TORONTECH

FORCED CONVECTION ELECTRIC HEATING INCUBATOR

Forced Convection Electric Heating Incubator – ToronCubator™ FC-X Series

ToronCubator™ FC-X is a precision Forced Convection Electric Heating Incubator designed for laboratories that require reliable, heating-only temperature control across a broad working range from ambient +5°C up to 100°C. This laboratory incubator combines the BRIGHT I intelligent control system, a preheating chamber design, and programmable multi-segment operation to deliver fast, uniform heating with minimal recovery time making it a dependable choice for microbiology, biochemical research, and general-purpose laboratory incubation where refrigeration is not required.

Available in five chamber volumes (64 L, 130 L, 210 L, 280 L, and 452 L) the ToronCubator™ FC-X Series gives laboratories a scalable selection of heating incubators that covers compact benchtop applications through large-capacity institutional workflows. The BRIGHT I control system automatically compensates operating parameters based on ambient environmental conditions, and the programmable design supports up to 10 segments across 100 repeatable cycles. A countdown reservation function with a range of up to 99 hours 59 minutes allows operators to schedule incubation start times in advance without manual intervention.

The double-door design with a glass inner door allows sample observation without opening the chamber. A 6-stage adjustable fan speed gives operators control over airflow and heat distribution to match the requirements of different sample types. One RS-485 interface supports integration with external data systems or laboratory networks. As a straightforward, heating-focused laboratory incubator, the ToronCubator™ FC-X is well suited for biochemical incubator workflows, routine microbiological incubation, and any application where a stable, programmable heated environment is the primary requirement.

APPLICATIONS

Forced Convection Electric Heating Incubator – ToronCubator™ FC-X Series Applications

The ToronCubator™ FC-X serves a wide range of laboratory, industrial, and research environments where precise electric heating and programmable temperature control are the primary requirements:

- Microbiology and Cell Culture bacterial culture incubation, cell growth studies, and microorganism propagation at stable setpoint temperatures in regulated laboratory incubators
- Biochemical Research enzyme activity assays, protein denaturation studies, and temperature-sensitive biochemical reactions requiring consistent, stable heating across the RT+5°C to 100°C range as a dedicated biochemical incubator
- Pharmaceutical QC in-process testing, reagent conditioning, and short-term stability screening of biological compounds and pharmaceutical samples at defined elevated temperatures
- Mould and Fungal Studies controlled thermal incubation for fungal cultivation and mould incubator applications where temperature-only control at defined setpoints is sufficient for the protocol
- Food Science and Safety microbial safety testing, fermentation trials, shelf-life evaluation, and spoilage studies at regulated temperatures
- Seed Germination and Agricultural Research germination trials, plant pathogen incubation, and soil microbiology research requiring stable, timed heating conditions
- Clinical and Diagnostic Laboratories sample preparation, reagent warming, and diagnostic assay incubation at precise setpoint temperatures
- Academic and Teaching Laboratories general-purpose incubators for undergraduate coursework, multi-user shared facilities, and routine laboratory workflows requiring simple, reliable heated incubation

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ToronCubator™ FC-X Series
Forced Convection Electric Heating Incubator

FEATURES

Forced Convection Electric Heating Incubator – ToronCubator™ FC-X Series Key Features

Control System and Interface

- LCD display with real-time readout of working status, setpoint, and operational parameters
- BRIGHT I intelligent control system with automatic environmental parameter compensation for consistent setpoint accuracy regardless of ambient conditions
- Programmable multi-segment design: 10 segments per cycle, 100 repeatable cycles for complex heating profile protocols
- Countdown reservation function supporting delayed-start scheduling up to 99 hours 59 minutes

Heating and Temperature Performance

- Preheating chamber design for rapid heat-up and efficient, uniform heat distribution throughout the working volume
- Temperature operating range: RT+5°C to 100°C
- Temperature fluctuation at 37°C: ±0.3°C
- Temperature uniformity at 37°C: ±0.8°C
- Heating-up time to 60°C: 10–25 minutes depending on model
- Temperature recovery after 30-second door opening at 60°C: 10–14 minutes depending on model

Airflow Management

- 6-stage fan speed regulation for adjustable forced-convection heat distribution across all shelf positions
- Fan-free ToronCubator™ FC-X variant available for natural convection protocols where airflow-sensitive samples require undisturbed incubation conditions

Safety and Alarm Systems

- Dual over-temperature alarm protection: primary sensor-controlled alarm circuit plus independent hardware-level temperature control switch operating as a separate backup safety layer
- Two-layer protection architecture provides redundancy for unattended incubation runs

Chamber and Physical Design

- Double-door construction with glass inner door for non-intrusive sample observation without opening the main chamber
- Adjustable shelving to accommodate samples of varying height and configuration
- Mechanical lock for chamber security between access events

Connectivity

- One RS-485 interface for integration with external data acquisition systems, laboratory networks, or monitoring platforms

THEORY & METHOD

Theory and Method

Electric Resistance Heating and Temperature Control

The ToronCubator™ FC-X operates on a heating-only closed-loop temperature control principle. The BRIGHT I control system continuously reads the internal chamber temperature sensor and modulates output from the electric resistance heating elements to maintain the programmed setpoint. Temperature resolution is 0.1°C, with fluctuation held to ±0.3°C and spatial uniformity within ±0.8°C, both measured at 37°C. The BRIGHT I system automatically adjusts compensation parameters in response to ambient environmental conditions, maintaining setpoint accuracy without requiring manual recalibration when laboratory temperatures shift between seasons or HVAC cycles.

Preheating Chamber Design

A defining feature of the ToronCubator™ FC-X is its preheating chamber architecture. A dedicated preheating zone accelerates thermal transfer into the working chamber, reducing heat-up time to 60°C to between 10 and 25 minutes depending on model size. This design also contributes to rapid temperature recovery after door access the larger 210 L and 280 L models recover within 10 minutes following a 30-second door opening at 60°C. For laboratories running continuous or high-frequency access workflows, this recovery performance directly affects throughput and experimental consistency.

Airflow Management and Heat Distribution

The 6-stage adjustable fan speed circulates heated air throughout the working chamber using forced convection, supporting the ±0.8°C uniformity specification across all shelf positions. Operators can select the fan speed that best fits their sample type lower speeds for open-vessel cultures or moisture-sensitive samples, higher speeds for faster initial equilibration and post-access recovery. The BXP-N configuration is available without a fan for applications where natural convection is preferred, such as certain agar plate cultures or protocols where airflow would disturb sample surfaces.

Programmable Profiles and Reservation Scheduling

Test protocols are structured as multi-segment sequences supporting up to 10 configurable segments across 100 repeatable cycles. This programmability covers ramp-and-soak temperature sequences, step gradients, and multi-phase incubation profiles without requiring operator intervention between steps. A countdown reservation function allows operators to schedule a delayed program start up to 99 hours and 59 minutes in advance. The RS-485 interface supports integration with external data acquisition platforms and laboratory networks for centralized monitoring.

Dual Over-Temperature Alarm Protection

The ToronCubator™ FC-X incorporates a two-layer over-temperature protection system. The primary layer is governed by the BRIGHT I temperature sensor control circuit, which triggers an alarm when the measured temperature exceeds the programmed threshold. The secondary layer is an independent hardware-level temperature control switch that operates separately from the main control system providing a backup safety mechanism that functions even if the primary sensor circuit develops a fault. This dual-alarm architecture is a practical safeguard for unattended incubation runs where operator oversight between checks may be limited.

TECHNICAL SPECIFICATIONS

Forced Convection Electric Heating Incubator – ToronCubator™ FC-X Series Technical Specifications

Parameter	ToronCubator™ FC-64X	ToronCubator™ FC-130X	ToronCubator™ FC-210X	ToronCubator™ FC-280X	ToronCubator™ FC-452X
Chamber Volume (L)	64	130	210	280	452
Temp. Range (°C)	RT+5 to 100				
Temp. Fluctuation at 37°C (°C)	±0.3				
Temp. Uniformity at 37°C (°C)	±0.8				

Parameter	ToronCubator™ FC-64X	ToronCubator™ FC-130X	ToronCubator™ FC-210X	ToronCubator™ FC-280X	ToronCubator™ FC-452X
Heat-up Time to 60°C (min)	16	20	15	15	25
Recovery After 30s Door Open at 60°C (min)	14	13	10	10	11
Rated Power (W)	500	500	750	950	1500
Internal Dimensions WxDxH (mm)	410×390×450	570×400×570	630×530×630	720×530×745	600×580×1300
External Dimensions WxDxH (mm)	575×566×722	715×616×842	775×746×902	865×730×1017	774×845×1704
Number of Shelves (Std./Max.)	2/5	2/7	3/7	3/9	4/13
Net Weight / Gross Weight (kg)	46/64	57/75	77/96	97/118	151/180
Package Size (mm)	675×726×872	835×776×992	895×906×1052	985×906×1167	894×1005×1854

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