



# SETIS™

SETIS™ Control Unit

## Insights into SETIS™ automation



# SETIS™

## SETIS™ Control Unit

### How to program and control SETIS™ bioreactors?

The answer is quite simple. SETIS™ has its own and customized Control unit.

At the control unit, compressed air is pressure-adjusted, distributed and controlled according to user specifications before reaching the bioreactors. This is thanks to our SETIS™ specific software, designed to fulfil all the possible Temporary Immersion functions, besides unique functions only available in our software.



SETIS™ Control Unit





# SETIS™

## SETIS™ Control Unit

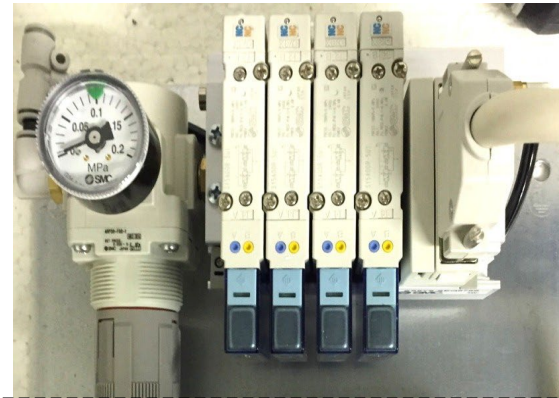
Control unit is composed of three main elements:

- Program Logic Control (PLC) unit. WAGO, Germany ([www.wago.de](http://www.wago.de))
- Pneumatic unit. SMC, Japan ([www.smc.eu](http://www.smc.eu))
- SETIS™ Software. Vervit

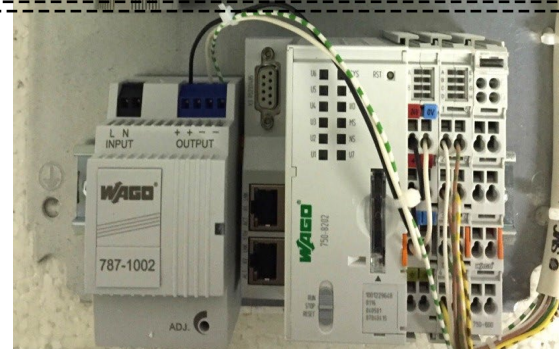
The unit is extremely compact and dynamic on both, PCL and Pneumatic elements. It is based on modular systems which allow unlimited unit expansion and upgrade.

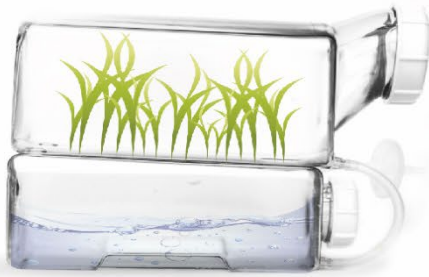
The Software is also designed to adapt to any hardware expansion, making the evolution of your installation very simple and safe.

### Pneumatics



### PLC





# SETIS™

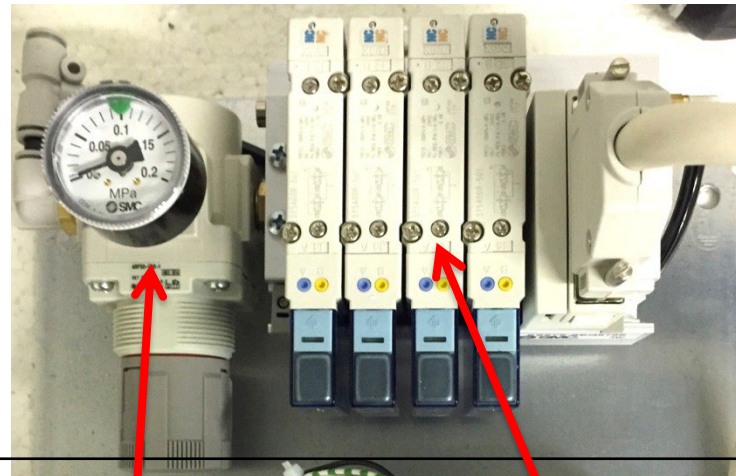
## SETIS™ Control Unit

### The pneumatic side

It is composed of two main elements:

- Air pressure regulation
- Valves

### Pneumatics



**Air pressure regulation**

**Electro-Valve**

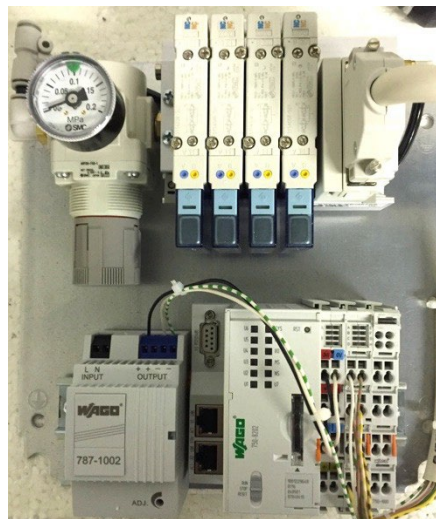


# SETIS™

## SETIS™ Control Unit

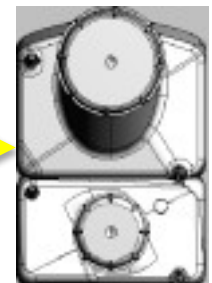
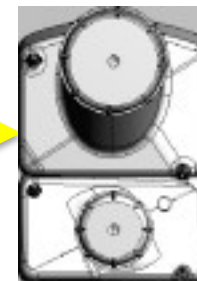
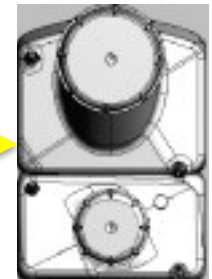
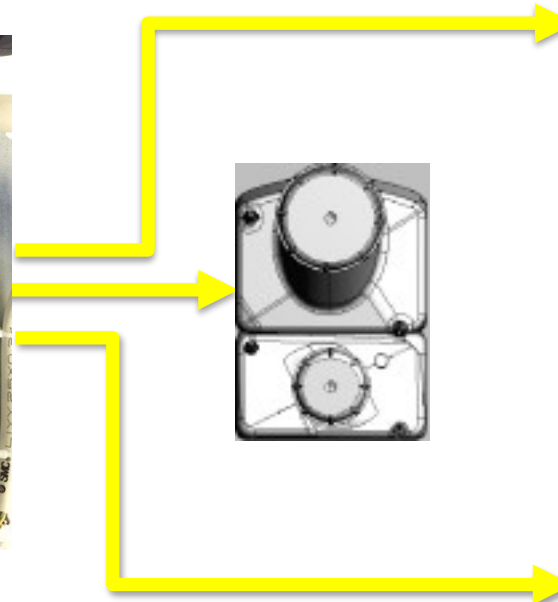
Compressed air is pressure-regulated and then distributed to all valves, to later be distributed to all bioreactors.

Compressed air



SETIS™ Control unit

SETIS™ bioreactors





# SETIS™

## SETIS™ Control Unit

### Air pressure regulation

Compressed air coming from the air compressor has usually a pressure between 3---10BAR. This pressure is highly reduced and adjusted prior entry to the valves to 0,1---0,2BAR, to later be used for both, immersion and ventilation functions.

In SETIS™ unit control, air pressure can be adjusted manually or automatically.

In case of manual, the same air pressure is adjusted manually for all operation functions. In case of automatic, the air pressure is regulated via the SETIS™ software and can vary for each operation function.



**Manual air  
pressure regulator**



**Automatic air  
pressure regulator**



# SETIS™

## SETIS™ Control Unit

### Air pressure regulation

Standard installations are delivered with manual pressure regulation. The automatic regulation is an option, which can be requested by client.

It is recommend to use the automatic regulation to profit from all functions of the SETIS™ software.

Mostly when installations control a large number of bioreactors.



**Manual air  
pressure regulator**



**Automatic air  
pressure regulator**



# SETIS™

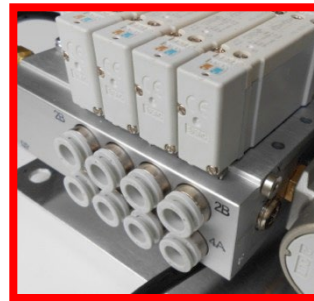
## SETIS™ Control Unit

### Valves

SETIS™ unit control uses 3/2 valves assembled in a manifold. Very compact and secure. Each **valve/slide** corresponds to one Control Point (CP --- two outlets, one for immersion and one for ventilation). Read further to understand what is a CP.

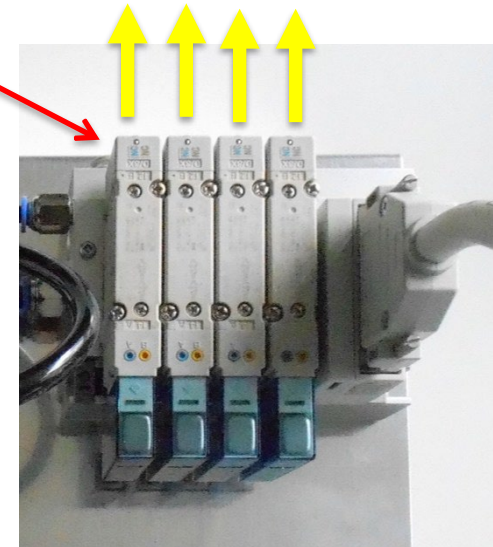
Manifolds are delivered minimum with 4 **slides**, or 6, 8, 10 and 12 **slides** each.

Valves have been calculated and adjusted to SETIS™ bioreactors functions, allowing a maximum of 32 bioreactors per CP. Higher number of bioreactors per CP can affect the airflow and consequently an optimal operation of the bioreactors.



Air outlet as push--in connectors for a quick and safe assembly

Air out towards bioreactors





# SETIS™

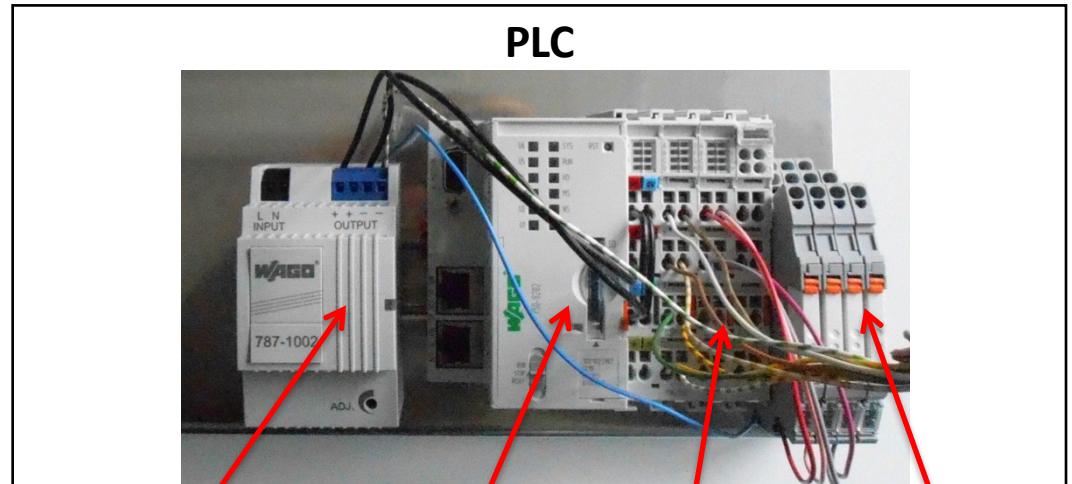
## SETIS™ Control Unit

### The PLC side

SETIS™ uses PLC to control all functions.

Main components:

- Power transformer (110--240V to 24VDC)
- Master unit PLC
- Input/output cards
- Relay cards



PLC

Power  
transformer

Master unit

I/O cards

Relay cards



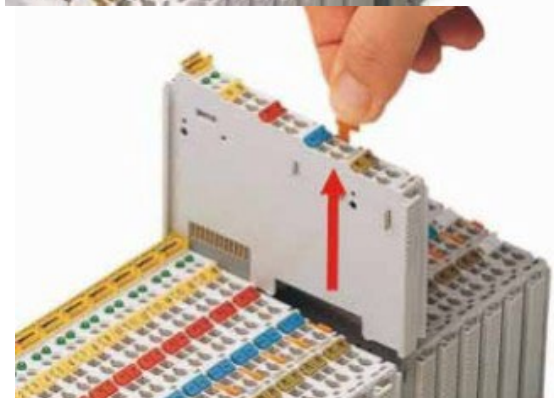
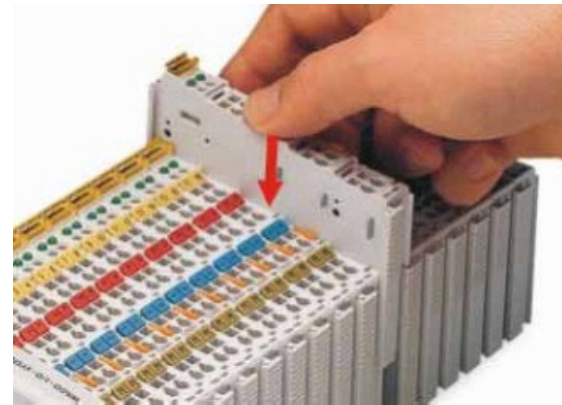
# SETIS™

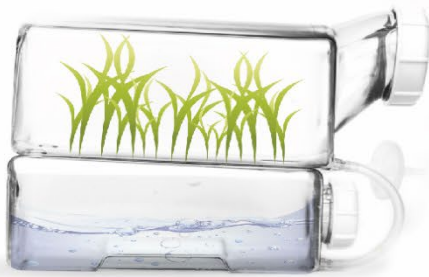
## SETIS™ Control Unit

### The PLC side

PLC is very dynamic and flexible, as I/O cards can be added/removed from the installation without affecting the functioning of the software.

It means the installation can expand any time according to client's desires.





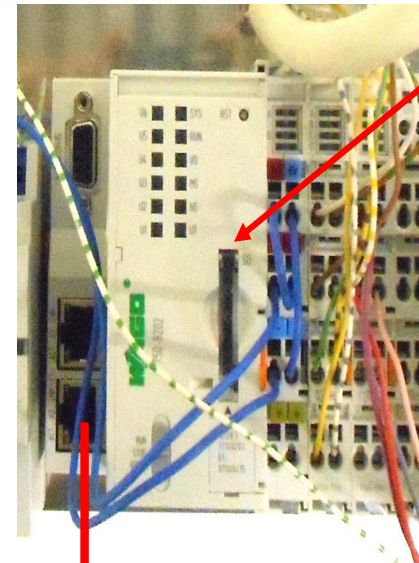
# SETIS™

## SETIS™ Control Unit

### The PLC side

Master unit holds the SETIS™ software, which is stored in the SD card placed in the slot. No software installation required in client's computer. Software is accessed via a web browser using the assigned IP address from your network. Read SETIS™ Software User Manual for more information.

Communication with the control unit can be both, via Wi-Fi or via Ethernet, using one of the UTP cable slots.



SD Card slot

UTP port connected to  
Local network  
(Wi-Fi communication)

UPT port connected  
to PC (Ethernet  
communication)



# SETIS™

## SETIS™ Control Unit

SETIS™ Control unit is delivered with all its components and 'ready to use'. Only a source of compressed air and electricity is necessary to start using the unit.

### Compressed air

3--10 BAR

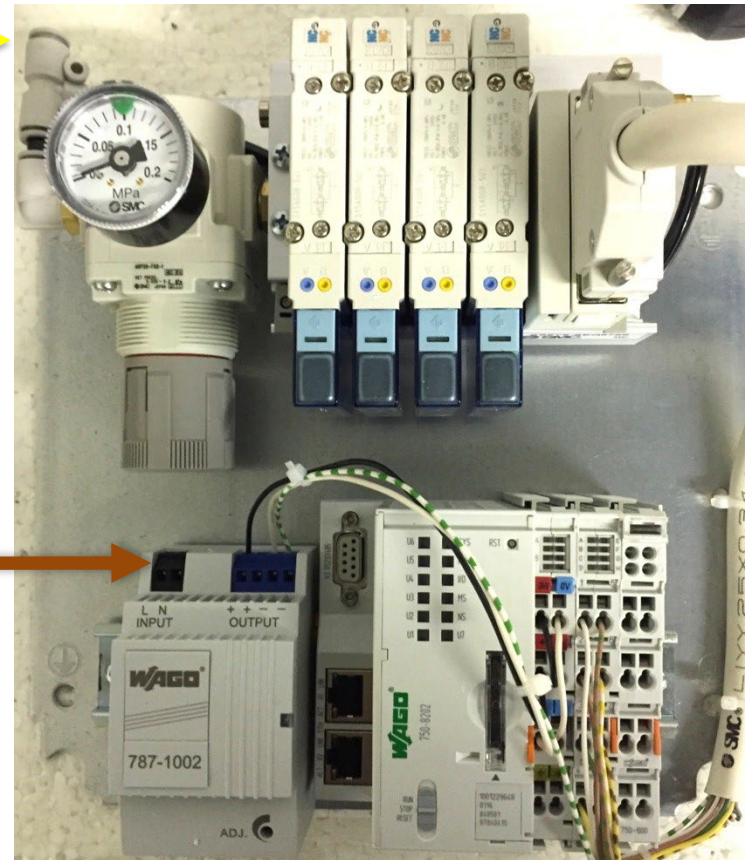
Dry & filtered

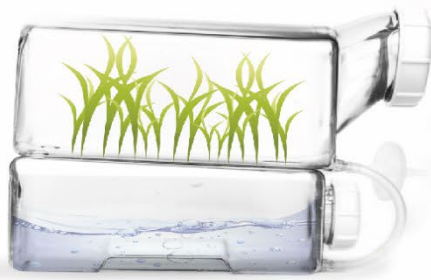
Use PU tube ø8mm to make this connection

### Power supply

110-240V

Use three wires--cable to make this connection, attaching the Ground wire to the enclosure





# SETIS™

## SETIS™ Control Unit

### Generation and handling of compressed air

To produce quality compressed air the installation should be composed of the following three elements.

- Air compressor
- Air dryer
- Air filtration



**Air dryer**



**Air filters**





# SETIS™

## SETIS™ Control Unit

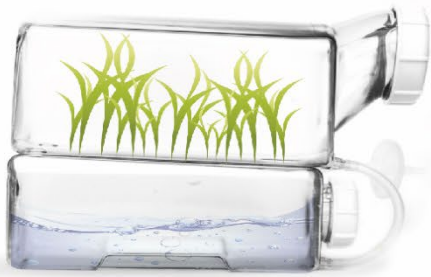
### Air compressor

As part of the SETIS™ platform, Vervit high quality compressors to costumers.

### Compressor specifications

- Brand: Atlas-Copco
- Oil-free compressor
- 1,5 HP
- 1,1kW
- Maximum pressure 10 BAR
- Two versions: 1x115V/60Hz  
1x220V/50Hz
- Flow @ 7 BAR: 124--143 l/min
- Sound level 65 dB(A)
- Mounted in tank of 50 liters
- Tank internally epoxy-coated
- Electronic timer drain





# SETIS™

## SETIS™ Control Unit

### Air compressor

Where to place the compressor?

This compressor has high standards to produce quality oil-free compressed air. Therefore, it is not recommended to place it in outside conditions.

Search for a place indoor within your lab where temperatures remain relatively constant the whole year. Preferably above in-vitro growth rooms temperature.

Compressed air will be stored in the tank for further use directly in the bioreactors. If temperature of tank is very low, the air will be also very cold to be brought to bioreactors/plants.



When air capacity is not sufficient, an external tank of 120 liters can be coupled to the compressor. Read further to know how to couple this tank to the installation.



# SETIS™

## SETIS™ Control Unit

### Air dryer and air filters

Compressed air generated by the compressor is humid and still contain large number of particles (consequently contaminants). The air needs to be dried out and all particles removed.

Vervit deliver dryers and filters as part of our SETIS™ platform to produce high quality compressed air.

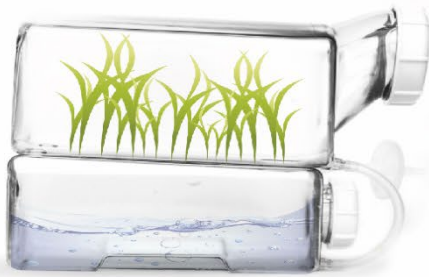
#### Dryer

- Brand: SMC
- Two models: 1x115V/60Hz  
1x220V/50Hz
- Flow capacity 400 l/min

#### Set of filters

- Brand: SMC
- Sequence of filtration (5µm/0,3µm/0,01µm)





# SETIS™

## SETIS™ Control Unit

### Generation and handling of compressed air

With all these elements clients can profit from a high quality compressed air, ideal for bioreactors operation.

All elements should be installed according to this diagram.

It is HIGHLY recommended to request the services of a professional to setup the installation. The guaranty of the air handling equipment can be **deemed** if the installation is not certified by an expert.





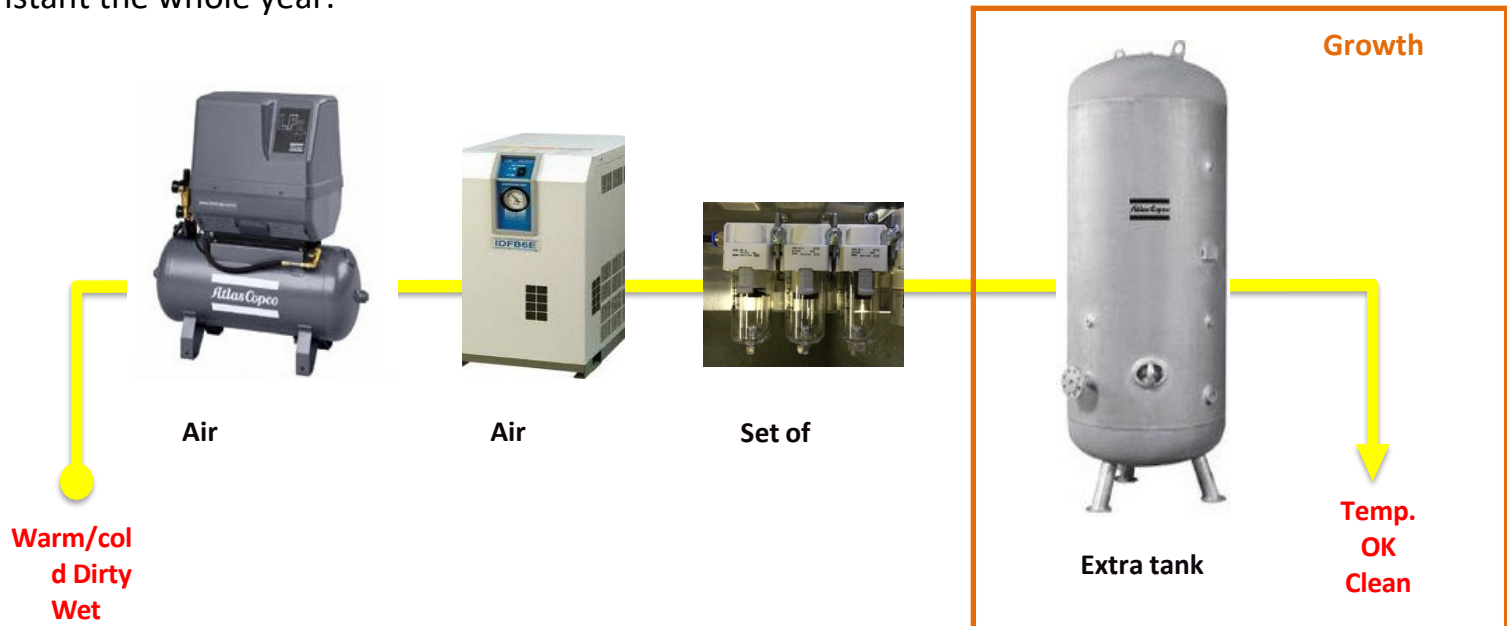
# SETIS™

## SETIS™ Control Unit

### Generation and handling of compressed air

If installation requires more air capacity, it is recommended to add an extra tank to store more compressed air. A tank of 120 liters will be sufficient.

As shown in the scheme, the new tank should be connected at the end of the installation, storing only clean and dry air. It is recommended to place this tank inside the growth room. Then the temperature of air is relatively constant the whole year.





# SETIS™

## SETIS™ Control Unit

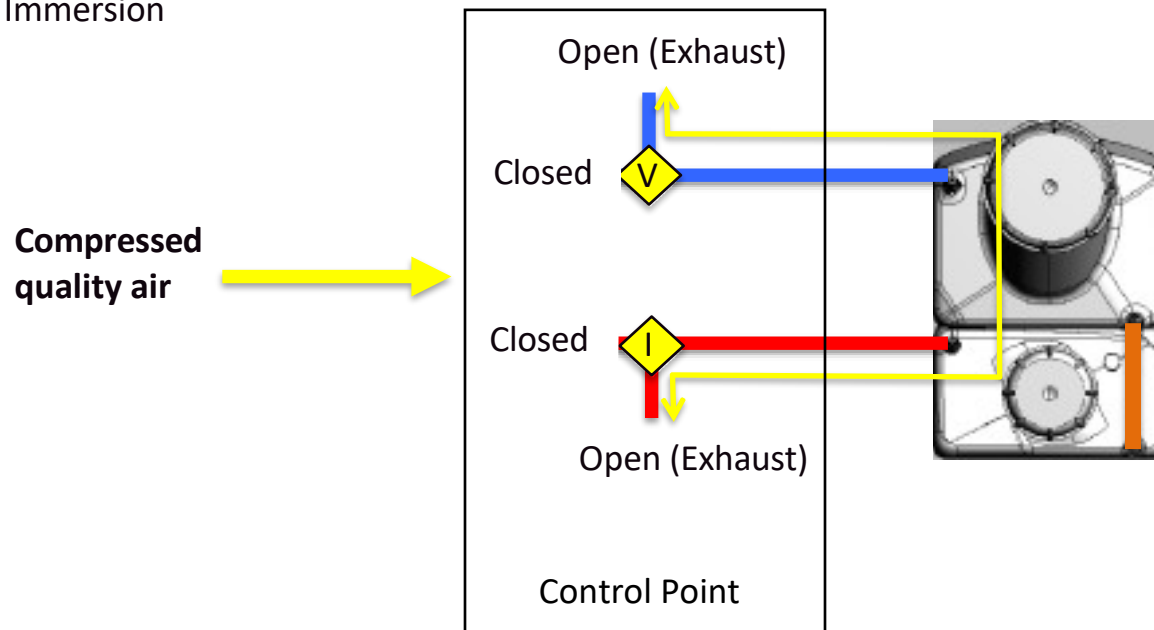
### What is a Control Point?

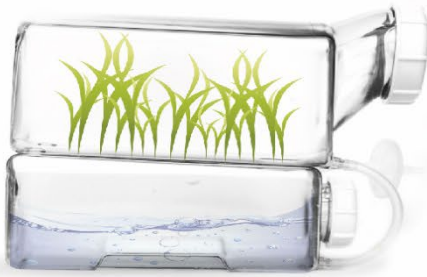
Control Point (CP) is a compressed air output from the SETIS™ Control unit, which independently controls one or several bioreactors via the SETIS™ Software.

Each CP is composed of two 3/2 electro valves (NC):

V – one for Ventilation

I – one for Immersion



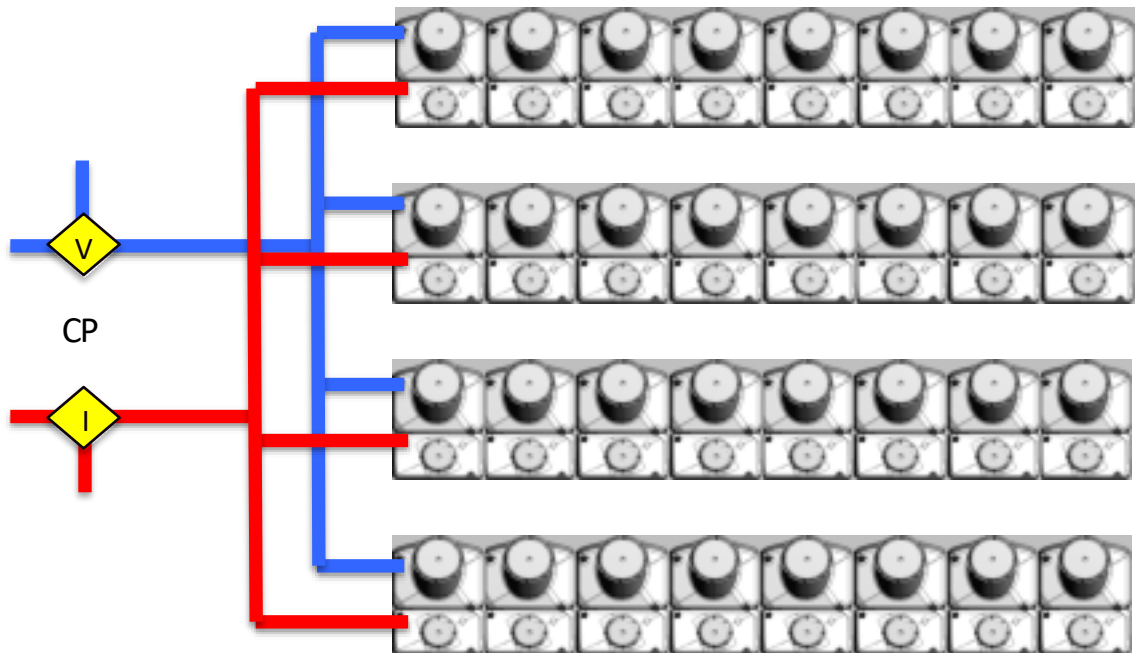
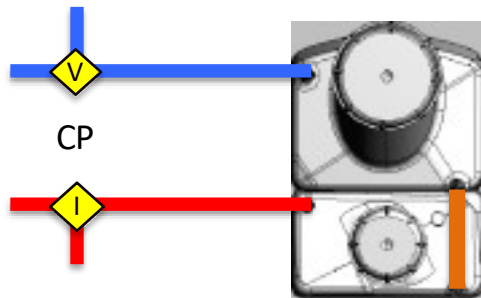


# SETIS™

## SETIS™ Control Unit

### What is a Control Point?

Each CP can control a minimum of 1 and a maximum of 32 SETIS™ bioreactors.



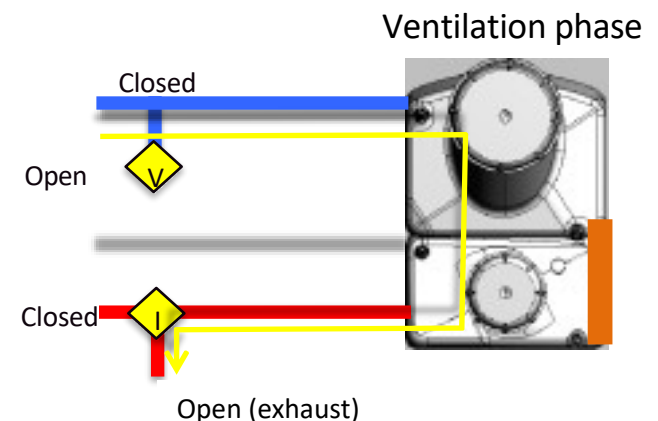
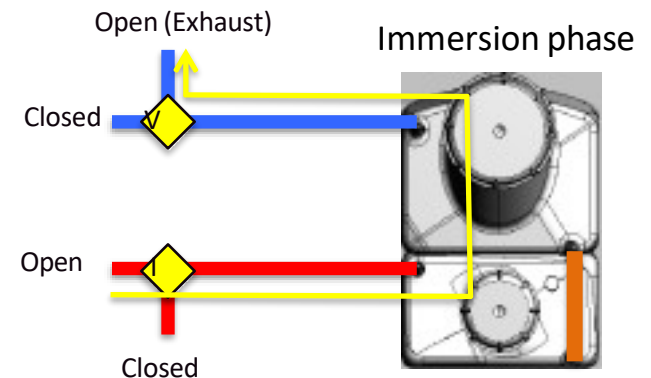
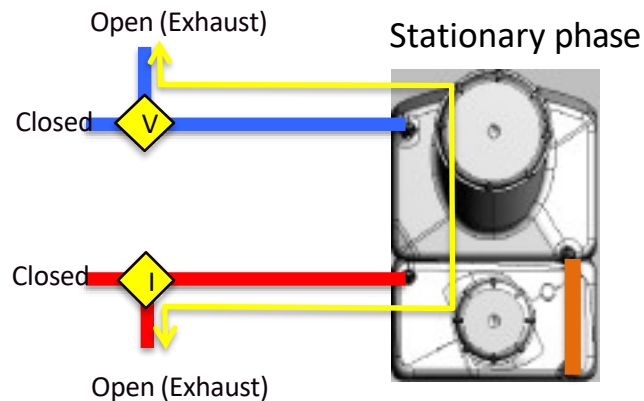


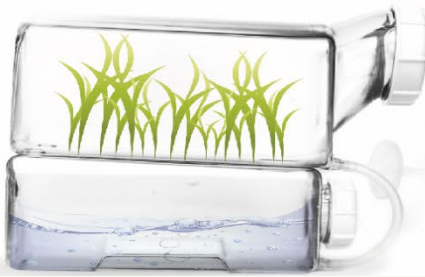
# SETIS™

## SETIS™ Control Unit

### How a Control Point operate the bioreactor?

By Open/Close the V and I electro valves, the immersion and ventilation phases are created.  
Compare with diagram from next slide





# SETIS™

## SETIS™ Control Unit

### SETIS™ Bioreactor working cycles

#### Stationary phase

No compressed air is supplied. Growth medium remains in the media vessel and plant material within a gas environment.

#### Immersion phase

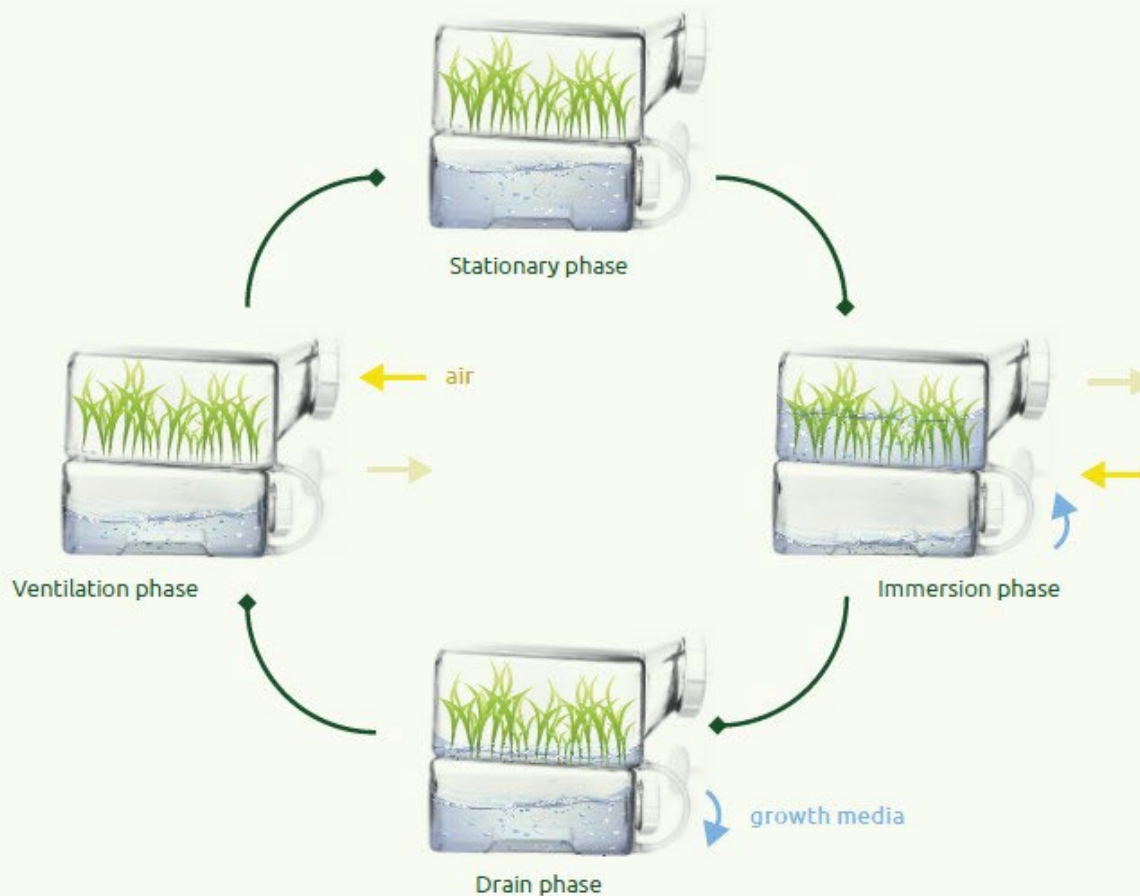
Compressed air is supplied into the media vessel in order to transfer growth media to the upper culture vessel. Plant material remains under a liquid environment and nutrients uptake takes place.

#### Drain phase

Gravity forces the growth medium back into the media vessel.

#### Ventilation phase

Compressed air is supplied into the culture vessel in order to renew its internal gas environment.



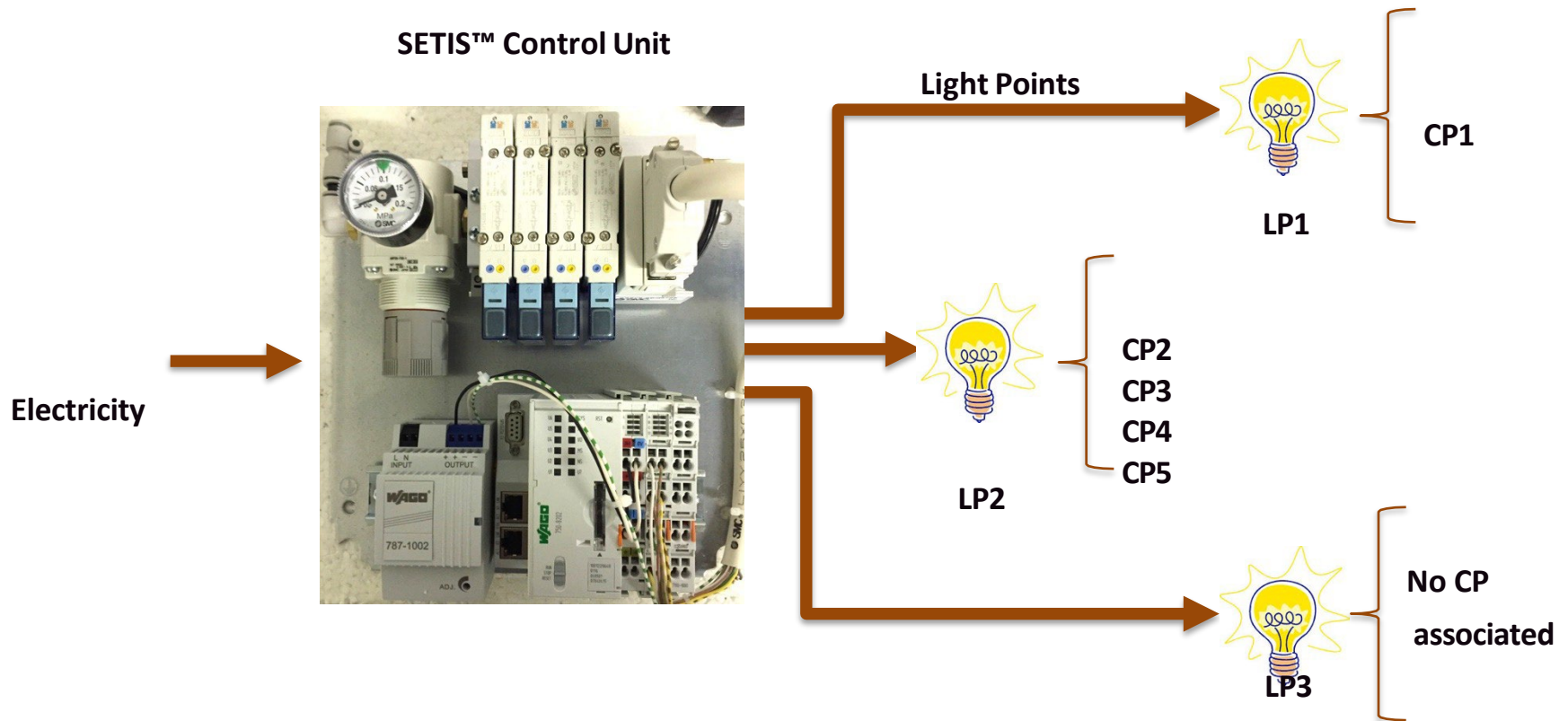


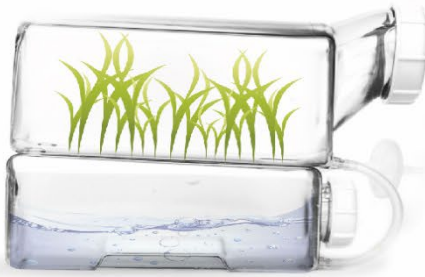
# SETIS™

## SETIS™ Control Unit

### What is a Light Point?

Light Point (LP) is a switch output from the SETIS™ Control Unit, which independently controls via the SETIS™ Software a group of lamps associated or not to a defined CP.





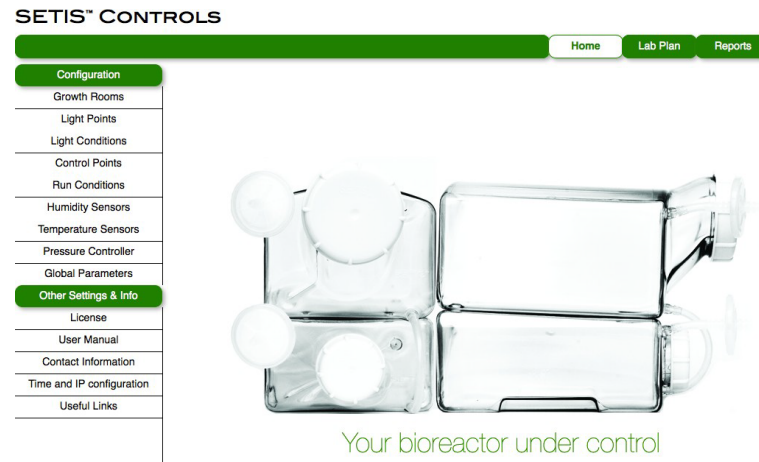
# SETIS™

## SETIS™ Control Unit

### General view on the SETIS™ Software

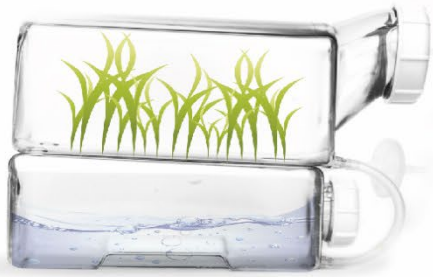
#### Main Menu groups:

- ... Configuration: The setup of all parameters related to Control Points, Light Points, sensors, and Lab configuration.
- ... Lab Plan: A dynamic and user-friendly visualization and operation of your lab setup.
- ... Reports: Occurred actions are visualized live to check the correct operation of the system.
- ... Other Settings and Info: Relevant additional information for the end user.



SETIS™ Systems

[office@setis-systems.be](mailto:office@setis-systems.be) ..... [www.setis-systems.be](http://www.setis-systems.be)



# SETIS™

## SETIS™ Control Unit

### General view on the SETIS™ Software

### Configuration

**SETIS™ CONTROLS**

Light Condition Configuration

Home Lab Plan Reports

**Configuration**

- Growth Rooms
- Light Points
- Light Conditions
- Control Points
- Run Conditions
- Humidity Sensors
- Temperature Sensors
- Pressure Controller
- Global Parameters
- Other Settings & Info**
- License
- User Manual
- Contact Information
- Time and IP configuration
- Useful Links

**Light Condition Configuration**

Name: 16/8

Save Remove

16/8  
LC 1  
LC 2

| Active                              | On Hour | On Minute | Off Hour | Off Minute |
|-------------------------------------|---------|-----------|----------|------------|
| <input checked="" type="checkbox"/> | 06      | 00        | 22       | 00         |
| <input type="checkbox"/>            | 00      | 00        | 00       | 00         |
| <input type="checkbox"/>            | 00      | 00        | 00       | 00         |

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23

**Visualize and change light conditions**

**List of light conditions**

**Setup the Light points**

**Create and save your own light conditions**

Name: Add

| Active                   | On Hour | On Minute | Off Hour | Off Minute |
|--------------------------|---------|-----------|----------|------------|
| <input type="checkbox"/> | 00      | 00        | 00       | 00         |
| <input type="checkbox"/> | 00      | 00        | 00       | 00         |
| <input type="checkbox"/> | 00      | 00        | 00       | 00         |



# SETIS™

## General view on the SETIS™ Software

### Configuration

#### SETIS™ CONTROLS

Run Condition Configuration
Home
Lab Plan
Reports

Configuration
Growth Rooms
Light Points
Light Conditions
Control Points
Run Conditions
Humidity Sensors
Temperature Sensors
Pressure Controller
Global Parameters
Other Settings & Info
License
User Manual
Contact Information
Time and IP configuration
Useful Links

Name: Growth 1
Duration: 35 days
Frequency: 240 min
Duration: 90 s
Pressure: 0 Bar
Immersion: 120 min
Ventilation: 60 s
Active: ☐
Start After: 0 days
Modify By: 0 mins
Every: 0 days
Immersion Freq. Var.: ☐
Ventilation Freq. Var.: ☐
Immersion Dur. Var.: ☐
Ventilation Dur. Var.: ☐
Fast Drainage: ☒
Post LAF Immersion: ☒

Name:
Duration: 0 days
Frequency: 0 min
Duration: 0 s
Pressure: 0 Bar
Immersion: 0 min
Ventilation: 0 min
Active: ☐
Start After: 0 days
Modify By: 0 mins
Every: 0 days
Immersion Freq. Var.: ☐
Ventilation Freq. Var.: ☐
Immersion Dur. Var.: ☐

Save
Remove

Growth 1  
Var Imm 1  
Var Imm 2  
Var Imm dur 1  
Var Imm dur 2

Parameters are entered based on frequencies.  
The software assign automatically the hours for ON/OFF signals

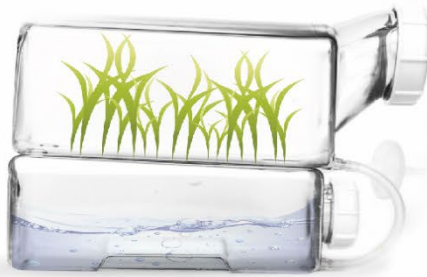
Setup the Control Points

Visualize and change  
Run Conditions

List of Run Conditions

Automatic variation on Immersion and  
Ventilations for advanced users

Create and save your  
own Run Conditions



# SETIS™

## General view on the SETIS™ Software

### Configuration

The whole lab configuration is defined and dynamically modified via this menu.

- ... up to 5 growth rooms
- ... up to 20 racks per growth room
- ... 4 shelves per rack

There is a visualization capacity of 6400 SETIS™ bioreactors in operation.

## SETIS™ CONTROLS

| Growth Room Configuration |                                     |        |          |           |        |       | Home | Lab Plan | Reports  |
|---------------------------|-------------------------------------|--------|----------|-----------|--------|-------|------|----------|----------|
| Configuration             | Active                              | Name   | T Sensor | RH Sensor | Length | Width |      |          |          |
| ◀ Growth Rooms ▶          | <input checked="" type="checkbox"/> | Room 1 | TS 1     | HS 1      | 10     | 10    |      |          | Racks... |
|                           | <input checked="" type="checkbox"/> | Room 2 | Empty    | Empty     | 10     | 10    |      |          | Racks... |
|                           | <input checked="" type="checkbox"/> | Room 3 | Empty    | Empty     | 10     | 10    | Save |          | Racks... |
|                           | <input checked="" type="checkbox"/> | Room 4 | Empty    | Empty     | 10     | 10    |      |          | Racks... |
|                           | <input checked="" type="checkbox"/> | Room 5 | Empty    | Empty     | 10     | 10    |      |          | Racks... |
| Light Points              |                                     |        |          |           |        |       |      |          |          |
| Light Conditions          |                                     |        |          |           |        |       |      |          |          |
| Control Points            |                                     |        |          |           |        |       |      |          |          |



# SETIS™

## General view on the SETIS™ Software

### Lab Plan

#### Growth rooms visualization

### SETIS™ CONTROLS

Growth Room Overview

Home

Lab Plan

Reports

Configuration

Growth Rooms

Light Points

Light Conditions

Control Points

Run Conditions

Humidity Sensors

Temperature Sensors

Pressure Controller

Global Parameters

Other Settings & Info

License

User Manual

Contact Information

Time and IP configuration

Useful Links

Room 1

TS 1

0 °C

HS 1

0 %

Room 2

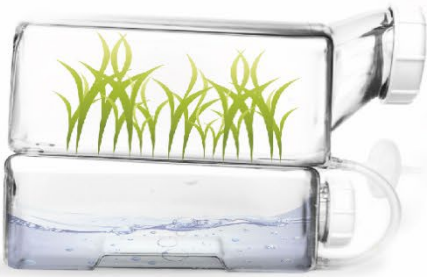
Room 3

Room 4

Room 5

SETIS™ Systems

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# SETIS™

## General view on the SETIS™ Software

### Lab Plan

#### Racks visualization

#### SETIS™ CONTROLS

Room 1 Rack Overview

< Back Home Lab Plan Reports

Configuration

- Growth Rooms
- Light Points
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- Useful Links

|         |         |         |         |         |
|---------|---------|---------|---------|---------|
| Rack 1  | Rack 2  | Rack 3  | Rack 4  | Rack 5  |
| Rack 6  | Rack 7  | Rack 8  | Rack 9  | Rack 10 |
| Rack 11 | Rack 12 | Rack 13 | Rack 14 | Rack 15 |
| Rack 16 | Rack 17 | Rack 18 | Rack 19 | Rack 20 |

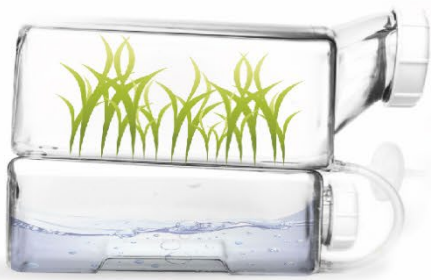
Position and orientation of each rack can be set, for easy visualization within the room



Visualization goes up to the shelf level, controlling each activated Control Point or Light Point associated.

# SETIS™ CONTROLS

| Room 1 Rack 1 Shelf Overview |                     |                           |                   |                       |                |
|------------------------------|---------------------|---------------------------|-------------------|-----------------------|----------------|
| < Back                       | Home                | Lab Plan                  | Reports           |                       |                |
| Configuration                | Growth Rooms        | Light Points              | Light Conditions  | Control Points        | Run Conditions |
| Humidity Sensors             | Temperature Sensors | Pressure Controller       | Global Parameters | Other Settings & Info | License        |
| User Manual                  | Contact Information | Time and IP configuration | Useful Links      |                       |                |
| Shelf 1                      |                     | Shelf 2                   |                   | Shelf 3               |                |
| Row 1                        | Row 2               | Row 1                     | Row 2             | Row 1                 | Row 2          |
| CP 1                         | CP 1                | CP 2                      | CP 2              | CP 3                  | CP 3           |
| Shelf 4                      |                     |                           |                   |                       |                |
| Row 1                        | Row 2               | Row 1                     | Row 2             | Row 1                 | Row 2          |
| CP 4                         | CP 4                |                           |                   |                       |                |



# SETIS™

## General view on the SETIS™ Software

### Resume of features and advantages

- A secure 'ready-to-use' installation
- Pneumatics optimized for SETIS™ bioreactor
- Compact and dynamic installation/software, based on modular system
- No software installation required
- Web-based access to software, controlling your installation from any location worldwide
- Software designed for optimal and simple operation of SETIS™ bioreactors, for both, research and production applications
- Parameters entered as frequencies, while the software automatically set the precise hours for ON/OFF actions
- Software automatically avoid valves overlapping, reducing compressed air needs and saving energy
- Dynamic Lab visualization with measuring of temperature and RH
- Options of manual or automatic compressed air pressure regulation
- Integrated Lighting controls
- Life reports on occurring actions
- Unlimited number of Control Points and Light Points
- Easy and user-friendly software and interface
- And many more...