



CO₂ CELL CULTURE INCUBATOR

CO₂ Cell Culture Incubator – ToronCubator™ CC

ToronCubator™ CC is a CO₂ cell culture incubator engineered for laboratories that demand precise atmospheric, thermal, and humidity control for mammalian cell growth. Available in three chamber volumes (55 L, 185 L, and 260 L) this laboratory incubator delivers a temperature range of RT+3 to 60 °C, CO₂ control from 0 to 20% ($\pm 0.1\%$), and humidity performance above 90% RH in high-humidity mode. A seven-inch touch-screen interface, three-level user management, NDIR dual-wavelength CO₂ sensing, and 150 °C dry heat sterilization make the ToronCubator™ CC one of the most capable and access-controlled CO₂ incubators available for life science and clinical research environments.

The ToronCubator™ CC is a direct-heat air-jacket CO₂ incubator purpose-built for cell culture, biomedical research, and any laboratory application requiring simultaneous control of temperature, CO₂ concentration, and relative humidity inside a sterile incubation environment. Three chamber volumes (55 L, 185 L, and 260 L) address a range of throughput needs, from compact benchtop setups to high-capacity multi-rack cell culture workflows.

The operating interface is a seven-inch color touch screen with an intuitive layout that allows users to complete complex parameter adjustments with minimal steps. A three-level management authority system assigns differentiated access rights to operators, supervisors, and administrators preventing unauthorized parameter changes while preserving full visibility across all user levels. All operational events, status logs, error reports, and performance parameters are stored on-board and can be exported via USB for audit trail and compliance documentation purposes.

The inner cavity uses 304 mirror-finish stainless steel throughout, with one-piece molded construction and no exposed screws eliminating crevices where microorganisms can accumulate. The anti-condensation inner door design prevents moisture buildup on the inner glass surface, maintaining clear sample visibility during humid incubation runs. The chamber can accommodate left or right door opening configurations, and the large-arc, dead-angle-free interior geometry makes cleaning straightforward after sterilization cycles.

Sterilization is accomplished through 150 °C dry heat technology an optional upgrade to 180 °C is available which kills heat-resistant spores and microorganisms without requiring the chamber to be emptied of its high-temperature-resistant components. The internal HEPA circulation filter and intake filter ($\leq 0.2 \mu\text{m}$) do not need to be removed during sterilization,

reducing downtime and contamination risk between culture runs. The antibacterial powder case coating delivers over 99% antibacterial efficiency on all exterior surfaces.

APPLICATIONS

CO₂ Cell Culture Incubator - ToronCubator™ CC Applications

The ToronCubator™ CC is designed for laboratory environments where cell viability, atmospheric precision, and contamination control are the primary incubation concerns. Its dual-parameter CO₂ and humidity control makes it suitable for a wide range of life science, clinical, and pharmaceutical B2B applications.

- Cell & Tissue Culture: mammalian cell line maintenance, primary cell culture, and stem cell research requiring precise CO₂, temperature, and humidity control for sustained viability.
- Biomedical Research: in vitro studies, transfection assays, cytotoxicity testing, and other protocols requiring a stable physiological environment across extended incubation periods.
- Pharmaceutical Development: cell-based assay development, biologics production support, and regulatory-grade cell culture documentation via USB operation log export.
- Clinical & Diagnostic Labs: IVF and assisted reproduction workflows, diagnostic specimen incubation, and clinical microbiology applications at controlled atmospheric conditions.
- Microbiology & Mycology: controlled-atmosphere microbial culture requiring defined CO₂ levels, humidity management, and contamination protection via HEPA filtration and UV sterilization options.
- Biosafety & Immunology: immune cell activation studies, hybridoma culture, and pathogen research requiring access-controlled operation and comprehensive alarm and audit trail systems.



FEATURES

CO₂ Cell Culture Incubator - ToronCubator™ CC Key Features

Smart Operating System

- Seven-inch color touch screen with intuitive interface for straightforward parameter control and status monitoring
- Three-level management authority system with differentiated access rights for operators, supervisors, and administrators
- On-board operation record storage with USB export for status logs, error reports, and performance data
- Audible and visual alarm system covering door events, temperature deviation, CO₂ anomalies, and sensor faults
- Optional IoT monitoring module for remote status visibility
- Optional humidity display and oxygen concentration monitoring (1-21%)

Temperature Control

- Six-sided direct heating for all-round thermal coverage and minimal temperature gradient across the chamber volume
- Rapid set-point recovery after door events with no overshoot system stability maintained throughout start/stop cycles
- 150 °C dry heat sterilization with optional 180 °C upgrade for elimination of heat-resistant spores and microorganisms
- Temperature uniformity $\leq \pm 0.25$ °C and fluctuation ≤ 0.05 °C across the full operating range

Process Design

- Anti-condensation inner door design prevents moisture accumulation on the inner glass surface during humid incubation
- Optional left or right door opening configuration to suit laboratory layout requirements
- Large-arc, dead-angle-free interior with no exposed screws one-piece molded shell for easy cleaning and sterility maintenance
- Fully sealed inner cavity with 304 mirror-finish stainless steel interior to protect the clean environment for cell growth

- Height-adjustable stainless steel shelves with high load-bearing capacity up to 20 kg per partition
- Compact footprint to maximize usable laboratory space; two units can be stacked to inhibit surface microorganism growth

Interface & Filtration

- Intelligent door control that adjusts equipment operation based on door status events
- High-temperature-resistant HEPA internal circulation filter no removal required during sterilization cycles
- Intake filter $\leq 0.2 \mu\text{m}$ and high-temperature-resistant IR CO₂ sensor both remain in place during sterilization
- Independent bottom-mounted humidification control for rapid humidity recovery after door access
- NDIR single-beam dual-wavelength CO₂ sensor with five-year service life; no need for removal during sterilization
- Antibacterial powder case coating with over 99% antibacterial efficiency on all exterior surfaces

Optional configurations include: oxygen concentration control (1–21%), three or six inner doors, IoT module, humidity display, cylinder switching, movable base, pressure reducing valve, and 180 °C dry heat sterilization mode.

Safety Protection

- Door-open alarm: if the inner door remains open for a defined period, the unit automatically sounds and displays a light alarm to prompt the user to restore status.
- Temperature upper and lower deviation alarm: if the measured temperature exceeds or drops below the set deviation threshold, the system sounds and displays an alarm and simultaneously cuts off or increases heating power until the set-point is restored preventing cell loss from abnormal temperature events.
- CO₂ concentration anomaly alarm: if CO₂ concentration rises or falls abnormally during stable operation, the unit sounds and displays an alarm to alert the operator immediately.
- Main temperature sensor fault alarm: if the primary temperature sensor fails, a fault alarm is generated and the system halts automatically to prevent unmonitored operation.
- CO₂ sensor fault alarm: if 60 consecutive seconds of sensor reply faults are detected, a CO₂ sensor fault alarm is triggered to alert the operator to a sensor condition requiring attention.

THEORY & METHOD

Theory and Method

Direct Heat Air-Jacket Thermal Control

The ToronCubator™ CC uses a six-sided direct heat method in which heating elements are distributed across all interior walls top, bottom, left, right, front, and back providing all-round thermal coverage with minimal gradient between surfaces. Temperature uniformity is rated at $\leq \pm 0.25$ °C and fluctuation at ≤ 0.05 °C across the operating range of RT+3 to 60 °C. Because door opening and closing parameters are actively compensated, the system recovers set-point conditions within 4–5 minutes of a door event without temperature overshoot, avoiding the parameter excursions that can affect sensitive cell culture incubation runs.

NDIR Single-Beam Dual-Wavelength CO₂ Sensing

CO₂ concentration is measured using a non-dispersive infrared (NDIR) sensor operating on a single-beam, dual-wavelength principle. One wavelength targets the CO₂ absorption band; the second serves as a reference channel. The ratio between the two eliminates sensor drift caused by aging, contamination, or temperature variation delivering stable, accurate CO₂ readings over a service life of five years without requiring sensor replacement. Control range spans 0–20% CO₂ with accuracy of $\pm 0.1\%$. Concentration recovery time after a door-opening event is under 4 minutes for ToronCubator™ CC 55 and ToronCubator™ CC 185, and under 5 minutes for ToronCubator™ CC 260.

Humidification Tray and Humidity Control

Humidity is generated passively through an evaporating humidification tray placed inside the working chamber. An independent bottom-mounted humidification control mechanism allows rapid recovery of relative humidity following door access. The system achieves over 90% RH in high-humidity mode and maintains above 80% RH in standard mode, with the humidity range confirmed as stable across the full temperature operating envelope. An independent drain port supports easy water addition and removal without disturbing the chamber environment.

Dry Heat Sterilization at 150 °C

The sterilization cycle runs at 150 °C for less than 10 hours, with an optional 180 °C mode available for more thorough decontamination. The process eliminates bacteria, fungi, and heat-resistant spores from all interior surfaces. High-temperature-resistant HEPA filters and the NDIR IR sensor remain in place during sterilization neither needs to be removed minimizing the contamination risk associated with disassembly and reassembly of internal components. The antibacterial powder exterior coating provides ongoing surface-level antibacterial protection between sterilization cycles, achieving over 99% antibacterial efficiency.

Three-Level Access Management and Data Logging

The PMMA-based operating system implements a three-level authority structure operator, supervisor, and administrator each with differentiated access to parameter changes, alarm acknowledgment, and system configuration. This architecture prevents accidental or unauthorized modification of incubation conditions in shared laboratory incubator environments. All operational events are logged continuously; USB export allows records to be transferred for GLP, GMP, or institutional audit documentation. An audible and visual alarm system covers door-open events, over/under temperature deviations, abnormal CO₂ concentration, main sensor faults, and CO₂ sensor faults.

TECHNICAL SPECIFICATIONS

CO₂ Cell Culture Incubator - ToronCubator™ CC Technical Specifications

Parameter	ToronCubator™ CC 55	ToronCubator™ CC 185	ToronCubator™ CC 260
Chamber Volume	55 L	185 L	260 L
Heating Method	Direct Heat Air-Jacket Type		
Temperature Range	RT+3 to 60 °C		
Temperature Uniformity	≤ ±0.25 °C		

Parameter	ToronCubator™ CC 55	ToronCubator™ CC 185	ToronCubator™ CC 260
Temperature Fluctuation	≤ 0.05 °C		
Temperature Recovery Time	< 4 min	< 4 min	< 5 min
Service Temperature Range	18-34 °C		
CO ₂ Control Range (%vol)	0-20%		
CO ₂ Control Accuracy (%vol)	±0.1%		
CO ₂ Sensor Type	Infrared (IR) NDIR, Single Beam Dual Wavelength		
CO ₂ Sensor Service Life	5 years		
Concentration Recovery Time	< 4 min	< 4 min	< 5 min
Intake Pressure	0.8-1.2 bar		
Humidification Method	Humidification Tray		
Humidity Range (High Mode)	> 90% RH		
Humidity Range (Low Mode)	> 80% RH		
Sterilization Method	Dry Heat Sterilization		
Sterilization Temp. / Duration	150 °C / < 10 h		
Intake Filter	≤ 0.2 µm		
Internal Circulation Filter	High-temperature resistant HEPA; no removal required during sterilization		
Case Coating	Antibacterial Powder >99% antibacterial efficiency		
Overall Dimensions W×D×H	500×600×690 mm	685×700×870 mm	745×700×1055 mm
Cavity Size W×D×H	310×380×470 mm	500×370×650 mm	555×565×835 mm
Inner Cavity Material	304 Mirror-Finish Stainless Steel		

Parameter	ToronCubator™ CC 55	ToronCubator™ CC 185	ToronCubator™ CC 260
Standard Partitions	2	3	3
Partition Size	305×270 mm	496×440 mm	550×460 mm
Load per Partition	20 kg		
Voltage	220-240VAC, 50/60Hz (110V is also available)		
Maximum Power	500 W	1200 W	1500 W



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