TORONTECH

CO2 SHAKER INCUBATOR

CO2 Shaker Incubator - ToronShake™ CO2 Series

CO2 shaker incubator is a cell culture instrument that combines orbital agitation, compressor refrigeration, and active CO2 atmosphere control within a multi-layer cabinet of independently operated shaking decks. The ToronShake™ CO2 Series targets cell biology laboratories, biotech research teams, and pharmaceutical development groups maintaining mammalian suspension cultures, hybridoma cells, CHO, HEK293, and other CO2-sensitive cell lines. Single, double, and triple-layer configurations are available across four per-layer chamber volumes: 115 L, 238 L, 290 L, and 340 L. All layers are housed within a single cabinet footprint, with per-layer tray areas ranging from 530×500 mm (115 L) to 925×530 mm (340 L) to accommodate flask loads from 250 mL to 5,000 mL.

Each deck in the ToronShake™ CO2 Series operates as a fully independent incubation environment: temperature setpoint, shaking speed, rotation direction, CO2 concentration, and program segments are configured separately per layer and do not interact with adjacent decks. The BRIGHT I intelligent control system auto-compensates control parameters in real time as ambient conditions shift, maintaining setpoint accuracy without manual recalibration. Five independent program groups, each with up to 30 configurable segments, store complex ramp-soak and multi-phase incubation protocols per cabinet. A 7-inch full-color touchscreen provides access to all layer-specific controls, real-time parameter readout, and historical data curves from a single panel.

The ToronShake™ CO2 Series is built for sustained cell culture operation: a SUS 304 stainless steel waterproof interior with internal drainage channels handles media spills without surface damage, and an imported DC brushless motor drives a three-dimensional three-axis transmission engineered to compensate for thermal expansion over long continuous runs. Frost-free compressor operation with configurable defrost intervals and delayed compressor start extends equipment service life. UV germicidal lamp control and standard interior lighting are included in the base configuration on all models. All models connect to an external CO2 gas cylinder through the included pressure-reducing valve and operate on AC220 ±22V, 50 Hz power supply.

APPLICATIONS

CO2 Shaker Incubator - ToronShake™ CO2 Series Applications

The ToronShake™ CO2 Series CO2 shaker incubator serves cell biology, biopharmaceutical, and bioprocess research workflows where orbital agitation and controlled CO2 atmosphere must operate simultaneously within a compact laboratory footprint.

- **Mammalian Suspension Cell Culture**: the primary application for this CO2 shaker incubator, culturing CHO, HEK293, BHK-21, and similar suspension-adapted mammalian cell lines under controlled CO2 atmosphere and orbital agitation to maintain the pH stability and gas-exchange conditions required for healthy cell growth and high viability across extended culture runs.
- **Hybridoma Culture and Monoclonal Antibody Production**: propagation of hybridoma cell lines for monoclonal antibody production under precise CO2 and temperature control, where pH drift from inadequate atmospheric CO2 directly reduces antibody yield and cell viability over time.
- **Biopharmaceutical Process Development**: early-stage process development for recombinant protein expression in mammalian host cells, including parallel screening of media formulations, feed strategies, temperature shifts, and CO2 setpoints across independently controlled decks within a single cabinet.
- **Viral Vector Production for Gene Therapy**: high-density suspension culture of producer cell lines for AAV, lentiviral, and adenoviral vector manufacturing, requiring the CO2-buffered pH environment and consistent orbital mixing this instrument delivers across large culture volumes.
- **Stem Cell Research**: culture of iPSCs, ESCs, and differentiated stem cell populations in suspension or aggregate formats under the physiologically controlled CO2 atmosphere required to maintain pluripotency or directed differentiation conditions at defined temperature and agitation setpoints.
- **Protein Expression Studies**: optimization of recombinant protein expression in mammalian and insect cell systems by screening agitation speed, temperature, and gas-phase composition across independently controlled decks simultaneously, without cross-contamination between protocols.
- **Pharmacological and Toxicological Screening**: cell-based assay development and compound screening workflows that require live mammalian cell cultures maintained under physiological CO2 conditions for extended periods with consistent environmental reproducibility across replicate runs.

- **Academic and Institutional Core Laboratories**: multi-user shared-access cell culture facilities where independent per-deck control allows different research groups to run different CO2 concentration, temperature, and agitation protocols simultaneously within a single ToronShake™ CO2 Series cabinet.

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ToronShake™ CO2 Series
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WARNING
ATTENTION

Standards

The ToronShake™ CO2 Series is designed and manufactured in alignment with internationally recognized standards for laboratory instrument safety, hygiene, electromagnetic compatibility, and biocontamination control. All standards below are independently researched; confirm active certification status with the manufacturer before referencing as formally certified in regulated submissions.

- IEC 61010-1 – Safety requirements for electrical equipment for measurement, control, and laboratory use
- EN ISO 14159:2008 – Safety of machinery; hygiene requirements for the design of machinery; applicable to the cleanable SUS 304 stainless steel interior construction
- ISO 14698-1 – Cleanrooms and associated controlled environments; biocontamination control; applicable to UV germicidal lamp sterilization and contamination management features
- UL 61010-1 – Safety requirements for electrical equipment for measurement, control, and laboratory use (North American reference standard)
- CE Marking (EMC Directive 2014/30/EU) – Electromagnetic compatibility requirements for laboratory electrical equipment
- RoHS Directive (2011/65/EU) – Restriction of hazardous substances in electrical and electronic equipment

FEATURES

CO2 Shaker Incubator - ToronShake™ CO2 Series Key Features

The ToronShake™ CO2 Series delivers independent multi-deck CO2 shaking incubation with full environmental control across temperature, CO2 atmosphere, and orbital agitation. All features below are standard across single, double, and triple-layer cabinet configurations.

- **Imported Infrared CO2 Sensor with Pressure-Reducing Valve**: an imported infrared CO2 concentration sensor delivers fast, accurate gas detection without interference from chamber humidity; the included pressure-reducing valve connects the cabinet directly to an external CO2 gas supply for stable, continuous atmosphere control throughout the incubation cycle.
- **Per-Deck Independent Environmental Control**: temperature setpoint, shaking speed, rotation direction, CO2 concentration, operating mode, and program segments are configured and operated independently per layer, allowing different protocols to run simultaneously in the same cabinet without cross-influence between decks.
- **BRIGHT I Intelligent Control System**: monitors internal chamber conditions continuously and auto-compensates control parameters as ambient laboratory conditions shift, maintaining setpoint accuracy on each deck without manual operator recalibration between runs.
- **7-Inch Full-Color Touchscreen with Layer-by-Layer Navigation**: a shared 7-inch full-color touchscreen gives operators access to all layer-specific controls, real-time and historical curve data, the Gregorian calendar scheduling function, and alarm event records; each layer is independently navigable from the same panel.
- **Slide-Out Shaker Platform with Flip-Down Access Door**: the shaking board slides out of each deck for straightforward flask loading and unloading, locks in position with a mechanical buckle during active runs to prevent displacement, and each deck has an independent flip-down door that can temporarily support flasks during loading to improve placement efficiency.
- **Side-Pull Door with Three-Side Magnetic Seal**: the side-pull access door provides direct access to culture vessels without disturbing adjacent decks, with three-sided magnetic sealing that maintains chamber integrity and CO2 atmosphere during oscillation.
- **5-Group x 30-Segment Programmable Protocol Library**: stores five independent protocol groups per cabinet, each supporting up to 30 programmable segments for ramp-soak sequences, multi-phase temperature profiles, and automated run transitions without operator intervention.
- **Dual Timing Modes**: operators select between timing from operating temperature onset or from the moment the chamber reaches the target setpoint, giving precise control over actual biological exposure time in each protocol segment.
- **Calendar-Based Appointment Scheduling**: the Gregorian calendar scheduling function programs run start times in advance, supporting delayed-start protocols for unmanned overnight or weekend laboratory operations.

- **150,000-Record USB Data Management with Alarm Event Logging**: onboard storage logs 150,000 data points per cabinet; USB drive export transfers complete timestamped run records for audit trail and QC documentation; the control system records alarm events and their exact occurrence times automatically, supporting backtracking and incident investigation.
- **Real-Time and Historical Curve Viewing with Time-Jump Search**: the touchscreen displays live parameter curves alongside searchable historical run data; set values and measured values are both visible simultaneously, making the full run trajectory reviewable without external software.
- **Screen Lock and Password Protection**: screen saver, lock screen, and unlock password settings prevent accidental parameter changes during unattended multi-day culture runs in shared or regulated laboratory environments.
- **UV Germicidal Lamp with Program-Controlled Timing**: the built-in UV germicidal lamp operates on a programmable timer for inter-run chamber decontamination; mirror-finish stainless steel interior surfaces maximize UV surface coverage with no shadowed areas.
- **Three Selectable Rotation Modes**: forward, reverse, and alternate rotation modes cover different agitation pattern requirements; the alternate mode supports a programmable alternation interval for protocols requiring periodic direction reversal.
- **Imported Fluorine-Free Compressor with Quiet Condenser**: the imported fluorine-free environmental-protection compressor reduces refrigerant climate impact; the low-noise condenser and efficient cooling fan support long-duration continuous operation without acoustic interference.
- **Configurable Frost-Free Operation**: defrost temperature, defrost interval, and defrost duration are user-adjustable parameters; delayed compressor start logic at run initiation protects the compressor from rapid cycling and extends operational service life.
- **SUS 304 Stainless Steel Waterproof Interior with Drainage Channel**: the waterproof inner cavity includes an internal diversion trough that channels and contains liquid spills during oscillation, protecting internal components and simplifying post-run cleaning and disinfection.
- **Hollow Tempered Glass Observation Door**: the hollow-core tempered glass door allows interior observation at any time without opening the chamber and disrupting the CO_2 atmosphere, reducing unnecessary gas loss between scheduled top-up events.
- **Imported DC Brushless Motor with Three-Axis Orbital Transmission**: the DC brushless motor drives a three-dimensional integrated three-axis transmission designed to absorb dimensional displacement from thermal expansion

and cold contraction during extended continuous operation, maintaining consistent orbital motion across all flask sizes.
- **Seamless Foam-Insulated Outer Cabinet**: the smooth-sprayed outer cabinet uses an integral seamless foam insulation structure for consistent thermal barrier performance and simplified exterior cleaning between culture runs.

THEORY & METHOD

Theory and Method

CO_2 shaker incubators maintain a controlled CO_2 atmosphere to stabilize the pH of bicarbonate-buffered cell culture media. Most mammalian cell culture protocols depend on approximately 5% atmospheric CO_2 to sustain the carbonate-bicarbonate equilibrium that keeps culture pH within the physiological range of 7.2 to 7.4. The ToronShake™ CO_2 Series monitors chamber CO_2 concentration with an imported infrared CO_2 sensor and opens the CO_2 inlet valve when the measured concentration falls below setpoint, restoring target levels from an external gas supply connected through the included pressure-reducing valve. This closed-loop infrared detection approach provides faster response and greater accuracy than thermal conductivity sensors and is not affected by the humidity changes that occur inside an actively shaking incubation chamber.

Orbital shaking mixes suspension culture vessels by rotating the shaker platform in a fixed-radius circular path at a selectable speed and direction. The ToronShake™ CO_2 Series drives this motion through an imported DC brushless motor connected to a three-dimensional integrated three-axis transmission engineered to absorb dimensional displacement from thermal expansion during extended temperature-controlled runs, keeping orbital motion consistent without flask shifting over time. Three rotation modes are available: forward, reverse, and alternate rotation with a programmable alternation interval. Speed ranges from 0 to 300 rpm with ±1 rpm accuracy at a standard vibration amplitude of Ø26 mm (Ø50 mm available on request).

Compressor refrigeration extends the temperature range from 4 °C to 60 °C, enabling sub-ambient incubation for cold-sensitive culture protocols as well as elevated-temperature runs up to 60 °C. The ToronShake™ CO_2 Series uses an imported fluorine-free compressor paired with a quiet condenser and efficient cooling fan for continuous, long-term operation. The

frost-free system provides user-adjustable defrost temperature, interval, and duration settings, together with compressor delayed-start logic that protects the compressor from rapid cycling at run initiation. The BRIGHT I control system governs all three environmental parameters across each deck independently, logging operational data to a 150,000-record onboard buffer and making complete run records available for USB export throughout and after each incubation cycle.

TECHNICAL SPECIFICATIONS

CO2 Shaker Incubator - ToronShake™ CO2 Series Technical Specifications

The ToronShake™ CO2 Series is available in single-layer (S), double-layer (D), and triple-layer (T) cabinet configurations across four per-layer chamber volumes. All performance parameters in the shared table apply to every model in the series.

Shared Performance Parameters — All Models

Parameter	Specification
Temperature Range	4–60 °C
Temperature Resolution	0.1 °C
Temperature Fluctuation (at 37 °C)	±0.5 °C
Temperature Uniformity (at 37 °C)	±1.0 °C
CO2 Atmosphere Control	Infrared sensor; external CO2 supply via included pressure-reducing valve
Rotation Rate	0–300 rpm
Rotation Accuracy	±1 rpm
Vibration Amplitude	Ø26 mm standard (Ø50 mm optional)

Parameter	Specification
Rotation Modes	Forward / Reverse / Alternate (programmable interval)
Program Storage	5 groups × 30 segments per cabinet
Timing Modes	From operating temperature onset / From setpoint arrival
Timer Range	0–999.9 h
Data Storage	150,000 records; USB export
UV Germicidal Lamp	Included, program-controlled
Standard Interior Lighting	Included
Interior Construction	SUS 304 stainless steel, waterproof, mirror finish, with drainage channel
Voltage	AC220 ±22V, 50 Hz (110V is also available)

Model-Specific Specifications

Parameter	ToronShake™ CO2 S115	ToronShake™ CO2 D115	ToronShake™ CO2 T115	ToronShake™ CO2 S290	ToronShake™ CO2 D290	ToronShake™ CO2 S238	ToronShake™ CO2 D238	ToronShake™ CO2 T238	Toro CO
Layer Configuration	Single	Double	Triple	Single	Double	Single	Double	Triple	Single
Volume per Layer (L)	115	115	115	290	290	238	238	238	340
Tray Size W×D (mm)	530×500	530×500	530×500	740×490	740×490	925×530	925×530	925×530	925×
Rated Power, per layer (W)	800	800	800	1,000	1,000	1,000	1,000	1,000	1,000

Parameter	ToronShake™ CO2 S115	ToronShake™ CO2 D115	ToronShake™ CO2 T115	ToronShake™ CO2 S290	ToronShake™ CO2 D290	ToronShake™ CO2 S238	ToronShake™ CO2 D238	ToronShake™ CO2 T238	Toro CO
Housing W×D×H (mm)	970×720×600	970×720×1200	970×720×1800	1160×760×760	1160×760×1520	1450×950×600	1450×950×1200	1450×950×1800	1450

Full Load Configuration per Layer

Model Group	Tray Size (mm)	250 mL	500 mL	1,000 mL	2,000 mL	3,000 mL	5,000 mL
ToronShake™ CO2 (S/D/T)115	530×500	×30	×20	×8	n/a	×6	n/a
ToronShake™ CO2 (S/D)290	740×490	×40	×24	×15	×11	×8	×6
ToronShake™ CO2 (S/D/T)238	925×530	×60	×40	×28	×15	×11	n/a
ToronShake™ CO2 (S/D)340	925×530	×60	×40	×28	×15	×11	×8

Configuration values shown are per layer. Double and triple-layer cabinets multiply total capacity by the number of decks.

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