

Think GAIA
For Life and the Earth

SANYO

MCO-19AIC Cell Culture CO₂ Incubator

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The industry's most complete cell culture solution for research, clinical and regulated applications.

Now with safe, effective and documented three-hour in situ H₂O₂ decontamination option for fastest turn-around and maximum availability.



Ideal for Regulated or Sensitive Applications

Advanced performance and design allows the MCO-19AIC to be used with confidence in high-value cell protocols among hard-to-grow cell lines, cells highly sensitive to contamination, ultra-sensitive media and reagents, or protocols that require a strict isolation and decontamination between processes.

These include:

- Stem cell research
- Autologous tissue regeneration & regenerative medicine
- In vitro fertilization¹
- Genomic and proteomic expression
- Esoteric plant and amphibian cell culture
- Hypersensitive and transgenic cell culture
- Low media volume microplate work

¹ 510(K) clearance applied for. Contact SANYO for status



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Stable cell culture environment with germicidal protection	SafeCell™ UV active background contamination control	H ₂ O ₂ Vapour decontamination

MCO-19AIC Cell Culture CO₂ Incubator

The industry's most complete cell culture solution for research, clinical and regulated applications.



The SANYO MCO-19AIC CO₂ Incubator is designed for demanding and regulated applications in the biomedical, pharmaceutical, medical research and clinical laboratory. Representing years of research, development and component testing, the MCO-19AIC offers outstanding performance and advanced, multi-level contamination control to provide the ideal solution for cell culture protocols.

Decontamination

The unique H₂O₂ decontamination option limits downtime to less than three hours when total chamber decontamination with verification is desired. All interior components and CO₂ sampling loop are decontaminated in situ. There is no need to remove or replace critical components.

Active Background Contamination Control™ fights contamination while cell culture protocols are in process. The patented SafeCell™ UV treats interior airflow to destroy airborne and humidity pan contaminants.

Exclusive InCu saFe® copper-enriched stainless steel interior surfaces assure constant germicidal protection.

Control and Monitoring

The MCO-19AIC control and information centre features a multi-function LCD with intuitive pop-up menu for straight-forward programming of set-points, alarms and controller functions. The LCD displays set-points, actual performance and incubator status at-a-glance.

Precise PID control logic provides stable CO₂, temperature and humidity conditions.

Multi-point data logging offers push-button graphical display. An optional PC interface permits remote transmission for GMP/GLP protocols as required.

CO₂ Control

SANYO proprietary single-beam, dual detector infrared (IR) CO₂ sensor delivers precise CO₂ control and fast recovery following door openings with no moving parts.

Continuous auto-zero calibration is standard.

An optional semi-automatic, one-point span calibration system is available. (See Options)

Temperature and Humidity Control

The patented Direct Heat and Air Jacket™ conditioning system precisely regulates temperature through multiple heating zones under microprocessor control.

The humidity pan is easy to fill, easy to clean and the automatic optical sensor advises of low water level.

Cabinet Design

The 170 litre capacity incubator is stackable with field-reversible doors.

Interior components and adjustable shelves are configured for easy access.

Model	MCO-19AIC(UV)	MCO-19AIC
Major Operating Systems		
H₂O₂ Decontamination System	Optional	Optional (also requires SafeCell™ UV)
SafeCell™ UV System	Standard	Optional
InCu saFe® Copper Enriched Stainless Steel Interior	Standard	Standard
Single Beam, Dual Detector IR CO₂ Sensor	Standard	Standard
Direct Heat & Air Jacket™ (DHA) Heating System	Standard	Standard
LCD Graphical Controller/Display, Door Mounted	Standard	Standard

Decontamination

Continuous Active Background Contamination Control™ fights contamination while cell culture protocols are in process without downtime or compromise to the incubator's performance. The patented SafeCell™ UV treats interior airflow to destroy airborne and humidity pan contaminants and InCu saFe® copper-enriched stainless steel interior surfaces assure constant germicidal protection. When total chamber decontamination with verification is required, the unique H₂O₂ decontamination option limits downtime to less than three hours.

H₂O₂ Decontamination

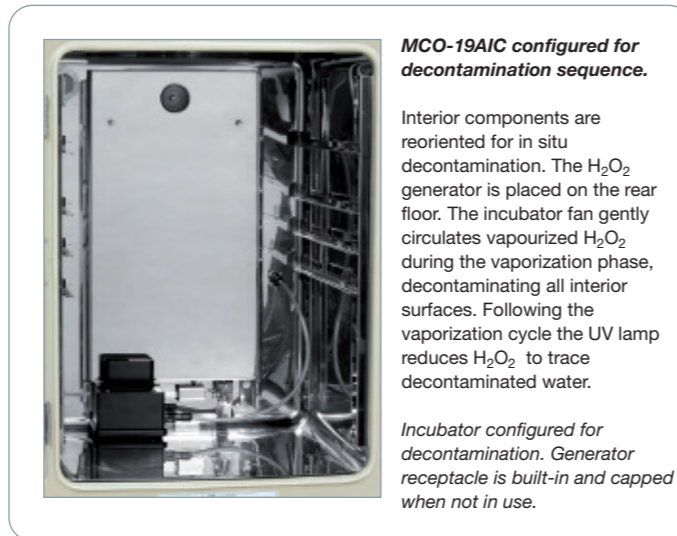
The use of low temperature H₂O₂ sterilisation in biological safety cabinets and barrier isolators is a popular alternative to ethylene oxide (EtO) as a safer, more efficient decontamination method. H₂O₂ has long been widely used in the pharmaceutical industry and in aerospace research. H₂O₂ is used to sterilise satellites and interplanetary exploration probes.

The MCO-19AIC Design Permits Safe, Effective H₂O₂ Decontamination

Unlike conventional incubators, the unique design features of the MCO-19AIC permit the safe use of H₂O₂ decontamination in situ with zero impact on adjacent equipment or the environment, and relative speed to return the incubator to service.

- The H₂O₂ decontamination process functions with the patented SANYO SafeCell™ UV system. Following a seven minute H₂O₂ vaporization, circulation and dwell cycle, the vaporization is stopped and the SafeCell™ UV lamp turned ON for 90 minutes.
- When exposed to UV light the H₂O₂ vapour breaks down into water vapour and oxygen. Throughout the entire cycle the MCO-19AIC airflow system continues to gently circulate interior air assuring 100% vapour contact with all interior surfaces and ultimately breaking down the H₂O₂ vapour as it passes over the UV lamp.

- The location of the interior sample ports of the single beam, dual detector IR CO₂ sensor creates a slight Venturi flow through the sensor permitting total decontamination of the CO₂ system at the same time.
- Shape and placement of interior components such as shelves, shelf brackets, plenum covers and the humidity tray permit the components to remain inside the MCO-19AIC during the decontamination process, conveniently by passing the need for a separate autoclave cycle.



reliable



H₂O₂ decontamination vs. high heat sterilization

■ = Uptime (hours) ■ = Downtime (hours)

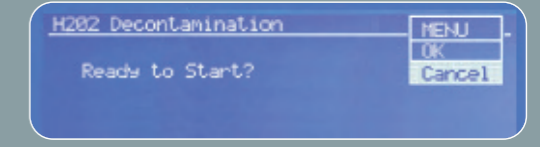
- Once the cycle is complete, the door locking system is released; the door can be opened, interior components repositioned and the incubator is returned to service.
- The H₂O₂ decontamination cycle is monitored for safety and cycle status. A physical door interlock and H₂O₂ neutralization sequence assures total decontamination and operator safety.

MCO-19AIC Performance and Availability Delivers Best Value

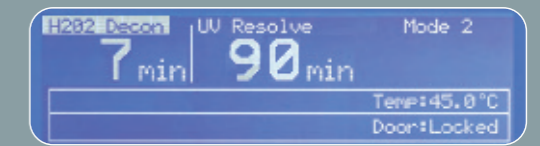
The documented 3 hour *in situ* H₂O₂ sequence puts the fully decontaminated MCO-19AIC available and ready for use quicker than any other incubator worldwide.

Decontamination Cycle

The H₂O₂ decontamination cycle is monitored for safety and cycle status. A physical interlock and neutralization sequence assures total decontamination and operator safety.



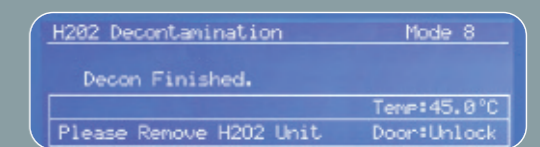
- 1. Start Cycle:** When the H₂O₂ button is pressed a confirming message prompts the user to proceed with the decontamination cycle or cancel.



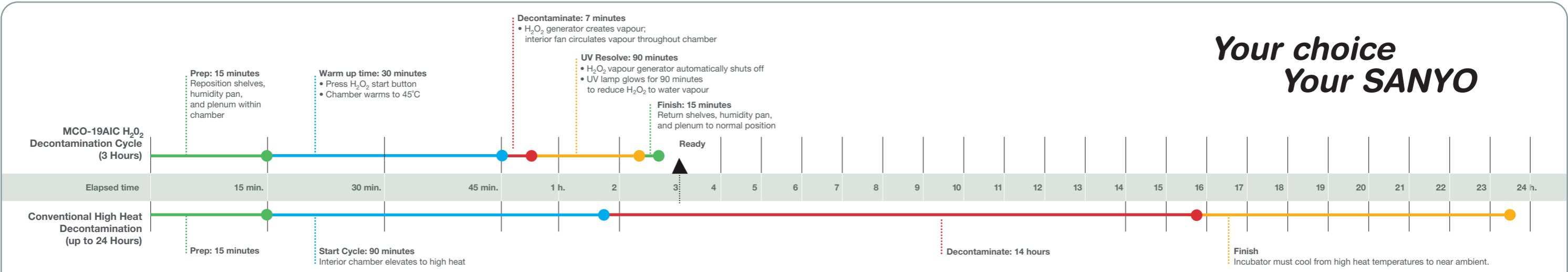
- 2. H₂O₂ Vapour Cycle:** Once the door locks automatically, the cycle starts. The flashing H₂O₂ display confirms the process and counts down remaining H₂O₂ vaporization time.



- 3. UV Resolution:** The H₂O₂ generator automatically completes after a 7 minute cycle. UV lamp comes ON. The flashing UV Resolve display counts down remaining time in the UV cycle as H₂O₂ is reduced to water and trace oxygen.



- 4. Cycle Complete:** When the cycle is complete the door lock releases automatically. The H₂O₂ generator and cable can be disconnected and removed and all interior components restored to their normal position.



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Active Background Contamination Control™

SANYO's Active Background Contamination Control™ combines narrow bandwidth, ozone-free ultraviolet light and InCu saFe® copper-enriched stainless steel alloy interior to fight contamination whilst the incubator remains in use. The MCO-19AIC is ideal for critical applications where continuous contamination control is essential to cell viability. The incubator offers significant economic benefits by minimising interruptions for decontamination, by improving cell culture growth and expression under stable, repeatable conditions, and by minimising the potential for product loss.

SafeCell™ UV System

SafeCell™ UV includes a programmable ultraviolet lamp that decontaminates conditioned air and humidity reservoir water to prevent contamination without affecting cell cultures in vitro.

- SafeCell™ UV inhibits the growth of mycoplasma, bacteria, molds, spores, yeasts and fungi without costly HEPA filters which accumulate contaminants in the chamber air.
- Positioned at the base of the plenum an isolated beam of high intensity, ozone-free ultraviolet light destroys contaminants, away from active cell cultures.
- Airborne contaminants are eliminated by an automatic UV cycle that automatically turns ON for a specified period after each door opening. Contaminants trapped within the distilled water pan are also destroyed by ultraviolet.
- Sterile, humidified air is released from the lower plenum for vertical convection through and around the perforated shelves. Interior air motion is suspended when the door is opened, minimizing movement of room air contaminants into the chamber.
- The SafeCell™ UV lamp cycle is factory set for normal use, and can be re-programmed as desired. Program parameters for the H₂O₂ decontamination cycle are non-adjustable for operator safety.

InCu saFe® Construction for Germicidal Protection

SANYO's exclusive InCu saFe® copper-enriched stainless steel alloy interior surfaces, plenum and shelving eliminate contamination sources and mitigate the effect of airborne contaminants introduced through normal use.

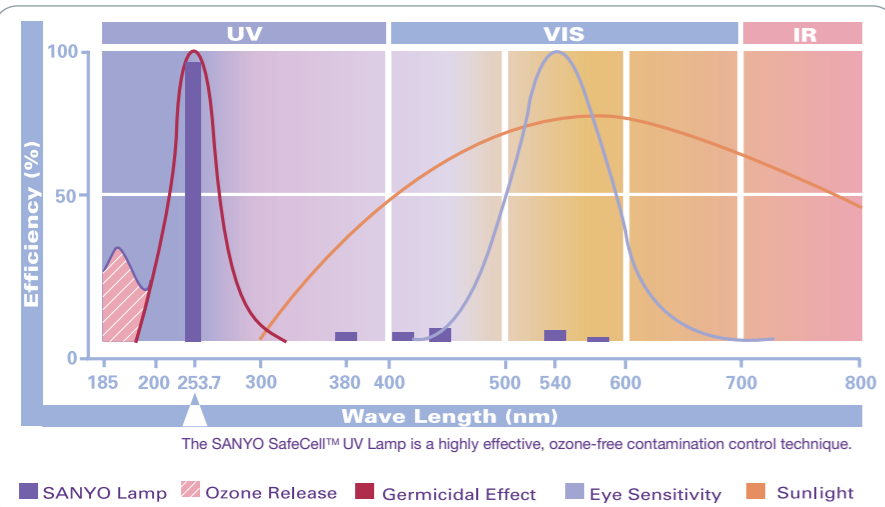
- Selected to provide passive germicidal protection without rust or corrosion, InCu saFe® expresses a natural germicidal effect inhibiting the growth of molds, fungi, mycoplasma and bacteria.
- All interior components, including the air management plenum, shelf supports, and humidity pan and fan assembly are easily removable without tools if required. When components are removed, all interior surfaces are exposed for conventional wipe down.
- Large curve corners and electro-polished surfaces are easy to clean.
- During the H₂O₂ decontamination cycle interior components can be repositioned within the chamber for in situ decontamination.
- An access port (with dual, non-VOC silicone stoppers) accommodates probes or instrumentation leads as required for specialized cell culture protocols.



Intelligent Control Interface with Integrated LCD Display

The MCO-19AIC Incubator is managed by an integrated microprocessor controller with LCD graphical display to simplify all incubator functions. The PID controller supervises the incubator's advanced systems to provide stable CO₂, temperature and humidity conditions complete with alarm, programming, calibration and diagnostic protocols.

- A multi-function, high resolution LCD displays set-points, actual performance and incubator status at-a-glance.
- An intuitive Pop-up menu and function keys provide straight-forward programming of set-points, alarms and controller functions.
- Standard parameters are factory-set for quick start-up, and all parameters can be changed as required.
- Multi-point data logging offers a graphical display of selected performance history.
- Logged parameters can be exported to remote databases, off-site alarm or data capture systems through optional communication boards for GMP/GLP compliance monitoring as required. (See Options)
- A remote alarm terminal mounted at the rear of the incubator can be connected to an external alarm system.
- The control panel is centre mounted in the outer door for easy access and viewing.



Mycoplasma Survival Results

Chart summarises test results with four strains of mycoplasma. Results demonstrate how SANYO InCu saFe® copper-enriched stainless steel alloy offers germicidal properties of conventional C1100 copper while maintaining both corrosion-proof and discoloration-resistant properties of conventional Type 304 stainless steel. Detailed test results are available from SANYO.

Mycoplasma Strain	Positive Control	Conventional Type 304 Stainless Steel	SANYO InCu saFe®	Conventional Copper C1100
Mycoplasma fermentans PG18	YES	YES	NO	NO
Mycoplasma orale CH19299				
Mycoplasma arginini G230				
Mycoplasma hominis PG21				

Precise Control of Culture Environment

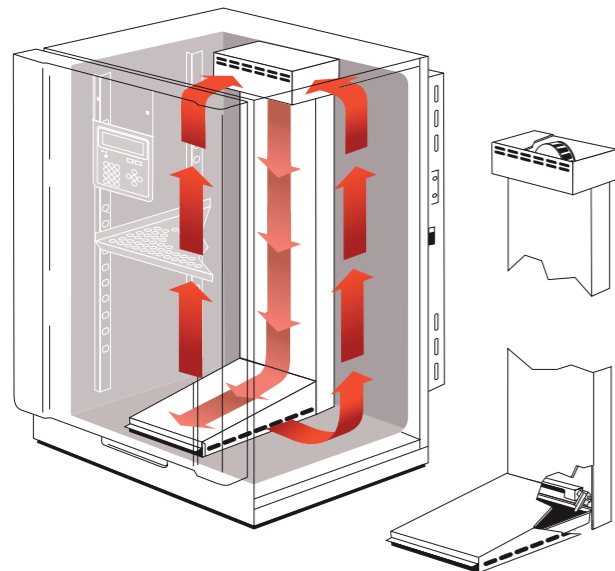
The MCO-19AIC offers the most stable cell culture environment with outstanding control and recovery performance of temperature and CO₂ concentration.



Dual Wavelength Infrared CO₂ Control System

The SANYO single beam, dual detector infrared CO₂ sensing system offers unprecedented control accuracy and stability by simultaneously measuring sample and reference wavelengths for continuous auto-zero calibration. The ceramic-based sensor is unaffected by moderate changes in temperature and relative humidity and is linked to the sophisticated P.I.D. microprocessor controller. Benefits include ultra-fast recovery without overshoot for optimum CO₂ control during periods of frequent incubator door openings.

- No moving parts for reliable operation.
- Sensor remains in situ during H₂O₂ and background UV decontamination.
- Set and actual CO₂ levels are displayed on the LCD display.
- An optional semi-automatic, one-point span calibration system is available. (See Options)
- A CO₂ sample port mounted on the incubator front also permits convenient confirmation of chamber CO₂ density.
- An optional automatic CO₂ cylinder switchover system is available. (See Options)



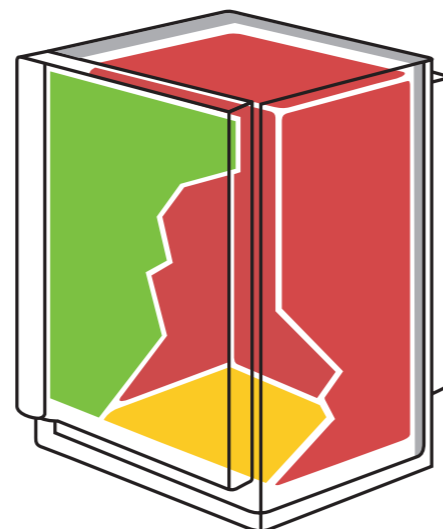
Direct Heat and Air Jacket™ Heating System

The patented Direct Heat and Air Jacket™ provides precise and uniform temperature control. Uniform temperatures are further enhanced by gentle fan circulation.

The direct heating provides highly responsive temperature control in response to door openings and the surrounding air jacket ensures uniform heating of the incubator eliminating 'cold-spots' and preventing condensation.

- The microprocessor provides PID control of the three independent heating sources surrounding the chamber; 1) side, top and rear wall heaters, 2) chamber base heater, 3) outer door heater.
- The independent outer door heater warms the inner glass door in response to ambient conditions to prevent condensation and promote temperature uniformity.
- The Air Jacket is surrounded by high density foam insulation to protect against ambient temperature fluctuations.

Direct Heat and Air Jacket™ Heating System



Elevated Humidity, Low Water Level Warning

To avoid cell culture desiccation, the MCO-19AIC maintains 95% RH at 37°C.

- Humidification is achieved by reliable natural evaporation and forced-air circulation. The system is enhanced by the Direct Heat and Air Jacket™ base heater, and protected by an optical water level indicator to warn of low water in the humidity pan.
- The humidity pan removes easily for regular cleaning and refilling.
- When filled the pan slides into place and the optical sensor automatically returns to position. The SafeCell™ UV lamp destroys contaminants introduced during the process.
- For the H₂O₂ in situ decontamination cycle the humidity pan is repositioned against the chamber wall to eliminate the need for separate autoclaving.



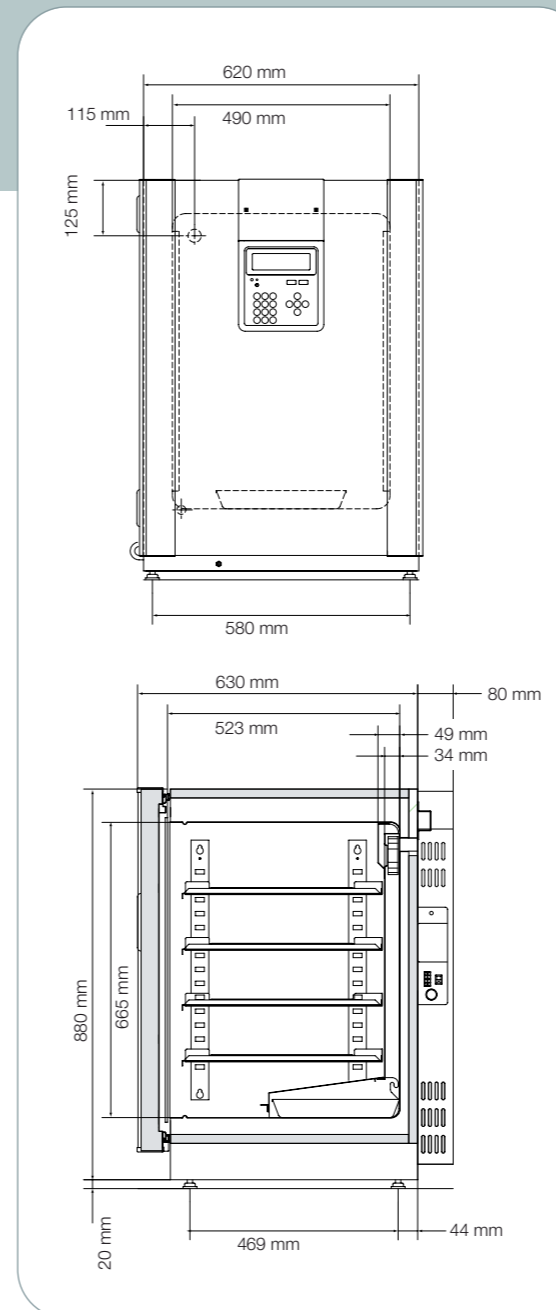
Zone	Location	Function	Energy	Microprocessor Controller
Main (Red)	Side, top and rear walls	Principal heat source	Variable	Energizes any, all or a combination of heating elements as required
Base (Yellow)	Floor	Base heater elevates the humidity reservoir to achieve 95%RH at 37°C	Variable	
Front (Green)	Outer door	Warms the inner glass in response to ambient conditions; prevents condensation on glass and around door opening and promotes temperature uniformity	Variable	
Air Jacket (White)	Side, top and rear walls	Sealed, surrounds interior chamber with natural air convection	--	--
Insulation (Grey)	Side, top and rear walls, door	Promotes energy efficiency, reduces effect of ambient temperature fluctuations on air jacket	--	--

Specifications

Model	MCO-19AIC(UV)	MCO-19AIC
Major Operating Systems		
H ₂ O ₂ Decontamination System	Optional	Optional (also requires SafeCell™ UV)
SafeCell™ UV System	Standard	Optional
InCu saFe® Copper Enriched Stainless Steel Interior	Standard	Standard
Single Beam, Dual Detector IR CO ₂ Sensor	Standard	Standard
Direct Heat & Air Jacket™ (DHA) Heating System	Standard	Standard
LCD Graphical Controller/Display, Door Mounted	Standard	Standard
Environmental Performance		
Temperature Control Range	+5°C above ambient to 50°C (in a 5°C to 35°C ambient)	
Temperature Fluctuation ¹⁾	±0.1°C	
Temperature Uniformity ¹⁾	±0.25°C	
CO ₂ Control Range ¹⁾	0 to 20%	
CO ₂ Fluctuation ¹⁾	±0.15%	
CO ₂ Sensor System	Ceramic based, single beam Infrared sensor, with dual wavelength measurement for continuous auto-zero calibration	
CO ₂ Sampling (Patent Pending)	No moving parts; airflow passes over in/out ports to sustain Venturi effect, continuous sampling	
CO ₂ Calibration	Automatic, continuous zero reference calibration, optional semi-automatic one point Gas Calibration Kit	
Chamber humidity	95%RH at 37°C by natural evaporation with humidifying pan with reflective optical low water sensor	
Airflow	Gentle vertical airflow, continuous with inner door closed	
Control, Monitoring, Alarms		
Temperature and CO ₂ Control	P.I.D control system, set-point resolution 0.1°C, 0.1% CO ₂	
Display	Alphanumeric LCD digital display	
Data Acquisition	Automatic log function of temperature and CO ₂ .	
Communications	Remote alarm contact standard, optional 4-20mA connection, optional RS232/RS485/LAN data ports	
Alarms	Automatic set temperature alarm, automatic set CO ₂ density alarm, upper limit temperature alarm, door alarm, low humidifying water alarm, UV lamp failure alarm (for UV equipped model only)	
Cabinet Design and Construction		
Exterior Cabinet and Door	Galvanized steel exterior, baked-on enamel finish	
Interior and Shelves	Copper-enriched stainless steel	
Inner Door	Tempered glass	
Insulation	Rigid foam polyurethane	
Access Port	Single 30 mm ID port with non-VOC silicone stoppers	
Leveling Feet	Adjustable	
Energy, Electrical, Utilities		
Maximum Power Consumption	310W	
Maximum Heat Dissipation	1120kJ/h	
Supply voltage	220-240V 50Hz (1.4A)	
CO ₂ Gas inlet connection / pressure	4 to 6 mm inner diameter tubing / Nominal 0.3 bar from two-stage CO ₂ regulator	
Dimensions, Weight, Capacity		
Interior Dimensions	490 x 523 x 665 mm (W x D x H)	
Exterior Dimensions	620 x 710 x 900 mm (W x D x H)	
Volume	170 litres	
Shelves	4 supplied as standard (Maximum 15), 450 x 450 mm, maximum load 7kg/shelf	
Nett weight	93kg	

Notes: ¹⁾ Ambient temperature: 25°C, setting: 37°C, CO₂: 5%, no load

Dimensions



Ergonomic and Practical Design

Stackable

- The MCO-19AIC is designed for stacking, allowing one unit to be positioned on top of another, doubling interior volume without additional floor space.
- An optional roller base is available for stacked installations for easier mobility. (see Options)

Field Reversible Door

- The reversible inner and outer doors allow right or left opening depending on user preference, installation space and how other adjacent equipment is positioned. The outer door includes a universal finger grip at each side.
- The outer door features a magnetic gasket designed to eliminate ambient air shear across the glass inner door and prevent condensation.
- The inner door gasket provides an effective barrier between the ambient air and the warm, humidified incubator atmosphere preventing condensation and eliminating moisture traps which can harbour contaminants.
- A door ajar alarm provides an audible and visual warning if the outer door is left open.

Control Panel

- The door-mounted control panel permits easy setting and viewing of parameters.

Shelves and Sample Management

- Convenient, space efficient inventory management is simplified through a system of adjustable, extendable perforated shelves.
- Shelves and brackets are formed from InCu saFe® copper-enriched stainless steel alloy and can remain inside the incubator during the H₂O₂ decontamination cycle or autoclaved separately if desired.
- Shelves are perforated to permit vertical airflow through and around labware.
- Shelf brackets are formed with an exaggerated angle to minimize surface contact with flat shelves*. Brackets slip easily into vertical supports that attach to interior chamber walls with clearance sufficient to permit proper air circulation.

* Patent pending

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Options

Model	MCO-19AIC(UV)	MCO-19AIC
Decontamination Options		
H ₂ O ₂ Decontamination Kit	MCO-HL	MCO-HL ¹⁾
H ₂ O ₂ Vapour Generator (Requires MCO-HL)	MCO-HP	MCO-HP ¹⁾
H ₂ O ₂ Reagent, pack of 6 bottles, each pre-measured bottle is sufficient for a complete H ₂ O ₂ decontamination cycle (specially formulated for MCO-19AIC)	MCO-H2O2	MCO-H2O2 ¹⁾
SafeCell™ UV System Kit narrow-bandwidth 253.7nm lamp and assembly	Built-in	MCO-19UVS
Common Options		
Automatic CO ₂ Cylinder Changeover System	MCO-21GC	MCO-21GC
Semi-automatic one point Gas Calibration Kit	MCO-SG	MCO-SG
Roller Base, for use in single or stacked installations	MCO-18RB	MCO-18RB
InCu saFe® Shelf and Brackets	MCO-47ST	MCO-47ST
InCu saFe® Half Tray System	MCO-25ST	MCO-25ST
Communication Terminal (RS-232C/RS485) ²⁾	MTR-480	MTR-480
Communication Terminal (LAN) ²⁾	MTR-L03	MTR-L03
Communication Terminal (Analog 4-20 mA) ²⁾	MCO-420MA	MCO-420MA
SANYO Data Acquisition Software	MTR-5000	MTR-5000

Notes: ¹⁾ Requires MCO-19UVS

²⁾ The MCO-19AIC/MCO-19AIC(UV) can be fitted with one communication terminal



SANYO H₂O₂ solution is specially formulated for optimal use with the MCO-HP Vapour Generator. Each pre-measured bottle is sufficient for a complete H₂O₂ sterilization sequence. Unit of issue: six per carton. **MCO-H2O2**



H₂O₂ Vapour Generator. **MCO-HP**
Shown with connecting cable, standard.

For accessory requirements or options not listed herein, contact SANYO or your SANYO distributor.

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SANYO Electric Co., Ltd., Biomedical Division, Gunma is certified for Quality management system: ISO9001 / Medical devices Quality management system: ISO13485 / Environmental management system: ISO14001

SafeCell™ UV U.S. Patent 6255103; Direct Heat and Air Jacket™ U.S. Patent 5519188;

SafeCell™ UV, InCu saFe®, Direct Heat and Air Jacket™, P.I.D./R™ and Active Background Contamination Control™, are trademarks of SANYO Electric Biomedical Co., Ltd.

Product conforms to RoHS
(European Restriction of Hazardous Substance directives)



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