



ADVANCED TEMPERATURE HUMIDITY INCUBATOR

Advanced Temperature Humidity Incubator — ToronCubator™ FH-X

ToronCubator™ ToronCubator™ FH-X is a precision Advanced Temperature Humidity Incubator developed for laboratories that demand tighter environmental control, extended data traceability, and seamless integration with facility monitoring systems. As the most advanced model in the ToronCubator™ lineup, this laboratory incubator features a 7-inch color LCD touchscreen, the BRIGHT II adaptive control system, and a variable-frequency refrigeration unit — delivering temperature fluctuation as tight as $\pm 0.3^{\circ}\text{C}$ and humidity uniformity within $\pm 2\%$ RH on compact configurations.

Six chamber capacities are available — 150 L, 250 L, 400 L, 800 L, 1000 L, and 1600 L — covering everything from focused bench-scale studies to high-throughput institutional applications. The ToronCubator™ FH-X stands apart from standard laboratory incubators through its built-in USB, RS232, and RS485 interface support, enabling direct connection to data acquisition systems, laboratory information management systems (LIMS), and external monitoring platforms. Internal non-volatile memory retains program data and records for more than 10 years without SD card dependency, making the ToronCubator™ FH-X a strong fit for regulated environments where long-term data integrity is a requirement.

Whether used as a biochemical incubator for cell and enzyme studies, a mould incubator for fungal growth protocols, or a general-purpose climate chamber for pharmaceutical stability work, the ToronCubator™ ToronCubator™ FH-X delivers the precision and auditability that modern laboratory workflows require.

APPLICATIONS

Advanced Temperature Humidity Incubator — ToronCubator™ FH-X Applications

The ToronCubator™ ToronCubator™ FH-X serves laboratory, pharmaceutical, and industrial environments where tight climate control and data traceability are both required:

- Pharmaceutical Stability Testing — long-term and accelerated stability studies under ICH Q1A-defined temperature and humidity conditions, with full data logging for regulatory submission support
- Biochemical and Life Science Research — controlled incubation for enzymatic reactions, protein studies, cell-based assays, and biological sample storage in regulated laboratory incubators
- Mould, Fungal, and Microbial Studies — as a dedicated mould incubator, it supports growth promotion, inhibition testing, and antimicrobial efficacy studies across standardized humidity conditions
- Environmental Simulation and Material Testing — corrosion resistance, humidity aging, and accelerated stress testing of electronics, polymers, and composite materials
- Seed Germination and Plant Science — repeatable temperature-humidity profiles for agricultural research, tissue culture, and crop development trials
- Food Safety and Quality Control — shelf-life modeling, microbiological challenge testing, and spoilage analysis under controlled conditions
- Academic and Multi-User Research Facilities — scalable general-purpose incubators for shared laboratory environments with multi-level access control requirements
- GMP and Regulated Manufacturing QC — process validation, in-process control testing, and finished product stability checks in pharmaceutical and biotech manufacturing settings



FEATURES

Advanced Temperature Humidity Incubator — ToronCubator™ FH-X Key Features

Control System and Interface

- 7-inch color LCD touchscreen for clear, intuitive parameter entry and real-time environmental monitoring
- BRIGHT II intelligent control system with adaptive parameter adjustment based on continuous environmental feedback
- Programmable multi-segment operation: 30 segments per cycle, 99 repeatable cycles
- Internal non-volatile data storage retaining records for more than 10 years without SD card dependency
- Multi-level password management for access control in shared, GMP, or regulated laboratory settings

Connectivity and Data Integration

- USB interface for data transfer and program backup
- RS232 interface for direct connection to computers and external recorders
- RS485 interface for integration with LIMS, building management systems, and multi-device networks
- Compatible with optional online monitoring platform for remote access and centralized data logging

Alarm and Safety Systems



The ToronCubator™ ToronCubator™ FH-X includes a comprehensive protective alarm suite:

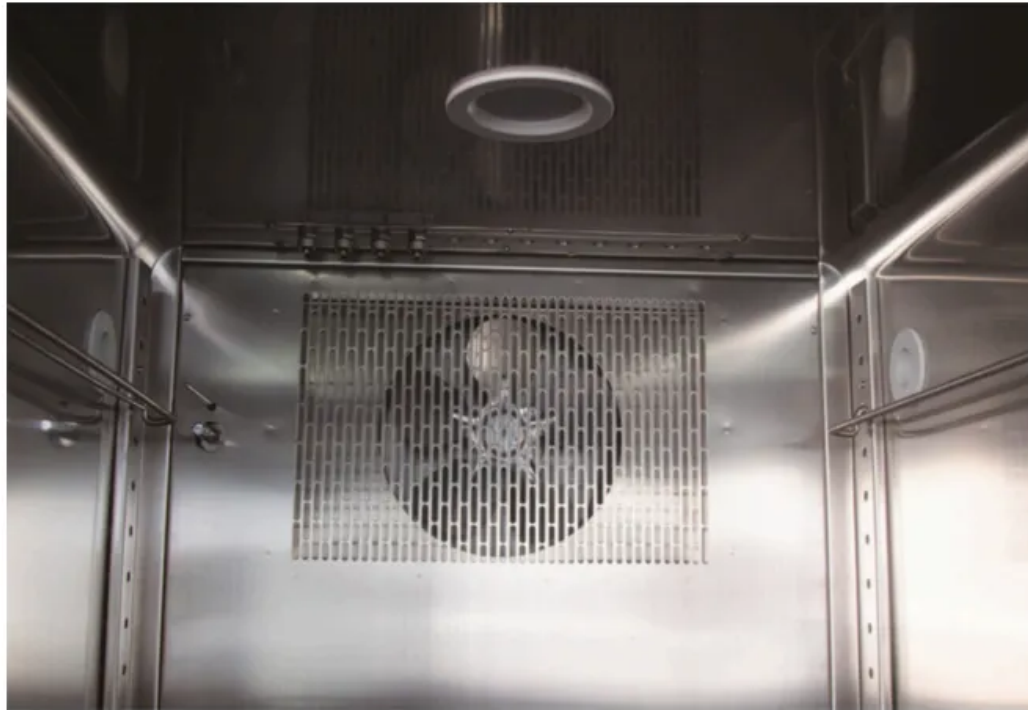
- Over-temperature and over-humidity alarm
- Over-temperature automatic shutdown protection
- Door-open alarm
- Water shortage alarm with automatic water replenishment function
- Sensor fault alarm
- Overload and leakage protection
- Compressor over-temperature protection
- Water and power outage recovery function

Refrigeration and Temperature Performance



- Variable-frequency refrigeration system for precise, energy-efficient temperature control
- Imported compressor and fan for reliable, continuous operation
- Temperature fluctuation within $\pm 0.3^{\circ}\text{C}$ across all models
- Temperature uniformity within $\pm 0.8^{\circ}\text{C}$ (150-800 L) and $\pm 1^{\circ}\text{C}$ (1000-1600 L) at 25°C
- Extended temperature range: -10°C to 85°C (without humidifying, 150-800 L)

Humidity System



- Imported precision humidity sensor for accurate, real-time RH monitoring
- Humidity range: 15%–98% RH (150–800 L models); 20%–98% RH (1000–1600 L models)
- Humidity fluctuation within $\pm 2\%$ RH (150–800 L) and $\pm 3\%$ RH (1000–1600 L)
- Automatic water replenishment with low-water detection and alarm

Chamber and Door Design



- Double-door construction with inner observation glass panel for sample monitoring without chamber access
- Anti-fog system on the interior door glass for unobstructed visibility during operation
- Test ports on both sides with 30 mm internal diameter for sensor pass-through and cable routing
- Mechanical lock for chamber security

Optional Add-Ons

- Online monitoring platform for remote environmental data access and logging
- GPRS SMS alarm for off-site alert notification
- Embedded printer for on-site hardcopy record generation

Theory and Method

The ToronCubator™ ToronCubator™ FH-X operates on a closed-loop dual-parameter control principle, managing temperature and relative humidity as independent but coordinated variables within a single working chamber. The BRIGHT II intelligent control system continuously reads live data from imported precision temperature and humidity sensors, then adjusts outputs from the refrigeration, heating, and humidification subsystems to maintain setpoint conditions within tight tolerances.

Temperature Control

Temperature regulation is handled through a variable-frequency compressor-based refrigeration circuit working in combination with electric resistance heating elements. Unlike fixed-speed compressors, the variable-frequency drive modulates compressor output in proportion to the measured deviation from setpoint. This results in temperature fluctuation held to $\pm 0.3^{\circ}\text{C}$ — tighter than standard incubator designs — along with reduced energy draw and extended compressor service life. A high-performance imported fan provides uniform air distribution, achieving spatial temperature uniformity within $\pm 0.8^{\circ}\text{C}$ at 25°C across the 150 L to 800 L range, and within $\pm 1^{\circ}\text{C}$ for the 1000 L and 1600 L configurations. The operating range extends from -10°C to 85°C without humidification (150–800 L models) and 0°C to 85°C for the larger configurations.

Humidity Control

Humidity management operates through a sensor-feedback loop connected to an electric heating humidification system. The imported RH sensor continuously monitors chamber conditions, and the control system modulates moisture introduction from the automatically replenished internal water supply to maintain the target humidity level. The ToronCubator™ FH-X delivers a humidity operating range of 15% to 98% RH on the 150–800 L models, with fluctuation within $\pm 2\%$ RH — one of the tighter performance bands available in this equipment category. The 1000 L and 1600 L models operate from 20% to 98% RH with fluctuation within $\pm 3\%$ RH.

Data Management and Connectivity

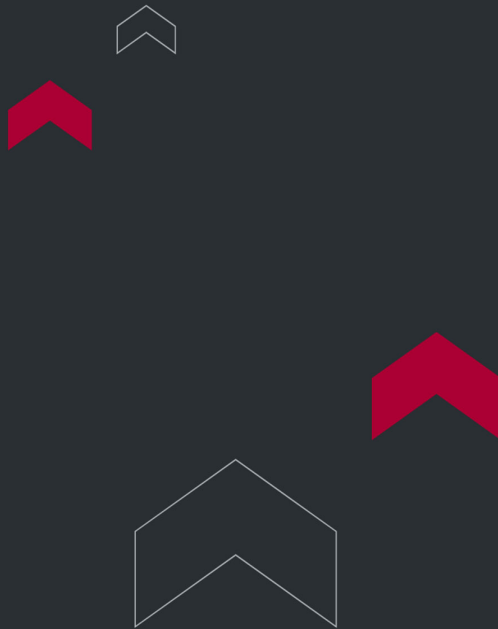
All program parameters, test profiles, and session data are stored in non-volatile internal memory with a retention period exceeding 10 years. Programs are structured as multi-segment sequences supporting up to 30 configurable segments per cycle and up to 99 repeatable cycles. USB, RS232, and RS485 interfaces allow direct integration with external data acquisition systems, LIMS platforms, and building automation infrastructure. Multi-level password management controls parameter access and protects data integrity across multi-user environments.

TECHNICAL SPECIFICATIONS

Advanced Temperature Humidity Incubator — ToronCubator™ FH-X
Technical Specifications

Parameter	ToronCubator™ FH-150X	ToronCubator™ FH-250X	ToronCubator™ FH-400X	ToronCubator™ FH-800X	ToronCubator™ FH-1000X	ToronCubator™ FH-1600X
Volume (L)	150	250	400	800	1000	1600
Temp. Range Without Humidifying (°C)	-10 to 85				0 to 85	
Temp. Range With Humidifying (°C)	10-60					
Temp. Resolution (°C)	0.1					
Temp. Fluctuation at 25°C (°C)	±0.3					
Temp. Uniformity at 25°C (°C)	±0.8				±1	

Parameter	ToronCubator™ FH-150X	ToronCubator™ FH-250X	ToronCubator™ FH-400X	ToronCubator™ FH-800X	ToronCubator™ FH-1000X	ToronCubator™ FH-1600X
Humidity Range (% RH)	15-98				20-98	
Humidity Fluctuation (% RH)	±2				±3	
Power (W)	1900	1950	2000	3100	3200	3300
Timer Range (min)	1-9999					
Internal Dimensions W×D×H (mm)	506×400×750	506×450×1100	600×610×1100	1200×610×1100	1200×760×1100	1400×850×1350
External Dimensions W×D×H (mm)	669×772×1444	669×822×1794	763×982×1794	1362×980×1782	1362×1130×1782	1562×1220×2040
Number of Baskets (Std./Max.)	3/6	4/12	4/12	4/12	4/12	4/12
Net Weight / Gross Weight (kg)	115/142	172/198	200/226	305/360	—	—
Package Size (mm)	810×980×1660	795×1030×1980	920×1170×1990	1510×1160×2010	—	—



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