

## Professional CO<sub>2</sub> and Multi-gas Incubators

Providing an ideally controlled environment  
for various cell cultures



MCO-175

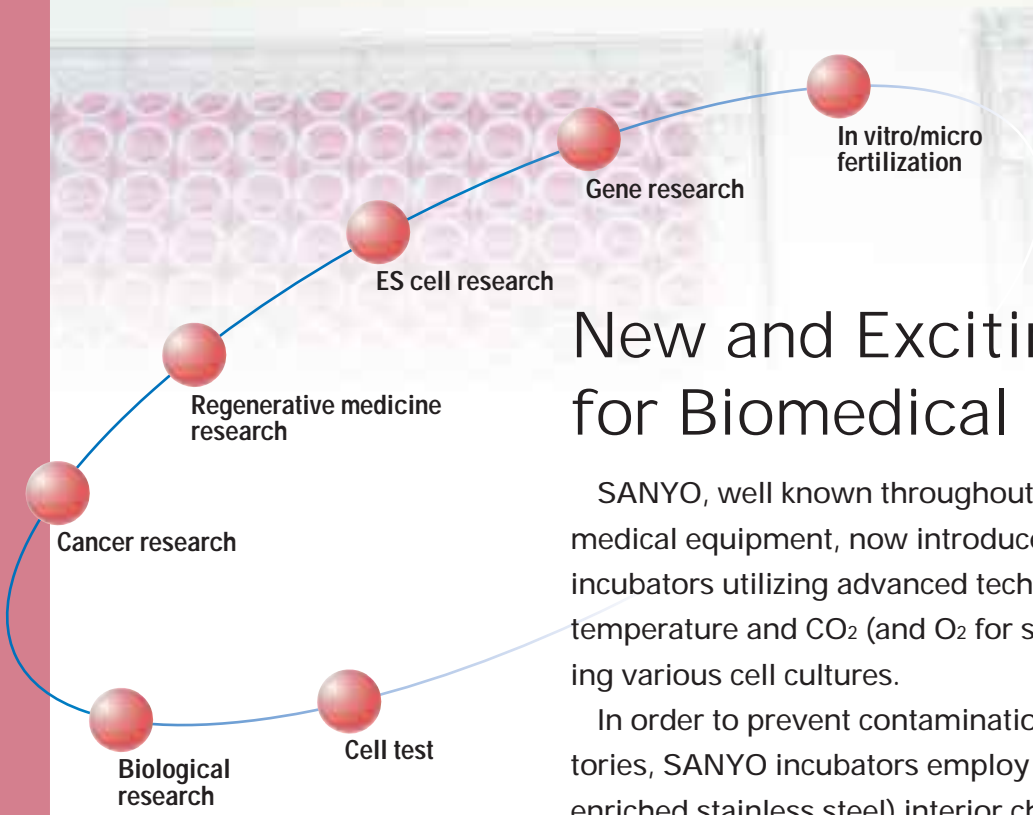
MCO-15AC

MCO-20AIC

Top: MCO-18M  
Bottom: MCO-18AIC

MCO-5AC x 3





## New and Exciting Possibilities for Biomedical Research

SANYO, well known throughout the world for its high-quality biomedical equipment, now introduces a wide variety of cell culture incubators utilizing advanced technology for unprecedented temperature and CO<sub>2</sub> (and O<sub>2</sub> for some models) control in processing various cell cultures.

In order to prevent contamination, the ultimate enemy of laboratories, SANYO incubators employ an exclusive inCu saFe® (copper-enriched stainless steel) interior chamber and SafeCell™UV (ultra-violet) lamp system.

With a wealth of other convenient features, SANYO incubators offer significant benefits to match the demanding needs of laboratory professionals.

# Preventive Contamination Control



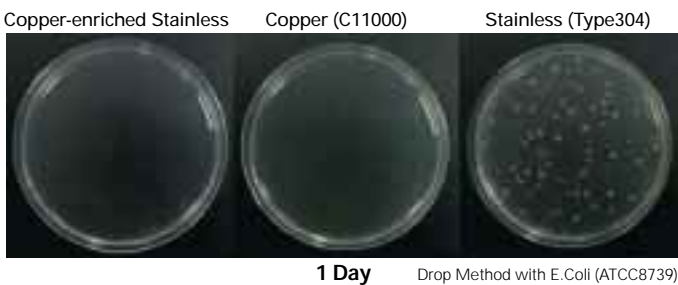
## inCu saFe®

inCu saFe® copper-enriched stainless steel is SANYO's new solution against contamination that combines the bacteria-killing property of copper with the corrosion resistance of stainless steel.

### Copper-enriched Stainless Steel Kills Mycoplasma

SANYO is proud to announce that InCu saFe®, the new copper-enriched stainless steel used in the interior of its CO<sub>2</sub> and multi-gas incubators, kills mycoplasma. Mycoplasma is one of the most common causes of contamination found in cell culture and the source can often be traced back to contaminated laboratory apparatus. The inCu saFe® walls and shelves inside SANYO CO<sub>2</sub> and multi-gas incubators eliminate mycoplasma and significantly reduce the risk of contamination without emptying the incubator.

### Anti-Contamination

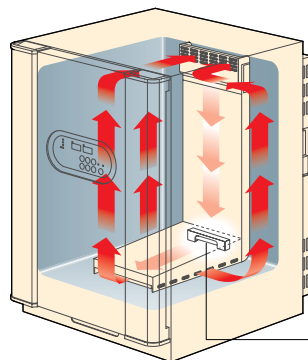


### Bacteria killing rate after 24 hrs\* (Drop Method)

Species	Stainless (Type304)	Copper Alloy Stainless
Escherichia coli (ATCC8739)	0%	99.928%
Escherichia coli (IFO3301)	0%	99.847%
Staphylococcus aureus (ATCC6538P)	0%	99.998%
Bacillus subtilis (ATCC6633)	0%	99.997%

(N=3) \*Bacteria killing rate=(1-Test Sample Colony No./Control Colony No.) x 100

inCu saFe® interior chamber with fully rounded corners inhibits bacteria growth continuously.



Airflow and water pan sterilization using a UV system (option)



## SafeCell™ UV

SafeCell™ UV U.S. Patent 6255103

SafeCell™ UV system with programmable ultraviolet lamp, isolated from cell cultures, sterilizes chamber air and water in the humidifying pan to maintain contamination-free conditions within the chamber.

### Completely Safe for Cell Culture

- Ozone-free UV lamp
- UV shielded from culture area by the tray cover of humidifying pan.
- UV shielding by laboratory dishes and flaskets (Laboratory dishes and flaskets are made of polystyrol with thickness of 50 μm, shielding UV 100%. (Photos below show the lid of the laboratory dish shielding UV without preventing proliferation of culture.)

### UV effect on humidifying water (actual machine test)



UV radiation time (0, 5 minutes)

### UV shielding effect by dish (yellow staphylococci culture)



24 hours of culture with UV radiation  
Without UV  
With UV through the laboratory dish lid

### UV effect on circulating air in chamber

Time	Colony number
30 minutes after door opening (without UV)	11
2 minutes after UV radiation	0
5 minutes after UV radiation	0

\*Bacteria not detected after 2 minutes of UV radiation.

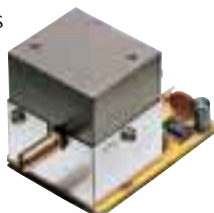


UV lamp (option)



## Infrared CO<sub>2</sub> Sensor

SANYO infrared CO<sub>2</sub> sensors utilize a long-life ceramic heater, eliminating conventional filament bulbs and electro-mechanical "chopping" devices. This advancement delivers accurate CO<sub>2</sub> control with fast recovery after door openings, regardless of humidity changes within the chamber. The sensors with no moving parts ensure high reliability and precision.



## FDA 510(k) Clearance

SANYO has received FDA 510(k) clearance to market its MCO-Series incubators as "assisted reproduction accessories" required to maintain optimum temperature, CO<sub>2</sub> and/or O<sub>2</sub> and relative humidity essential for in vitro applications.

For MCO-20AIC, MCO-18AIC, MCO-5AC, MCO-17AC and MCO-18M.

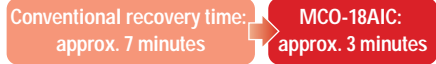


**MCO-20AIC/18AIC/5AC/18M**

**Environmental Improvement with High Precision**

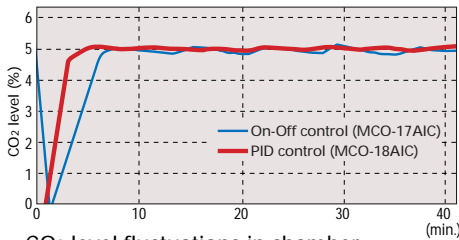
**Faster CO<sub>2</sub> Level Recovery (MCO-18AIC / 18M)**

Fast recovery of the CO<sub>2</sub> level is due to the effective combination of an infrared CO<sub>2</sub> sensor and PID (Proportional, Integrated and Differential) control. This incubator offers a long-awaited performance level with a more stable CO<sub>2</sub> environment to reliably function for heavy usage situations that require frequent door openings.

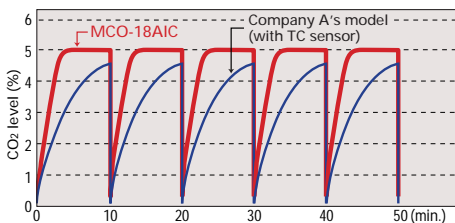


Maintaining uniform CO<sub>2</sub> levels is assured even with frequent incubator door openings.

CO<sub>2</sub> level recovery characteristics (door open for 30 seconds)

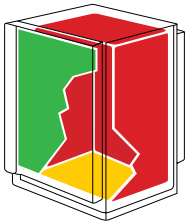


CO<sub>2</sub> level fluctuations in chamber when door openings of 30-second duration are made at 10-minute intervals



**Improved Temperature Stability with D.H.A. System**

P.I.D. controlled 3-way heaters plus SANYO's proprietary D.H.A. (Direct Heat and Air jacket) provides a high-precision temperature environment, and minimizes the risk of condensation and subsequent contamination.



The main heater provides precise temperature control.  
The bottom heater warms the distilled water and controls chamber humidity.  
The outer door heater prevents condensation on the inner door and facilitates quick temperature recovery after door openings.

Direct Heat and Air Jacket U.S. Patent 5519188

**Water Level Sensor**

The humidity pan has an optical water level sensor to warn of a low water level.



**Easy Maintenance**

**Auto Calibration (MCO-20AIC / 18AIC / 18M)**

The microprocessor will automatically "Zero" the incubator using room air as a reference. This feature will maintain an accurate CO<sub>2</sub> control without worrying about CO<sub>2</sub> drift.

**Automatic Setup**

By turning on the power and simply entering the temperature and CO<sub>2</sub> setpoints into the unit you can walk away while the microprocessor takes over. The unit will attain setpoint and adjust itself to your required parameters.

**Safeguard**

**Full Rounded Corners**

The interior chamber is constructed of Copper Alloy stainless steel with full rounded corners. All plenums, shelves, brackets and standard humidity pan are removable without the use of tools. These design features provide an interior that is easily cleaned to reduce chances of contamination.

**Easy to Use**

**Field-reversible Door**

The reversible door allows right or left opening depending on the installation space and how other peripheral equipment are positioned. Each corner of the door has a special grip for easier opening.



Corner grip (MCO-18AIC)



MCO-18AIC

**Shelves Provide Easier Access to Culture Containers**

**(MCO-18AIC / 18M / 20AIC)**

Much more convenience has been obtained by slanting downward the bending direction of the front of the shelves. As a result, putting in and taking out culture containers like dishes and micro plates have become extremely easy.



**Automatic CO<sub>2</sub> Cylinder Switch-over System (option)**

This system automatically switches from the primary to secondary gas cylinder when a CO<sub>2</sub> gas level drop in the chamber is detected. The in-use gas cylinder is confirmed on the control panel.

**Space Utility**

**Stackable Design Takes Up Less Space**

By simply using the fixing metal supplied as a standard accessory, two\*1 or three\*2 units can be stacked according to available space and usage. This configuration is also cost-effective.

\*1 MCO-5AC/15AC/17AC/18AIC/18M/20AIC/175

\*2 MCO-5AC



MCO-18AIC

MCO-5AC

**MCO-175**

**CO<sub>2</sub> Incubator with Water Jacketed System for Stable Temperature Environment**

**Water Jacketed System**

The large size MCO-175 model incorporates a water jacketed system which takes advantage of the heat retention characteristics of water. Because there is no sudden temperature change or loss of temperature during power failure, a stable temperature environment is ensured.

**PID control plus chamber direct sensing system maintains a high-precision temperature environment.**

Through the combination of a PID (Proportional, Integrated and Differential) control system for ultra-precise temperature control and a cabinet-air sensing system which accurately monitors inside temperature, this model exhibits exceptional precision within  $\pm 0.1$  degree of the preset temperature. For the temperature sensor, a durable, ultra-precise PT sensor (Pt 100 $\Omega$ ) is used.

**Automatic stop mechanism for fan motor and CO<sub>2</sub> valve**

With this mechanism, the fan motor and CO<sub>2</sub> valve are automatically stopped when the door is opened. This prevents air flow from the chamber and prevents air contamination due to the mixing of air.

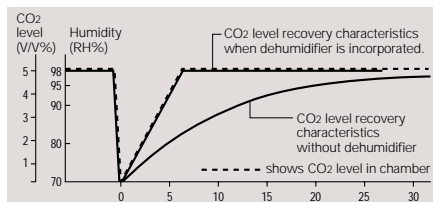
**Automatic control door heater**

The inside door incorporates a door heater that is interlocked with the temperature adjuster for automatic control. This prevents temperature differences between the chamber and the inner door, thereby preventing dew condensation on the inner door.

**Thorough pursuit of high-precision cultivation**

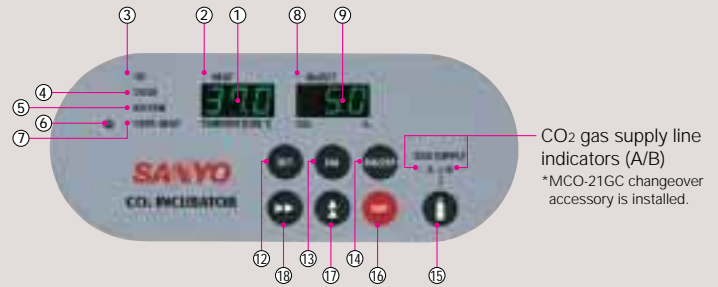
**CO<sub>2</sub> level recovery characteristics**

(initial value of chamber: 37°C, 99% RH, 5% CO<sub>2</sub> level)  
(Ambient condition: 20°C, 70% RH)



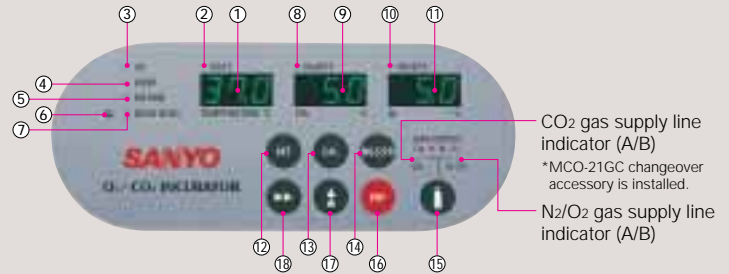
A compact electronic dehumidifier plus a thermal conductivity CO<sub>2</sub> sensor produces a high-precision CO<sub>2</sub> environment

**MCO-20AIC  
MCO-18AIC  
MCO-5AC**



CO<sub>2</sub> gas supply line indicators (A/B)  
\*MCO-21GC changeover accessory is installed.

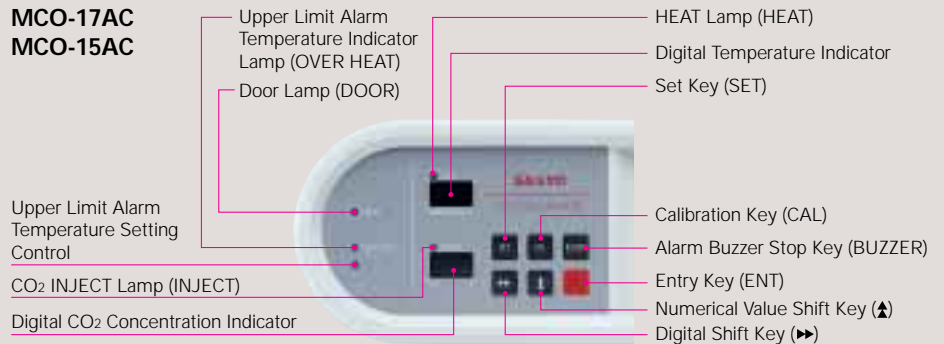
**MCO-18M**



CO<sub>2</sub> gas supply line indicator (A/B)  
\*MCO-21GC changeover accessory is installed.  
N<sub>2</sub>/O<sub>2</sub> gas supply line indicator (A/B)

- ① Digital temperature indicator
- ② Heater lamp
- ③ UV indicator
- ④ Door lamp
- ⑤ Water level alarm lamp
- ⑥ Upper limit regulator
- ⑦ Over heat lamp
- ⑧ CO<sub>2</sub> inject lamp
- ⑨ Digital CO<sub>2</sub> density indicator
- ⑩ O<sub>2</sub> inject lamp
- ⑪ Digital O<sub>2</sub> density indicator
- ⑫ Set key
- ⑬ Calibration key
- ⑭ Alarm buzzer stop key
- ⑮ Gas supply line switching key
- ⑯ Enter key
- ⑰ Numeric shift key
- ⑱ Digital shift key

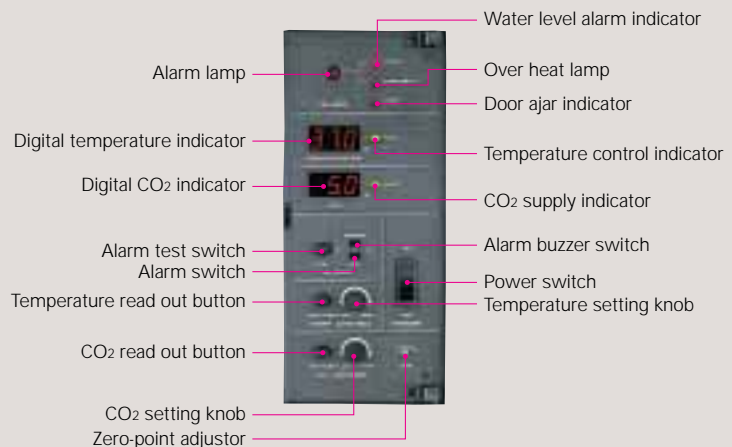
**MCO-17AC  
MCO-15AC**



Upper Limit Alarm Temperature Setting Control  
CO<sub>2</sub> INJECT Lamp (INJECT)  
Digital CO<sub>2</sub> Concentration Indicator

HEAT Lamp (HEAT)  
Digital Temperature Indicator  
Set Key (SET)  
Calibration Key (CAL)  
Alarm Buzzer Stop Key (BUZZER)  
Entry Key (ENT)  
Numerical Value Shift Key (▲)  
Digital Shift Key (▶▶)

**MCO-175**

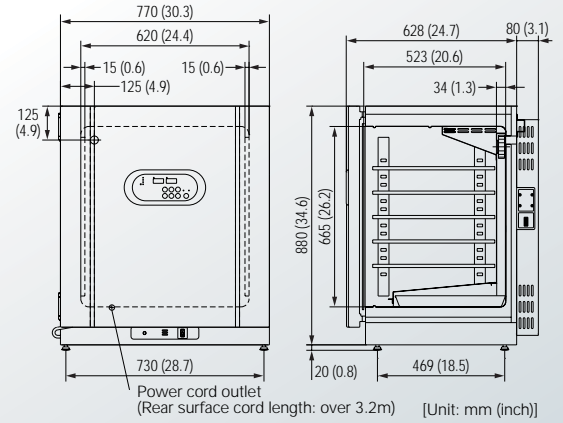


Water level alarm indicator  
Alarm lamp  
Over heat lamp  
Door ajar indicator  
Temperature control indicator  
Digital temperature indicator  
Digital CO<sub>2</sub> indicator  
CO<sub>2</sub> supply indicator  
CO<sub>2</sub> read out button  
CO<sub>2</sub> setting knob  
Zero-point adjuster  
Alarm test switch  
Alarm switch  
Alarm buzzer switch  
Power switch  
Temperature setting knob



## Professional CO<sub>2</sub> Incubator

- Continuous contamination control with inCu saFe® interior and SafeCell™ UV technologies
- Precision temperature and CO<sub>2</sub> control
- Large capacity



**MCO-20AIC**



CO<sub>2</sub> level

Temperature

Interior volume

0 – 20%

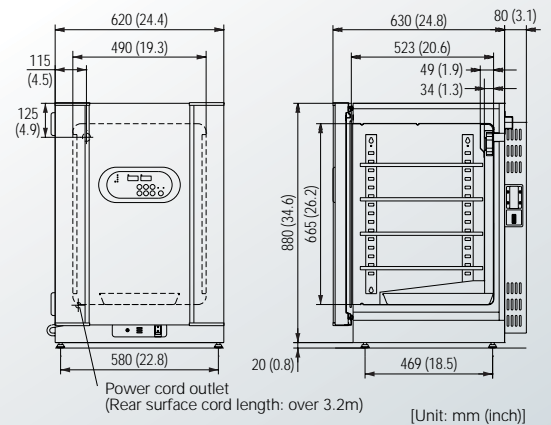
Ambient temp. +5°C – 50°C

215L/7.6 cu. ft.



## Professional CO<sub>2</sub> Incubator

- Continuous contamination control with inCu saFe® interior and SafeCell™ UV (option) technologies
- Fast CO<sub>2</sub> level recovery offers greater CO<sub>2</sub> environment stability for frequent door openings



**MCO-18AIC**



(option)

CO<sub>2</sub> level

Temperature

Interior volume

0 – 20%

Ambient temp. +5°C – 50°C

170L/6.0 cu. ft.



### Personal Series Compact CO<sub>2</sub> Incubator

- Patient specific, space saving
- Compact design
- Triple stackable

[Unit: mm (inch)]

**MCO-5AC**



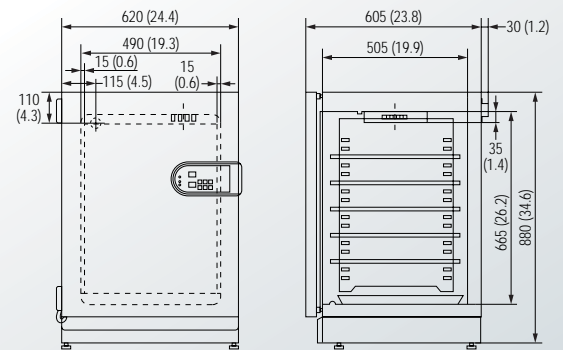
(option)

CO <sub>2</sub> level	Temperature	Interior volume
0 – 20%	Ambient temp. +5°C – 50°C	49L / 1.7cu. ft.



### Professional CO<sub>2</sub> Incubator

- Accurate temperature and CO<sub>2</sub> control & recovery characteristics
- Space saving
- Easy installation



[Unit: mm (inch)]

**MCO-17AC**



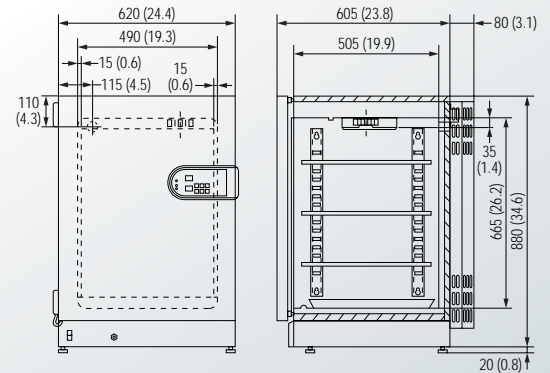
CO <sub>2</sub> level	Temperature	Interior volume
0 – 20%	Ambient temp. +5°C – 50°C	164L / 5.8cu. ft.





## Professional CO<sub>2</sub> Incubator

- Accurate temperature and CO<sub>2</sub> control & recovery characteristics
- Space saving
- Easy installation
- Basic entry-level model



[Unit: mm (inch)]

**MCO-15AC**



CO<sub>2</sub> level

**0 – 20%**

Temperature

Ambient temp. **+5°C – 50°C**

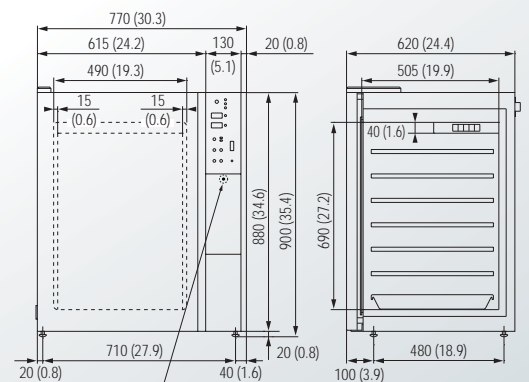
Interior volume

**164L/5.8cu. ft.**



## Water Jacketed CO<sub>2</sub> Incubator

- Water jacket heating system
- 170-liter effective



Power cord outlet  
(Rear surface cord length: over 3.2m)

[Unit: mm (inch)]

**MCO-175**



CO<sub>2</sub> level

**0 – 20%**

Temperature

Ambient temp. **+5°C – 50°C**

Interior volume

**170L/6.0cu. ft.**





## Professional Multi-gas Incubator



### MCO-18M



CO<sub>2</sub> level

O<sub>2</sub> level

Temperature

Interior volume

0 – 20%

1 – 18%  
22 – 80%

Ambient temp. +5°C – 50°C

170L / 6.0cu. ft.

The new MCO-18M automatic air jacket multi-gas incubator provides precise CO<sub>2</sub> and O<sub>2</sub> level controls to realize a stable cell culture environment. It features multiple-patented technologies to safely achieve in vitro performance.

#### Automatic Gas Cylinder Switchover System

This system automatically switches from the primary to secondary gas cylinder when the O<sub>2</sub> gas level does not change while an injection valve is open. An optional gas switchover for CO<sub>2</sub> gas is also available. The in-use gas cylinder is confirmed on the control panel.

#### Preventive Contamination Control

InCu saFe® copper enriched stainless steel chamber with large curve corners inhibits bacteria growth on its surface continuously. Airborne and water contaminants in the water pan can also be eliminated by patented SafeCell™ UV, an automatic ozone-free ultraviolet lamp (option), without affecting cell cultures.

#### Immediate Recoveries

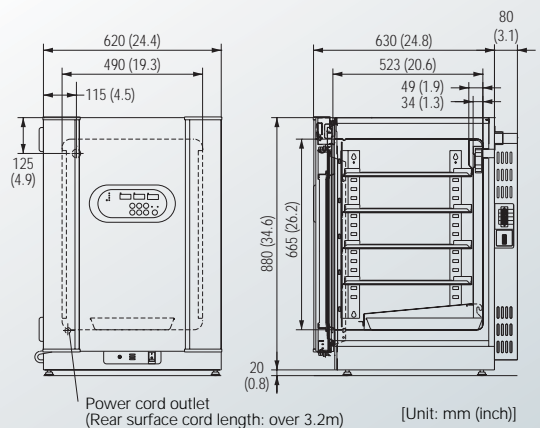
Immediate CO<sub>2</sub> recovery can be obtained by the combination of IR sensor and P.I.D. gas injection control which injects a large amount of CO<sub>2</sub> gas while fine-adjusting the injection to prevent overshooting in the chamber. Also, Sanyo IR sensor uses no moving parts. Therefore, it is extremely reliable and the lifespan is long. Additionally, along with a zirconia O<sub>2</sub> sensor, a P.I.D. control is used for fast O<sub>2</sub> level control. The N<sub>2</sub> gas bubbler in the water pan creates bubbles and helps recover humidity level quickly after door openings.

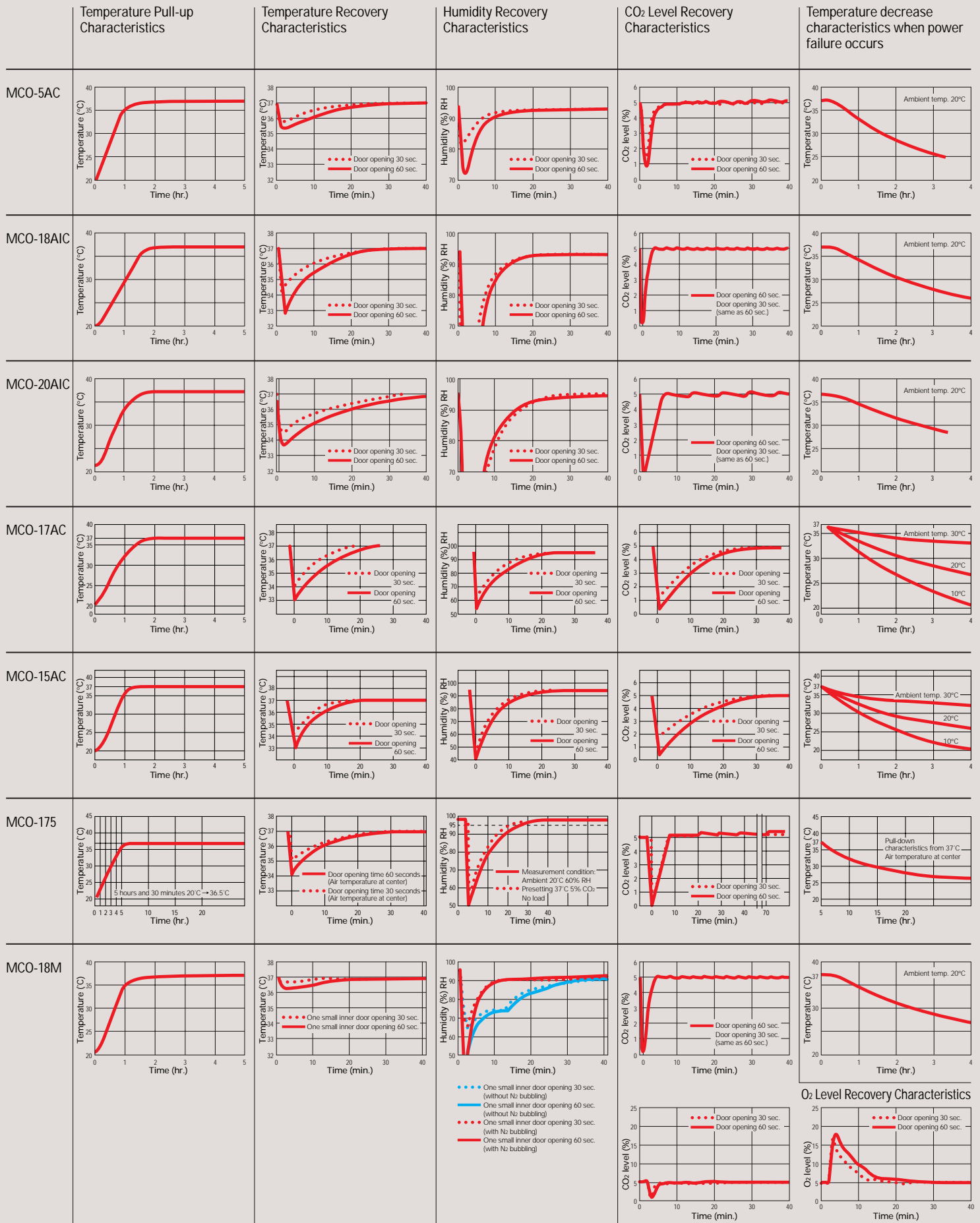
#### Easy-to-Access Double Inner Door System

A double inner door system keeps gas consumption low and prevents outside air influx. An optional half tray adds greater flexibility.



Double inner door system



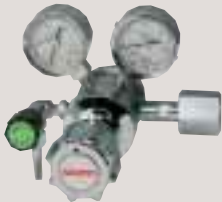


**2 different models can be stacked\* according to usage.**

\*Stacking kit (optional metal tool and spacer) are required. For more details, see tables on the right.



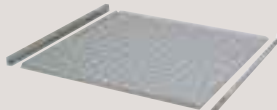
Stacking example  
Top (MCO-18AIC)  
Bottom (MCO-20AIC)



CO<sub>2</sub> gas pressure regulator  
**MCO-100L**



Roller base  
**MCO-20RB**



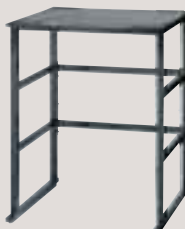
inCu safe® shelf and brackets  
**MCO-45ST**



Half tray  
**MCO-25ST**



Stand  
**MKD-300T**



Stackable stand for 2 units  
**MKD-150T**

**Stacking Kits**

Upper unit / Lower unit	MCO-175	MCO-17AC MCO-15AC	MCO-18AIC MCO-18M	MCO-20AIC	MCO-5AC
MCO-175	MCO-175SB	MCO-18SB		MCO-175SB	—
MCO-17AC/15AC	—	MCO-18PS		—	—
MCO-18AIC/18M	—	MCO-18PS	(Standard)* <sup>1</sup>	—	—
MCO-20AIC	—	MCO-21SB		(Standard)* <sup>2</sup>	—
MCO-5AC	—	—	—	—	(Standard)

\*1: 0.5 kit is included and fixed under rear cover of MCO-18AIC/18M.

\*2: 0.5 kit is included and fixed under rear cover of MCO-20AIC.

	MCO-175	MCO-17AC MCO-15AC	MCO-18AIC MCO-18M	MCO-20AIC	MCO-5AC
Roller base	—	MCO-18RB		MCO-20RB	MCO-5RB
Individual small door	(Standard)	—	MCO-18ID (Standard for 18M)	MCO-20ID	—
Extra tray (copper-enriched stainless steel)	MCO-45ST		MCO-46ST	MCO-58ST	MCO-30ST
Half tray	MCO-25ST			MCO-35ST	—
CO <sub>2</sub> /N <sub>2</sub> pressure regulator	MCO-100L/100LM				
Water preservative agent	MCO-100C	—	—	—	—
Recorder (CO <sub>2</sub> & Temp.)	MCO-101TR*	—	—	—	—
SANYO DAQ system	—	—	MTR-480/2000		
CO <sub>2</sub> tank switcher	—	—	MCO-21GC		MCO-5GC
UV system kit	—	—	MCO-18UVS2	—	MCO-18UVS2
UV replacement kit	—	—	MCO-20UV		
Stand	MCO-300T	MCO-50T		MCO-300T	—
Stackable stand for 2 units	MCO-200T	MCO-150T	MCO-150T/200T	MCO-200T	

\*Chart paper: RP-CO, Pen: Cartridge

**SANYO DAQ Systems**

**Monitoring Features**

Integrated remote monitoring system for SANYO biomedical products (optional)

**SANYO Data Acquisition Software MTR-2000**

This software is fully compatible with MCO-20AIC, MCO-18AIC, MCO-18M and MCO-5AC. It allows data transfer between these models and a PC.

**Interface board MTR-480**

Exclusive option for SANYO biomedical products RS232C and RS485, for easy installation



# MCO-20AIC/18AIC/5AC/17AC/15AC/175/18M

## Specifications

		CO <sub>2</sub> Incubators					Multi-Gas Incubator	
Model No.	MCO-20AIC	MCO-18AIC	MCO-5AC	MCO-17AC	MCO-15AC	MCO-175	MCO-18M	
Exterior dimensions (W x D x H)	770 x 708 x 900 (mm) 30.3 x 27.9 x 35.4 (inch)	620 x 710 x 900 (mm) 24.4 x 28.0 x 35.4 (inch)	480 x 548 x 575 (mm) 18.9 x 21.6 x 22.6 (inch)	620 x 685 x 900 (mm) 24.4 x 27.0 x 35.4 (inch)		770 x 620 x 900 (mm) 30.3 x 24.4 x 35.4 (inch)	620 x 710 x 900 (mm) 24.4 x 28.0 x 35.4 (inch)	
Interior dimensions (W x D x H)	620 x 523 x 665 (mm) 24.4 x 20.6 x 26.2 (inch)	490 x 523 x 665 (mm) 19.3 x 20.6 x 26.2 (inch)	350 x 378 x 375 (mm) 13.8 x 14.9 x 14.8 (inch)	490 x 505 x 665 (mm) 19.3 x 19.9 x 26.2 (inch)		490 x 505 x 690 (mm) 19.3 x 19.9 x 27.2 (inch)	490 x 523 x 665 (mm) 19.3 x 20.6 x 26.2 (inch)	
Interior volume	215 L / 7.6 cu.ft.	170 L / 6.0 cu.ft.	49 L / 1.7 cu.ft.	164 L / 5.8 cu.ft.		170 L / 6.0 cu.ft.	170 L / 6.0 cu.ft.	
Net weight	106 kg / 234 lbs.	93 kg / 205 lbs.	50 kg / 110 lbs.	84 kg / 185 lbs.	78 kg / 172 lbs.	108 kg / 238 lbs.	97 kg / 214 lbs.	
Temperature	Heating method			Direct Heat & Air Jacket (DHA) Heater: Independent 3-way control		Direct Heat & Air Jacket (DHA)	Water Jacket	Direct Heat & Air Jacket (DHA) Heater: Independent 3-way control
	Temp. control system							Microprocessor PID
	Temp. range							5°C above ambient temperature to +50°C (Ambient temperature: 5°C to 35°C)
	Temp. uniformity			±0.25°C*		±0.2°C*		±0.25°C*
	Temp. controllability				±0.1°C*			
CO <sub>2</sub>	CO <sub>2</sub> control system		Microprocessor PID		On-Off control		Microprocessor PID	
	CO <sub>2</sub> sensor		Infrared		Thermal conductivity		Infrared	
	CO <sub>2</sub> range							0 to 20%
	CO <sub>2</sub> controllability							±0.15%*
O <sub>2</sub>	O <sub>2</sub> control system							Microprocessor PID
	O <sub>2</sub> sensor							Zirconia
	O <sub>2</sub> range							1 to 18%, 22 to 80%
	O <sub>2</sub> controllability							±0.2%*
Humidity	Humidifying system							Natural vaporization with water in humidity pan
	Chamber humidity		95 ±5% RH		95 ±5% RH (AT: 20°C, 60% RH)		95 ±5% RH	
Shelves	Shelf dimensions (W x D x H)		580 x 450 x 12 (mm) 22.8 x 17.7 x 0.5 (inch)	450 x 450 x 12 (mm) 17.7 x 17.7 x 0.5 (inch)	310 x 310 x 10 (mm) 12.2 x 12.2 x 0.4 (inch)	450 x 450 x 10 (mm) 17.7 x 17.7 x 0.4 (inch)	450 x 450 x 12 (mm) 17.7 x 17.7 x 0.5 (inch)	
	Shelf material							Copper-enriched stainless steel
	Maximum load		5 kg / 11 lbs. per shelf	7 kg / 15.4 lbs. per shelf	4 kg / 8.8 lbs. per shelf	10 kg / 22 lbs. per shelf		7 kg / 15.4 lbs. per shelf
	Shelves		5 Standard, 15 Max.	4 Standard, 15 Max.	3 Standard, 6 Max.	5 Standard, 17 Max.	3 Standard, 15 Max.	6 Standard, 19 Max. 4 Standard, 15 Max.
Contamination control	Interior surface							Copper-enriched Stainless Steel
	UV lamp (ozone-free)		Standard	Option	Option	—	—	Option
	Water level sensor							Optical type
Access port							30 mm (1.2") diameter	
Air filter							0.3µm, Efficiency: 99.97% (for CO <sub>2</sub> )	
Alarm system			<ul style="list-style-type: none"> <li>High/low temperature</li> <li>CO<sub>2</sub> deviation</li> <li>Door ajar</li> <li>Low water</li> <li>Independent overheat protection</li> </ul>		<ul style="list-style-type: none"> <li>High/low temperature</li> <li>CO<sub>2</sub> deviation</li> <li>Door ajar</li> <li>Independent overheat protection</li> </ul>		<ul style="list-style-type: none"> <li>High/low temperature</li> <li>CO<sub>2</sub> deviation</li> <li>O<sub>2</sub> deviation</li> <li>Door ajar</li> <li>Low water</li> <li>Independent overheat protection</li> </ul>	
Remote alarm contacts							30V DC, 2A allowable	

### \* Conditions

Ambient temperature: 25°C, Temperature setting: 37°C,  
CO<sub>2</sub> level setting: 5%, O<sub>2</sub> level setting: 5% no load

• Appearance and specifications are subject to change without notice.



SANYO Electric Biomedical Co., Ltd., as a member of the SANYO Electric Group, has received ISO14001 Certification for its environmental management system.



### Applicable scope:

Quality Management Systems for Design/Development, Manufacturing and Servicing of Preservation equipments, Clean system equipments, Automated hospital pharmacy equipments, Culturing equipments, Diagnostic & Testing equipments and Drying & Sterilizing equipments.



Distributed by:

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