

## SMART GREENHOUSE DL GREEN-I4.0-2



Greenhouse-grown products have become indispensable to our daily life, from food production to flower nursery activities. However, even if productivity in greenhouses is generally higher than in open field crops, it becomes necessary to improve its efficiency and sustainability. De Lorenzo has developed an intelligent greenhouse capable of integrating the most modern cultivation techniques with an advanced data monitoring system based on I4.0 sensors and technology.

The system consists of 2 zones, each independent of the other, in which it will be possible to monitor humidity, temperature, lighting. It is possible to manage the entire system remotely. In fact, the sensors in the greenhouse are connected to a dedicated hardware for data collection that communicates directly to the online software platform. In this way, it is also possible to view the state of cultivation remotely.

**It requires:**

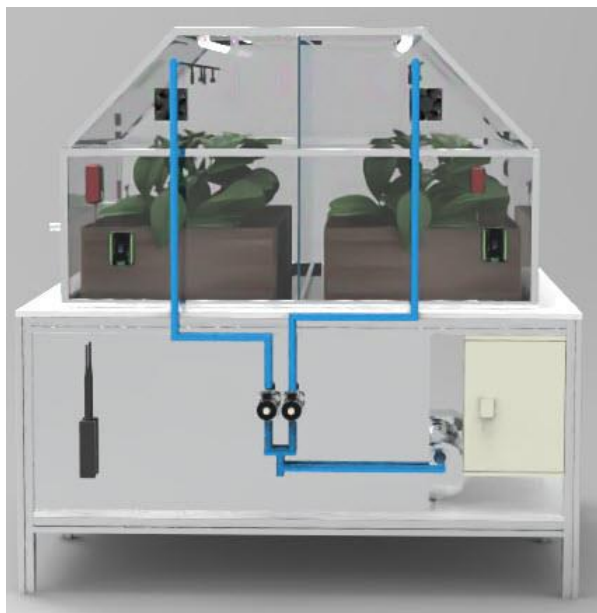
- Internet connection
- Water and electrical supply

## THE SYSTEM INCLUDES THE FOLLOWING:



### Bench:

- Dimensions:
  - Length: 1.20 m.
  - Width: 1.20 m.
  - Height: 1.80 m.
- Frame in aluminium:
  - High resistance to corrosion.
  - Natural anodized finish.
  - High mechanical resistance.
- Electrical cabinet with protection:
  - IP65 reinforced steel cabinet.
  - PLC Siemens 1200.
  - Power supply 110/220 V, 50/60Hz.
  - Safety relay.
  - Switch for connection.
  - Programming port outside the cabinet.
- Computer equipment.



### Greenhouse:

- Metal structure.
- High resistance acrylic covers.
- Side window.
- Side vent.
- Humidity variation system.
- Temperature variation system.
- Lighting variation system.
- Drip and sprinkler irrigation system.
- Containers for substrate or soil. Each container forms a zone.
  - 2 containers:
    - Length: 1.15 m.
    - Width: 55 cm.
    - Height: 30 cm.
- Pump for fertilizer application.
- Zoned irrigation control divided in 4 areas (each box of substrate forms an area).



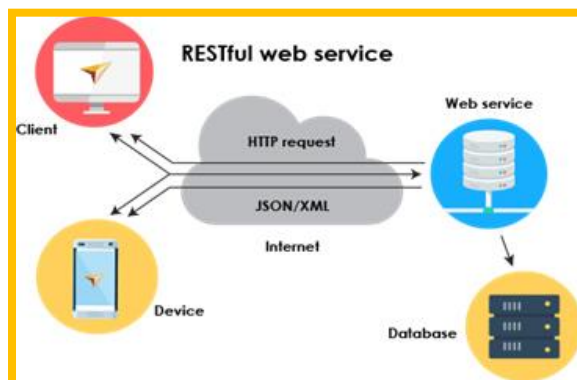
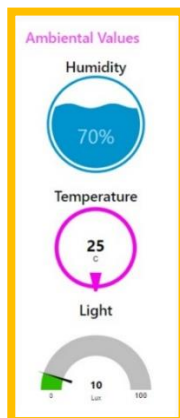
#### Intelligent sensors:

- Humidity in the soil.
- Indoor and outdoor temperature, with monitoring from mobile phone - laptop (it requires connection to the greenhouse network).
- Indoor and outdoor ambient humidity, with monitoring from mobile phone - laptop (it requires connection to the greenhouse network).
- Flow sensor to measure the consumption of the greenhouse; it delivers the result to the communications platform and can be checked on a laptop or mobile phone.
- Energy meter to measure the electricity consumption. Information and values are available on the communications platform.

#### Computer:

- Intel Core I5 processor
- Memory: 32 GB
- HDD: 1 TB
- OS: Windows 10
- Ethernet – Wi-Fi
- 2 USB ports

## COMMUNICATIONS PLATFORM



- It notifies the alarms by email and they are also displayed in the control panel.
- It allows the information to be exported to CSV and JSON format.
- Centralized database. To carry out practices with historical information.
- Control of maximum and minimum humidity parameters.
- Zoned irrigation control.
- Direct communication to DB in LAN network of the institution.
- Supports 32 simultaneous connections.

## **DIDACTIC EXPERIENCE**

In addition to the activities related to cultivation, the student who uses the De Lorenzo's intelligent greenhouse will have the opportunity to carry out the following didactic experiences:

- Calculation of electricity consumption.
- Calculation of water consumption.
- Obtaining sensor readings (humidity, temperature) from the communications platform.
- Verification of optimal environmental humidity values according to the type of crop.
- Verification of optimal temperature values according to the type of crop.
- Verification of optimal pH values in soil (digital sensor disconnected from the platform).
- Statistical analysis of values stored in the database.
- Irrigation configuration based on preset parameters.
- Comparative outdoor climate vs. indoor climate (humidity and temperature).