



FC-7 (Automatic O₂/CO₂/N₂ mixer)

User's Guide



Quorum

Quorum Technologies Inc.
4673 Wellington Road #35 RR#6
Guelph, ON, Canada N1H 6J3
519.824.0854
www.quorumtechnologies.com

Product Manager: Ryan Geil



Live Cell Instrument

Tel_ +82-2-906-0596 / +82-2-3391-0596 , Fax_ +82-2-903-0597

E-mail_ info@chamlide.com / chamlide@hanmail.net / chamlide2@yahoo.com

Address_ A404 Hageye-techno town, 250-3 Hageye-dong, Nowon-gu, Seoul, Korea 139-727

www.chamlide.com

What is the FC-7?

The **FC-7™** is an automatic O₂/CO₂/N₂ Gas mixing and supply system for Chamlide chambers and incubators. The FC-7 produces mixed gas from 100% O₂, 100% CO₂, and 100% N₂ gas cylinders. Also, the FC-7 produces very low concentrations of O₂ mixed gas (min. 0.2% ~ 20%). It is possible to regulate the concentration, program concentration gradients and record gas concentrations over time using CCP ver 3.7 software or MetaMorph software. LCI will custom-make an FC-7 that can supply higher flow rates of mixed O₂ gas.

Parts included

Component		Quantity
FC-R-Z301	Automatic O ₂ /CO ₂ /N ₂ mixer	1
FC-R-Z002	4ø(O.D) tubing (from gas cylinder to gas-in fitting of FC-7)	3m x 3
FC-R-Z003	6ø(O.D) tubing (from FC-7 to the controller (CU-109))	3m
FC-R-Z004	Gas control speed valve for 4ø tubing	3
FC-R-Z005	Calibration device (calibration connector)	1
FC-R-Z006	(Optional) RS232/485 converter with CCP ver 3.7 (CD)	1
FC-R-Z007	(Optional) Communication cable with CU-109	1
	220V fuse	2
	AC power cable	1

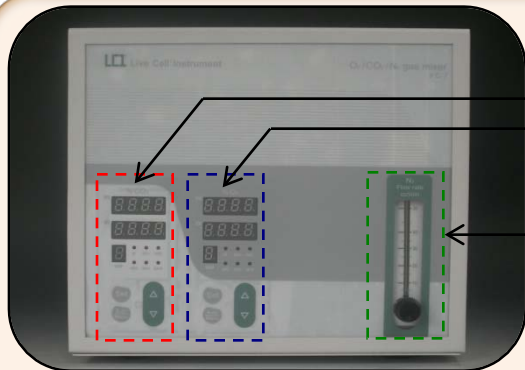
Specification

Sensor	O ₂	HS-1 O ₂ sensor
	CO ₂	NDIR CO ₂ sensor
Control range	O ₂	0.2 ~20 %
	CO ₂	1 ~ 20 %
	N ₂	Max 100 ml/min
Control method	O ₂	PID, solenoid valve
	CO ₂	PID, solenoid valve
	N ₂	Analogue flow meter (or MFC)

Caution before using the FC-7

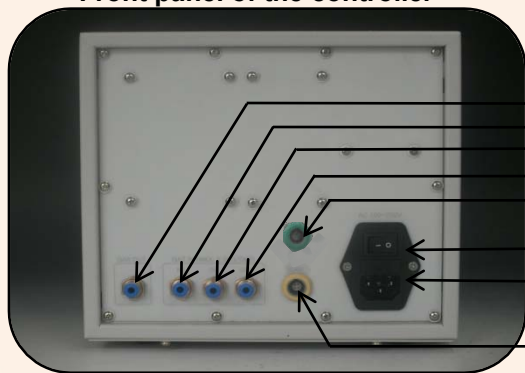
- Do not place the FC-7™ in direct sun light, in a room where the temperature is not controlled, or in room vibration is generated. The FC-7™ run at optimum efficiency in an air-conditioned room where the temperature is kept room temperature (around 25°C).
- Avoid any tension on the wires and tubes connected to the gas cylinders.
- In the event of any unexpected problems such as equipment malfunction, report them immediately to the LCI distributor.

Instructions and a names of the parts



Front panel of the controller

- O₂ concentration control
- CO₂ concentration control
- N₂ flow meter



Back panel of the controller

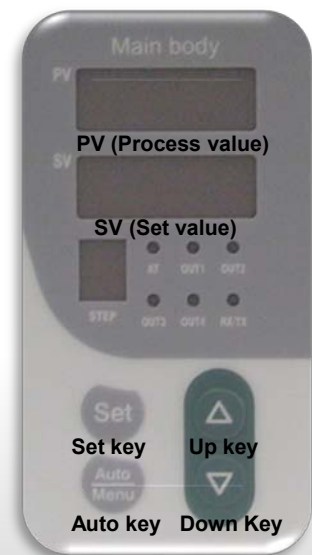
- Mixed gas out
- 100% N₂ gas in
- 100% O₂ gas in
- 100% CO₂ gas in
- Calibration receptacle
- Main switch
- AC power
- RS232/485 port / Communication cable

How to set the temperature

- 1) Turn the main switch on.
- 2) Push the set key once to change the gas concentration
- 3) Use the up and down arrows to set the gas concentration you want.
- 4) Push the set key again to save the setting.

- NOTE**
- SV (Set Value) indicates the desired gas concentration.
 - PV (Process value) shows the actual temperature

- NOTE**
- Auto key is for company setting.
 - You can set the temperature by CCP ver 3.7 software.



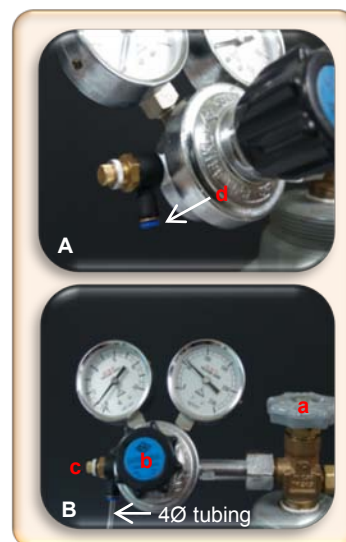
Operation

1. Connect the “gas control speed valve” to the gas regulator.

- 1) Connect a gas regulator to the gas tank.

NOTE ▪ It is best to use a gas regulator with an upper range limit of less than 2.5 Kg/cm² (35 psi.)

- 2) Remove the outlet fitting from the regulator and connect provided “gas control speed valve” to the regulator instead (A).
- 3) Connect one end of 4Ø polyurethane tubing to the gas control speed valve(d) .



2. Start-Up

- 1) Disconnect the short loop of tubing from the “N₂ in” and “Gas out” ports on the back of the FC-7.

● **Nitrogen : Please use 99.999% N₂ cylinder.**

- 2) Connect the N₂ line to the “N₂ in” port.
- 3) Open the N₂ cylinder main valve and ensure pressure is at 0.2~0.3 kg/cm² (3 ~4 psi.)
- 4) Open brass valve of the “gas control speed valve” 1 full turn.
- 5) Turn on FC-7 and adjust the flow meter to about 50 cc/min.
- 6) Set CO₂ and O₂ SV to 0.0 and wait for PV values to reach 0.0.

NOTE ▪ If O₂ PV does not reach 0.0~0.1 or you have used the FC-7 for more than 6 months, you should calibrate the O₂ sensor. (See page 6.)

- **Carbon Dioxide : Please use 99.9% CO₂ cylinder.**

- 7) Open the CO₂ cylinder main valve and ensure pressure is at 0.2 kg/cm² (3 psi.)
- 8) Open brass valve of the "gas control speed valve" 1 full turn.
- 9) Run CO₂ gas through the CO₂ line for 1 min. to wash the line, then Connect the CO₂ line to the "CO₂ in" port.
- 10) Set desired CO₂ value.

- **Oxygen : Please use 99.9% O₂ cylinder**

- 11) Open the O₂ cylinder main valve and set its pressure as follows.

The gas pressure of the O ₂ cylinder	Range of O ₂ concentration to be controlled
0.1 kg/cm ² (1.5 psi.)	0.2 ~ 1.0 %
0.2 kg/cm ² (3.0 psi.)	0.5 ~ 5.0 %
0.4 kg/cm ² (5.7 psi.)	2.0 ~ 10.0 %
0.6 kg/cm ² (8.5psi.)	3.0 ~ 20.0 %

- 12) Open brass valve of the "gas control speed valve" 1 full turn.
- 13) Run O₂ gas through the O₂ line for 1 min. to wash the line, then Connect the O₂ line to the "O₂ in" port.
- 14) Set desired O₂ value.
- 15) Confirm the pressures on the three gas regulators are still correct.
- 16) Make any fine adjustments necessary to reach desired CO₂ and O₂.
- 17) Connect another silicone line to "Gas out" port on the back panel of the FC-7.
- 18) Connect the other end of the silicone line from "Gas out" to the Chamlide controller (CU-109) or the place you want.

3. Shut-Down

- 1) Set CO₂ and O₂ SV values to 0.0
- 2) Close both the CO₂ and O₂ cylinder main valves.
- 3) Run the FC-7 with just N₂ until the PV values of CO₂ and O₂ reach 0.0.
(Run flow meter at 100 cc/min. to expedite.)
- 4) Use a short loop of tubing to plug the “N₂ in” and “Gas out” ports.
- 5) Close the N₂ cylinder main valve and turn off the FC-7.

Calibration of O₂ sensor

This method will calibrate the O₂ sensor in the FC-7 (Automatic O₂/CO₂/N₂ mixer) against the concentration of atmospheric oxygen (20.9 %) the O₂ sensor in the FC-7. To maintain the accuracy of the oxygen sensor within the FC-7, the following **calibration procedure should be performed approximately every 6 months.**

NOTE ▪ Only insert the calibration connector into the calibration receptacle when calibrating the O₂ sensor. **Do not plug it in during normal operation of the FC-7.**

Calibration Procedure

- 1) Disconnect the short loop of tubing from the “N₂ in” and “Gas out” ports on the back of the FC-7.
- 2) Connect a small air pump to the “N₂ in” port of the FC-7.
- 3) Run the air pump for 1 hour to fill the FC-7 with ambient air.
- 4) Turn on the FC-7.
- 5) Wait until the PV value of O₂ is stable.

NOTE ▪ If you do not have the air pump, leave the FC-7 without the short loop for more than 1 week for the same effect as the air pump.

- 5) Insert the calibration connector into the calibration receptacle on the back of the unit (green port) for about 3 seconds and then remove it.

Calibration connector

The calibration connector is fitted with a magnet for handy storage on the back of the FC-7 unit.

**Calibration receptacle**

- 6) The PV value of O₂ is changed to 20.9.
- 7) Calibration is complete.