



PLANT GROWTH CHAMBER

AN ISO 9001 : 2015 / 14001 : 2015 / WHO-GMP CERTIFIED CO. & CE MARK PRODUCT

Model No : SRL / PGC-11



Controller : [PLC with HMI TFT screen]

Controls temperature, lighting, humidity and Co2 with High-definition Touch Screen for real time graphing. Programs can be configured to run in real time or elapsed time. Ramping and non-ramping program methods shall be implemented. Multiple programs can be linked creating complex sequence to simulate natural conditions. Trouble shooting with on board diagnostics. Dual experiment protection via integrated yet independent temperature limit shutdown. It shall auto-restart when temp inside the chamber comes to normal. Temperature low and high deviation alarm. Ambient temperature monitoring. Alarm (audio and visual). Power failure event logging. Auto restart in case of power failure with inbuilt battery to protect memory.

Provides Precise Temperature, Maintains Uniform And Accurate Growth Environment, Timer, Alarm, Auto-Tuning And Auto Start Stop Function. Technical Design and Construction Silent Fan Motor to Maintain Uniform Temperature Over Temperature and Current Protection Capability Ensure User Safety, Adjustable Sliding Rack, And Alert Unexpected Interruption Of Electrical Power Or Unauthorized Change.

PLC with HMI: Real-Time Connectivity : Users have complete control of chamber using the PC connected through LAN, Including creating / editing programs and changing operating tolerances. Shall have feature to run in real time or elapsed time. Ambient temp. Monitoring. 24 hrs. Chamber monitoring. Temp. Will rise gradually to reach the temp. In fixed time, remain in fixed temp. For Known period of time & then decreased back to initial temp, in fixed time internal gradually. Stepwise Programmable Controller with 50 or more programs Provides Automatic Operation of Variable Temperature, Humidity Value, 50 Or More Cycles with Minimum 100 Sections in Each Cycle, Data logger with RS 485/232 port for logging & transfer of data. Auto restart, power failure event logging, memory protection S.M.A.R.T/ SELF diagnostics system. Data collected from each logger shall be transferred to central data storage unit. Shall provide central data storage unit with facility to retrieve the stored data at any time. Multiple programs linked together to simulate natural condition. Control system shall have audio/audiovisual warning/alarm when set temperature/RH is below or above the set values. Ethernet communication port. Ambient temp. Monitoring. Over Temperature and Current Protection Capability Ensure User Safety, Adjustable Sliding Rack, Water Level Sensor Alert Control System. Total no of output: 23 channels. Alert Unexpected Interruption of Electrical Power or Unauthorized Change. 4 digit password lock.

[USFDA approved 21 CFR compliance software] :

PLC with HMI Control system with touch screen display & HMI for data Storage, data logger reading & audit trail, Door access & SMS records, Email alert. Data Logger 1 temp + 1 RH. Data Logger with LCD display window capable to store non volatile data memory up to 5000 readings with audit trail facility USFDA approved 21 CFR Part 11 compliance software. Change over to stand by system automatically as per schedule or on detecting fault with current system Temperature & Humidity overshoot and under shoot protection Mobile Alarm system, Door Access, system setting reset , Graph, SMS, Email alert, etc.

Applications :

This chamber product is frequently used for research application such as lighting for plant pathology research and seedling germination and development.

Ecocentric System :

Chamber runs on the basis of Dewpoint control. Less deviations during short-term door opening & power failure. Less utility area Increased storage area. Low operating cost. Minimum power & water consumption. Reduced deviations. Less breakdowns due to standby refrigeration & humidification system. Due to PLC HMI & controlling through microprocessor based PID Temp. & RH operations the on time of both Temp. & RH system is reduced & efficiency of this system is increased with reduced energy consumption.

Salient Features : [Optional]

First time in **India** developed by **SR Lab Instruments**. Standby Refrigeration, Standby Humidification & Standby safety controller with auto changeover, In case of failure of the main system, To run the system for a longer with uninterrupted operation.

Also USFDA approved 21 CFR compliance software, where in case of temp. & RH fluctuation, SMS & Email alert shall be sent to registered user nos and minute details of operation of the chamber can be downloaded weekly, Monthly or Quarterly.

PLANT GROWTH CHAMBER

Cabinet Construction & Insulation :

MOC of the Chamber will be: Double walled Chamber with Inner of stainless steel 304 grade & outer of CRCA duly powder coated, PUF Insulation in between two walls.

- (i) Double door, inner door of glass with frame & silicon gasket sealing, outer door metallic with PUF insulation.
- (ii) The unit will be made of double walled leak proof metal door with lock, with a provision of opening door from inside.
- (iii) Forced air circulation for uniform temperature.
- (iv) Lockable & Movable PU wheels for easy movement.

Insulation of Walls, ceiling and floor : 80mm thick puff panels with puff in-place density of minimum of 1kg per cubic foot. Exterior metal surface of insulation puff panels or its equivalent shall be of minimum 24 gauge embossed white galvanized steel or its equivalent. Interior metal surface of insulation puff panels or its equivalent shall be of minimum 26 gauge smooth steel with baked white enamel finish or its equivalent. Exterior and interior metal surface shall not have metal-to- metal bonding.

Door : Flush type doors of metal surfaces (as per above specification of metal) with proper puff insulation of above mentioned standard or its equivalent. Doors shall have magnetic snap-in perimeter gasket or its equivalent, self-closing cam lift gravity hinges or its equivalent, a posi-seal door closure or its equivalent. Door shall have key lockable latch handle. Doorjamb shall be made fiberglass reinforced plastic or any other suitable material compatible with constructed door

Airflow/Circulation :

The chamber is provided with best air circulation to give better temperature uniformity this is achieved by using one set of motor & blower in baffle wall Compartment to push treated air in working chamber. This system gives better than 1 deg c. temperature uniformity in working chamber, evaporator, heaters & steam injection system is from back side, behind baffle wall, the air circulation blower is also fitted in this compartment only. This arrangement helps to mix steam and air together and pass well mixed air inside the working chamber. Due to above system the temperature and humidity (R.H.) in complete chamber almost remains equal.

Uniform horizontal or vertical airflow shall be provided for maintaining uniform temperature and RH in the room. System for adjustable forced air exchange shall be provided with up to 20 air exchanges per hour of fresh air to the room or its equivalent and an option to shut it down when not required.

Temperature & Humidity Range :

-10°C to +60°C, (lights ON & OFF Condition)
Resolution : 0.1°C, Accuracy : ±0.2°C, Uniformity : ± 0.5°C to ± 1°C

Relative humidity from 10% to 98%,
Resolution : 0.1%, Accuracy : ± 2% , Uniformity : ± 3%.

Lighting System :

Up to 1400 µmoles/m²/sec

- (i) Lights are mounted on shelves / side walls of the chamber.
- (ii) Programmable ON/OFF lights for day/night effect. [0-100%]
- (iii) Option for Lighting the each tier of the plant growth chamber with properly spaced **RGB-IR lights** to impart uniform light intensity on the shelf. (Light intensity-As per requirement) Programming and control of the lighting is done via PLC with HMI control system.
- (iv) Programmable event with suitable **UV-A /UV-B** lights in the chamber.
- (v) Lighting shall be dimmable either with open loop or closed loop controls. **(Optional)**

Lamp heat will be removed by conditioning system. Shelves will be lighted with fluorescent / Incandescent / LED with balanced spectrum for Uniform Light intensity, measured 6 inches from lamps on programmable on/off light events.

Light meter for display & recording of light output. **(Optional)**

Optional: Ability to dim light intensity from 0 to 100 percent in one-percent increments, with the option to add individually controlled light channels for multiple-tier chambers . This dimmable lighting system provides more uniform light distribution throughout the chamber with a more balanced spectrum for general plant growth.

Ability to control each color in a multi color lamp bank. Each standard lamp bank shall consist of multi-color LEDs consisting of

- Cool white (6500K) LEDs / Warm White (3500K) LEDs
- Red (650-670nm) LEDs
- Blue (451nm) LEDs
- Far Red (720-740nm) LEDs
- Green (510-550nm) LEDs
- UV-A (390nm) LEDs
- UV-B (310nm) LEDs
- Violet (430nm) LEDs

LED PCB material. Alluminium plating steel, intensity adjustable from 0 to 100%. Programmable in intensity & time (photoperiod), Low heat load, longer lifespan compared to HPS or fluorescent bulbs.

(Option to customize (add / remove) the light as per requirement)

PAR light sensor: Photosynthetically Active Radiation Sensor. **[Optional]**

Shelves / Trays & Growth Area / Height :

Perforated / Bar type stainless steel trays & can be lifted easily for cleaning. Adjustable up to 0.5 inch increment / decrement.

Growth area per shelf : As per requirement.

Total growth area : As per requirement.

Growth height per tier : As per requirement.

PLANT GROWTH CHAMBER

Refrigeration : (Air Cooled)

Emerson /Danfoss/Tecumseh: make compressors, 1 stage cooling system for TEMP. & Humidity Control. All accessories such as HPCO/LPCO, Oil Separators, Dryers, Relays, OLP etc. of **Danfoss/Tecumseh Emerson** Make. CFC free refrigerant to be used to comply with the New Environmental Regulation. Will have suitable tonnage compressor for maintain temperature with lights on. Will have hermetically sealed condensing unit compressor coupled with Evaporation coil and condenser, safe guarded by time delay circuit. Cabinet shall be supplied with air-cooled condensing unit with extended compressor life and close temperature control. Cooling system will be split type to place condenser unit in a ventilated area to avoid hot air in growth chamber. Cooled air shall be delivered in such a way to reduce or eliminate condensation within media dishes and to provide maximum uniformity In different research vessels. This may be through silent and durable fan motors or through any kind of advanced air diffusers. Air Cooled Condenser with solenoid & LP to pass hot gas to the chamber for uniformity & long life of compressor for continuous usage. Phenolic coating for cooling & condensing coils (All weather proof).

Sensor :

Sensors : Rotronic Make Hygroclip non condensing type sensor for RH and PT-100 'A' class for temp. calibrated from ERTL / NABL accredited labs.

Special Features :

- Drain Line connections: ¼" Nozzle.
- Noise Level: 70 db
- Water Line Connection: ¼"
- Max. 95%RH continuous operation at higher temp. Of 60°C will consume water 3-4 Ltrs/hrs.
- ¼" Piping connections required for water filter used in supply line of humidity control unit.
- Quality of water and flow and pressure : Soft water 2-3 Ltrs/min
- Date acquiring software with electronic form
- Additional Software: 1 Copy.

Certification :

ISO 9001:2015 Certified Co. D&B registered & CE mark product.

ISO 14001:2015 & WHO-GMP.

NSIC & MSME registered.

Electrical safety compliance 61010.

Calibration & validation certificates traceable to NABL / ERTL accredited labs.

Safety Features :

- 2 minute compressor "on" delay timer to safeguard the compressor. Compressors overload relay protector. Electronic low water level cut off device to cut off the supply to boiler heater in case of low water level. Safety Temp. Controller. MCB for mains.
- (i) Unit will be provided with safety devices for temperature and humidity overshoot in case of malfunction.
 - (ii) Built-in temp. Deviation, audio/visual alarms. Safety thermostat for over shooting of temp. Safety circuit to cut off the whole system.
 - (iii) OLP (Overload Protector) & Time delay Circuit for safety of compressors.
 - (iv) HRC fuses for compressors, Heaters & Mains.

Power Supply :

Single phase 230V AC, 50 Hz / Three phase 440V AC, 50 Hz.

Heating :

Good quality SS tubular heaters.

Humidification & Dehumidification :

Will consist of pan type humidifier tank fitted with boiler heaters, and give alarm if fault occurs or Ultrasonic Humidification System. Water reservoir tank will be connected to the humidifier. De-humidification coils are installed below the cooling coils for lower humidity.

Optional Accessories :

Co₂ Application : Complete package with CO₂ NDIR Sensor for packaging between range of 250 PPM to 2000 PPM with CO₂ cylinder & regulator directly operated from PLC automatically.

1. Servo controlled voltage stabilizer.
2. PAR Light Sensor.
3. Dimmable light control.
4. Suitable RO system.
5. UPS backup with batteries to run the equipment in case of power failure.

Documentation :

To comply with the documentation requirements, we provide IQ, OQ & PQ protocols to be executed before taking the chamber in to for regular use, and support the supply with the following documents with the detail operational and service manual.

Standard Operating Procedure (SOP)

Operational Manual for Controller

IQ,PQ,OQ protocols certificate.

Calibration certificate of all controlling modules with traceability.

Certificate of MOC.

Test Report of chamber prior to supply with mapping certificate.

wiring diagram for ease of service maintenance.