Towers (TS40 / TS60)

#### COMMERCIAL FRAMEWORK

Ag Tech Manufacturing delivers complete engineering coverage from specialized **Manufacturing** and

## AUTONOMOUS MONITORING & CONTROL CONSOLE

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The Aqua-60 incorporates a centralized, moisture-isolated industrial control module. Interfaced with high-durability sensors, it actively monitors system diagnostics to guarantee biosecurity:

- **Real-Time Telemetry Tracking:** Continuous, active probe reading of **pH**, Dissolved Oxygen (**DO**), Temperature (**T\_w**), and liquid sump levels.
- **Integrated Light Scheduling:** Built-in programmable timing automation regulating overhead lighting arrays to maintain optimal circadian and developmental schedules.

precision site **Implementation** to  
commercial **Sale** operation lines.

## SYSTEM OVERVIEW

The **Aqua-5000** is an industrial-grade, highly biosecure Recirculating Aquaculture System (RAS) engineered specifically for early-stage fingerling development and intensive cohort nursing. Optimized to function as a core node within the proprietary *Intelligent Aquaponics System (IAS)* framework, the Aqua-5000 balances robust mechanical water polishing, active biochemical filtration, and autonomous environmental monitoring to ensure maximum survival metrics and precise growth synchronization.

### Key Operational Dynamics

The framework provides an ideal biome for intensive pairing, configured for a standard foundational colony of **1 male to 5 females** (1:5 broodstock ratio). This specialized hydrodynamic design stabilizes water columns, segregates suspended solids instantly, and features integrated multi-tier safety contingencies to protect highly sensitive fingerling populations.

## INTEGRATED HARDWARE & LIFECYCLE ARCHITECTURE

Subsystem	Engineering Specifications & Capabilities
<b>Biofiltration Array</b>	Fluidized moving bed biofilter (MBBR) utilizing high-surface-area geometric media. Optimizes Nitrosomonas and Nitrobacter bacterial colonies to execute rapid conversion of Total Ammonia Nitrogen (TAN) into inert nitrates.
<b>Solid Separator</b>	Multi-stage mechanical swirl separator alongside a specialized low-velocity settling chamber. Rapidly isolates and evacuates dense biological particulate matters before mineralization occurs, preserving dissolved oxygen levels.
<b>UV Sanitization Unit</b>	High-output inline ultraviolet sterilization chamber delivering a precise germicidal dose ( $>30,000 \text{ mJ/cm}^2$ ). Neutralizes waterborne pathogens, viral vectors, and unwanted single-celled algal blooms continuously.
<b>Lighting &amp; Photoperiod</b>	Integrated overhead industrial LED arrays configured with a fully customizable smart controller. Features automated digital dimming to smoothly simulate dawn/dusk transitions, preventing fish shock.

## SYSTEM CAPABILITIES

**5,000**FINGERLINGS /  
MO**1 : 5**BROODSTOCK  
RATIO

## TECHNICAL SPECIFICATIONS

<b>Model Reference</b>	AQUA-5000-N3
<b>Target Output</b>	5,000 fingerlings/mo
<b>Recommended Colony</b>	1 Male, 5 Females
<b>Filtration Loops</b>	Mechanical & Bio
<b>UV Sterilization</b>	Inline Germicidal
<b>Control Parameters</b>	pH, DO, Temp, Levels
<b>Photoperiod Control</b>	Integrated Schedule
<b>Frame Construction</b>	Structural Aluminum
<b>Tank Material</b>	Heavy-Duty Acrylic

## INTEGRATION VECTOR

The Aqua-5000 is fully compatible with Ag Tech Manufacturing's full lineup of commercial systems, engineered specifically to seed high-density vertical frameworks:

- Intelligent Aquaponics System (IAS1200)
- Vertical Cultivation Towers (TS40 / TS60)
- Hatchery Systems (Aqua-60 Pre-seed Node)

### DEPLOYMENT FRAMEWORK

Ag Tech Manufacturing delivers complete end-to-end support including

## AUTONOMOUS MONITORING & AUTOMATION CONSOLE

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Every Aqua-5000 infrastructure deployment features a dedicated centralized automation controller. Equipped with high-fidelity, marine-grade galvanic and optical probes, the processor polls system vitals continuously to manage automated feedback loops.

- **Real-Time Vitals Assessment:** Instant, unceasing telemetry tracking for *pH*, Dissolved Oxygen (*DO*), Temperature (*T\_w*), and structural liquid levels.
- **Programmable Logic Control:** Triggers automated aeration pumps, fresh water top-offs, and localized inline heaters when metric boundaries are breached.
- **Telemetry & Export:** On-board graphical interface displays historical multi-day charts directly on-site, syncing with external smart-farm telemetry networks.

precision industrial **Manufacturing**, site-specific mechanical **Implementation**, and factory commercial **Sale** deployment warranties.

## REGULATORY COMPLIANCE & CERTIFIED METHODOLOGIES

**Executive Directive:** All proprietary equipment lines, manufacturing materials, chemical-free structural coatings, and biological biological-loop fluid methodologies developed by Ag Tech Manufacturing have been strictly audited and verified to integrate seamlessly with the United States Department of Agriculture (USDA) **National Organic Program (NOP)** standards. Our closed-loop biological nutrient mineral frameworks fully comply with NOP criteria for certified organic food cultivation, allowing producers to achieve dual-market certification under a single infrastructure layout.

## 1. THE DUAL-MARKET PARADIGM: TRADITIONAL & ORGANIC SYNERGY

Commercial agricultural business models demand unprecedented infrastructure flexibility. Infrastructure that constraints a grower to a single cultivation strategy poses a significant risk to market agility. Ag Tech Manufacturing has solved this restriction by engineering our entire commercial hardware suite around **Hybrid Dual-Use Capacity**.

Whether a commercial producer utilizes conventional synthetic input matrices (**Base NPK** liquid concentrates) or closed-loop biological mineral infusions Derived from organic digestion loops, our systems execute identical flow dynamics and mechanical stability. By matching materials chemistry to strict organic regulations, a facility can pivot an entire cultivation array from conventional high-volume crops to premium certified-organic lines without replacing a single piece of hardware.

## 2. EQUIPMENT LINE ADAPTABILITY MATRIX

The following architectural breakdown details how each primary technology line integrates conventional traditional agricultural operations while validating NOP organic certification pathways:

System Line	Traditional Agricultural Capacity	NOP Organic Agriculture Pathway
<b>Intelligent Aquaponics (IAS1200)</b>	Operates as a high-yield automated recirculation loop using conventional commercial aquaculture inputs to optimize leafy green and fruit mass development.	Utilizes full bio-converted aquaculture effluents where fish waste is processed by certified nitrifying biomes into organic nitrate. Fully eliminates synthetic chemicals.
<b>Germination Series (GS6 / GS8)</b>	High-throughput early-lifecycle cloning and plug propagation using conventional inert rockwool cubes or synthetic rooting hormone solutions.	Compatible with OMRI-listed organic compost plugs, coco-coir matrices, and organic biological root-inoculants within non-leaching, food-grade polymers.
<b>Vertical Column Systems (TS40 / TS60)</b>	Maximized volumetric density utilizing concentrated liquid synthetic minerals driven by automated multi-channel dosing injection clusters.	Engineered to handle dense biological liquids. Smooth non-porous interior tracking channels prevent microbial bio-fouling from thick organic materials.

System Line	Traditional Agricultural Capacity	NOP Organic Agriculture Pathway
<b>Vertical Racks (HGS4 / HGS6 / HGS8)</b>	Industrial high-load tray arrays configured for commercial traditional seedling trays, microgreen flats, and automated conventional drainage flushes.	Constructed entirely from inert structural components that emit zero volatile chemical leaching, preserving organic compliance in high-moisture canopies.

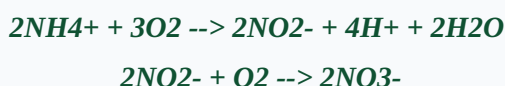
### 3. STRUCTURAL INTEGRITY & MATERIAL CHEMISTRY

A primary barrier to achieving NOP certification in Controlled Environment Agriculture (CEA) is chemical leaching from equipment frames, plumbing, and reservoirs. Ag Tech Manufacturing systematically mitigates this variable through strict material choices:

- **Structural Aluminum Frameworks:** We utilize premium architectural-grade anodized aluminum alloy extrusions instead of chemically treated plastics or painted carbon steels. This completely eliminates any risk of zinc or synthetic paint flaking into the crop root zones.
- **Pure Plastic Plumb Components:** All fluid transportation loops are constructed from certified unplasticized, non-leaching plastics. This prevents the release of endocrine-disrupting plasticizers into the water column, preserving water organic purity.
- **Heavy-Duty Acrylic & Composite Containment:** All viewing raceways and containment vats are forged from high-molecular-weight polymers, ensuring complete biological neutrality when handling acidic organic solutions (pH ranges down to 5.5).

### 4. NOP BIOLOGICAL METHODOLOGY BREAKDOWN

Ag Tech Manufacturing's operational guidelines align directly with the core directive of organic agriculture: the reliance on biological processes rather than synthetic inputs. Within our flagship **IAS1200**, the conversion of biological inputs follows a strict biochemical pathway that satisfies NOP nutrient regulations:



This natural microbial conversion changes organic aquaculture waste compounds into bio-available plant nutrients naturally, perfectly mirroring healthy terrestrial soil biomes within a pristine, soil-less technological environment. As a member of the **ESA Organics** ecosystem, Ag Tech Manufacturing continues to deliver the equipment architectures required to bridge the gap between heavy industrial output and ecological preservation.