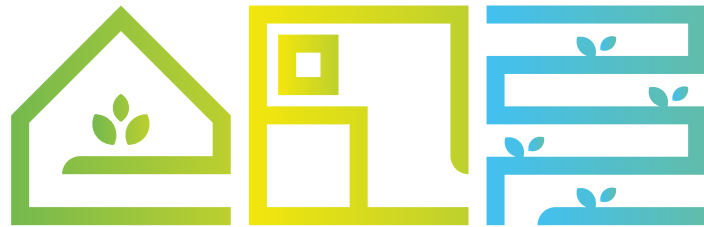
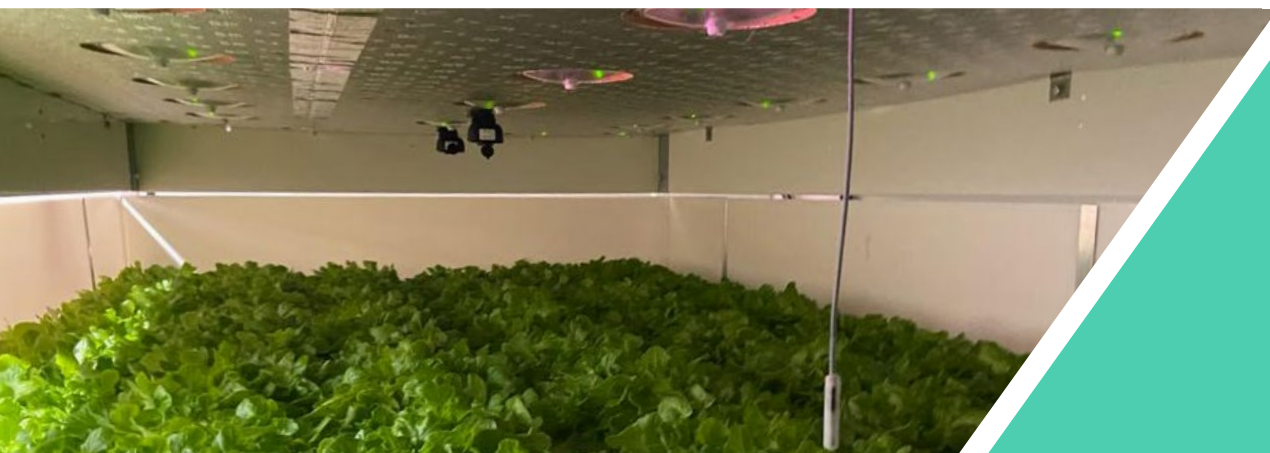


Logiqs



Controlled Environment Module
Homogeneous light and climate per 6m²



The perfect machine for doing growing trials
Exactly the same conditions every time



www.logiqs.nl

CEM ADVANTAGES

Homogeneous climate and light:

- Temperature difference is less than 0.5 °C (*).
- Relative humidity difference is less than 0.5% (*).
- Light homogeneity is more than 90% (*).

* On the same height level

Flexible setting:

- Temperature between 15 and 28 °C.
- Humidity between 50% and 90%.
- Far red, red, white and blue can be set independently.



Easy to work with:

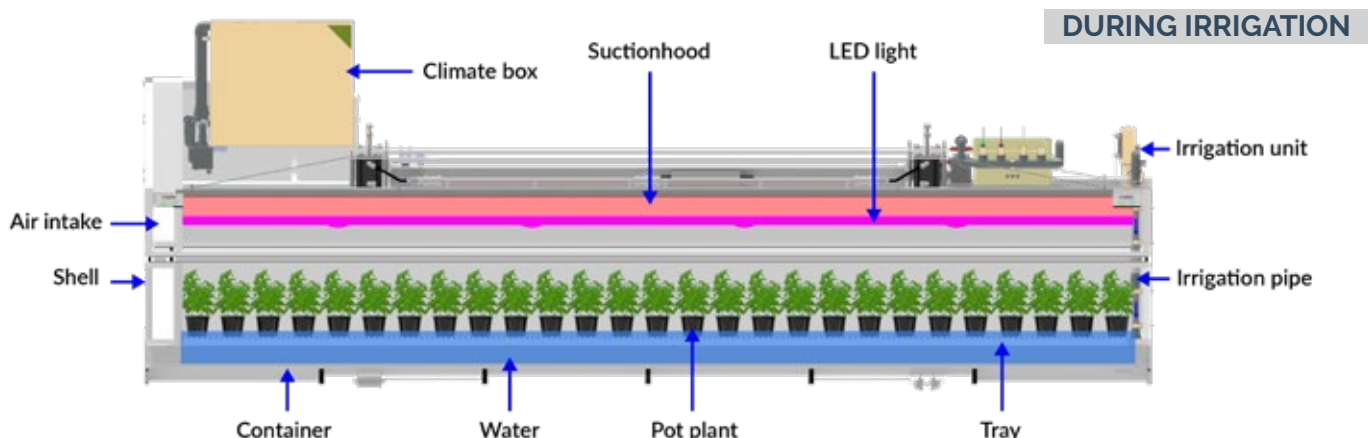
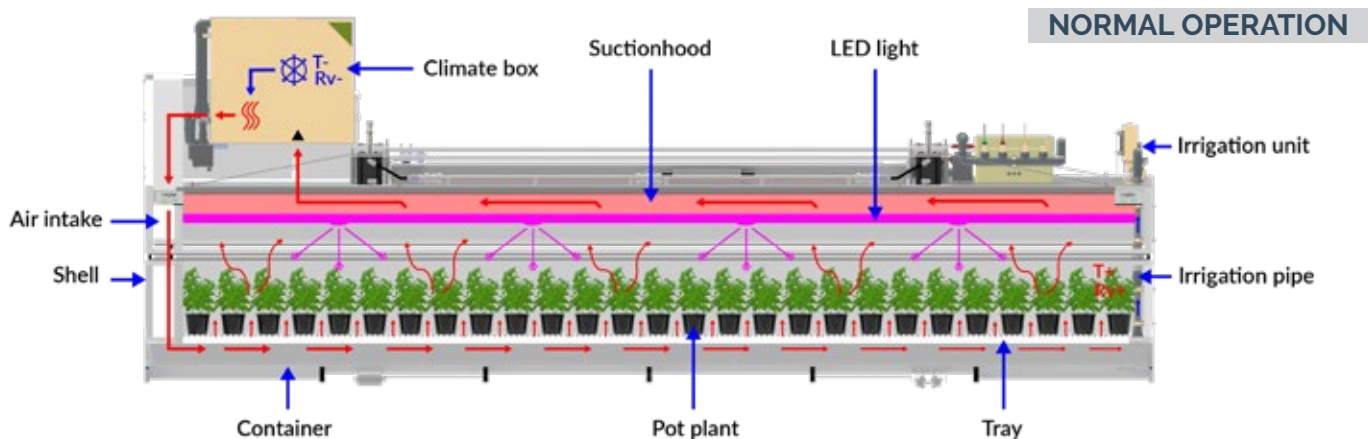
- Wheels and size make it easy to move.
- Only a connection to 230 Vac, water and ethernet/WiFi needed.

Fully closed grow room:

- Independent of environment light and climate.
- Transpiration and CO2 uptake can be measured real time.

HOW CEM WORKS

- Once the bench is in position, the top descends onto it, sealing the CEM from external climate and light.
- Air moves up from below the plants, through the canopy, to ceiling.
- Inside the ceiling it passes and cools the LED light fixtures.
- The air is then climatized in the climate box to the set conditions and goes down through the air intake.
- Below the plants the air moves between a waterproof insert and tiles with holes and spikes that are a bit above the insert.
- The air goes up through small holes that are evenly distributed.
- The plants are positioned on small knobs, allowing air to spread beneath them and then move upward between the plants.
- Two factors contribute to a 15% airspeed difference between holes: suction from fast-moving horizontal air balancing extra pressure near the air inlet, and the small hole size creating an air-chamber effect.
- Irrigation can be done with ebb flow. With flood there is no air circulation.



CONTROL

Each CEM has an onboard computing module:

- Climate:
 - Temperature
 - Humidity
 - Air speed
 - CO2
- Light (4 separate channels):
 - 440nm Blue
 - wide White
 - 660nm Red
 - 739nm Far-red
- Irrigation (not always included):
 - pH
 - EC
 - Flow rates:
 - Ebb flow with set interval
 - Continuous flowing shallow water

FarRed (1.00:00) JSON properties

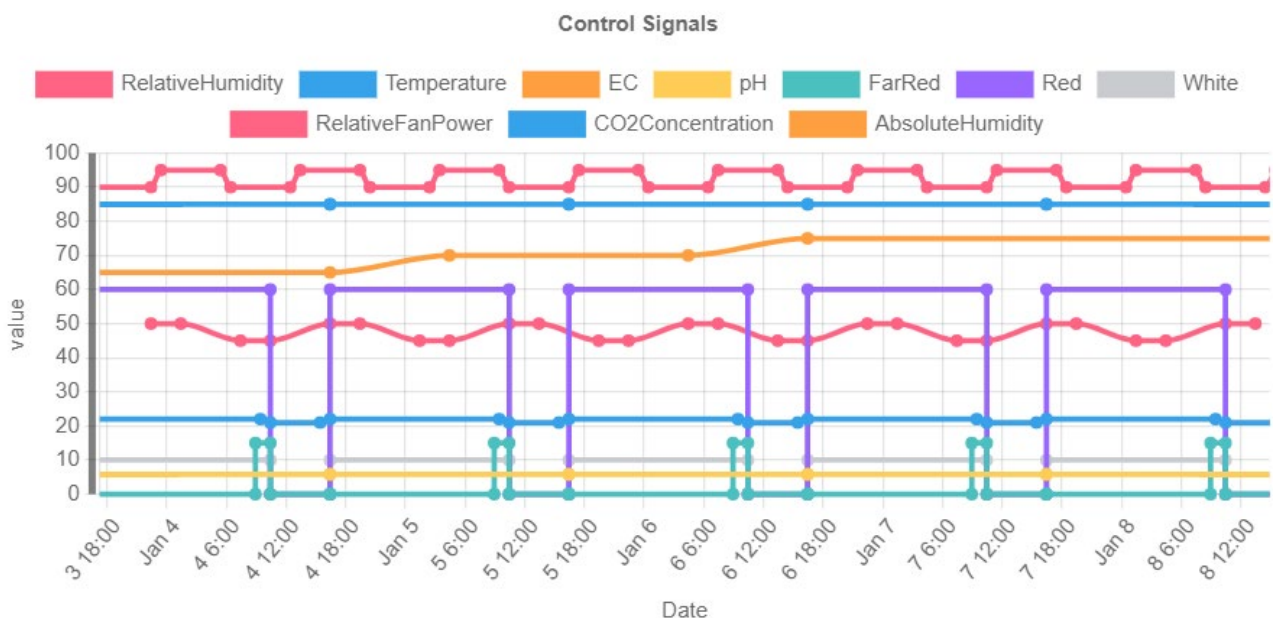
Controller Name
FarRed

Setpoints

Duration	Fade	Setpoint	
16:00:00		0	🗑️ ↓
0:30:00	smc		🗑️ ↑ ↓
01:00:00		15	🗑️ ↑ ↓
00:30:00	smc		🗑️ ↑ ↓
06:00:00		0	🗑️ ↑

+ Setpoint/fade - Last Setpoint/fade 🗑️ All

⚙️ Recipe setpoint definition

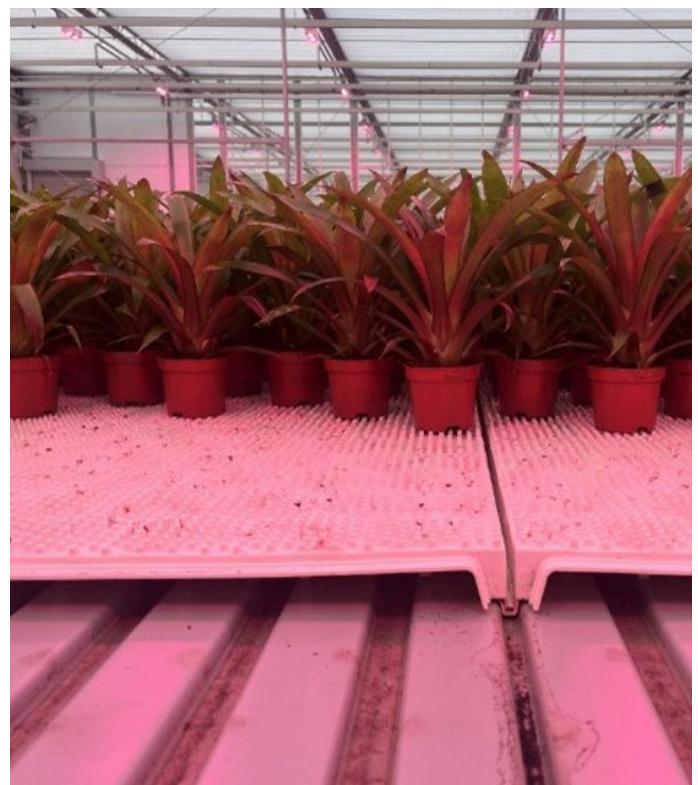
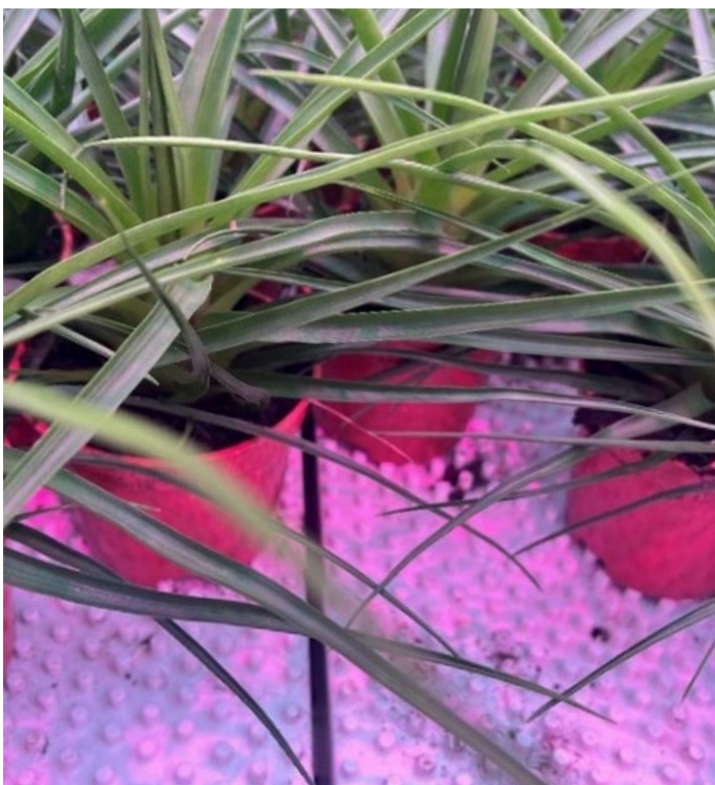


WHY VERTICAL AIRFLOW

The CEM uses air that moves up through the plants.

This has the following advantages for the plants:

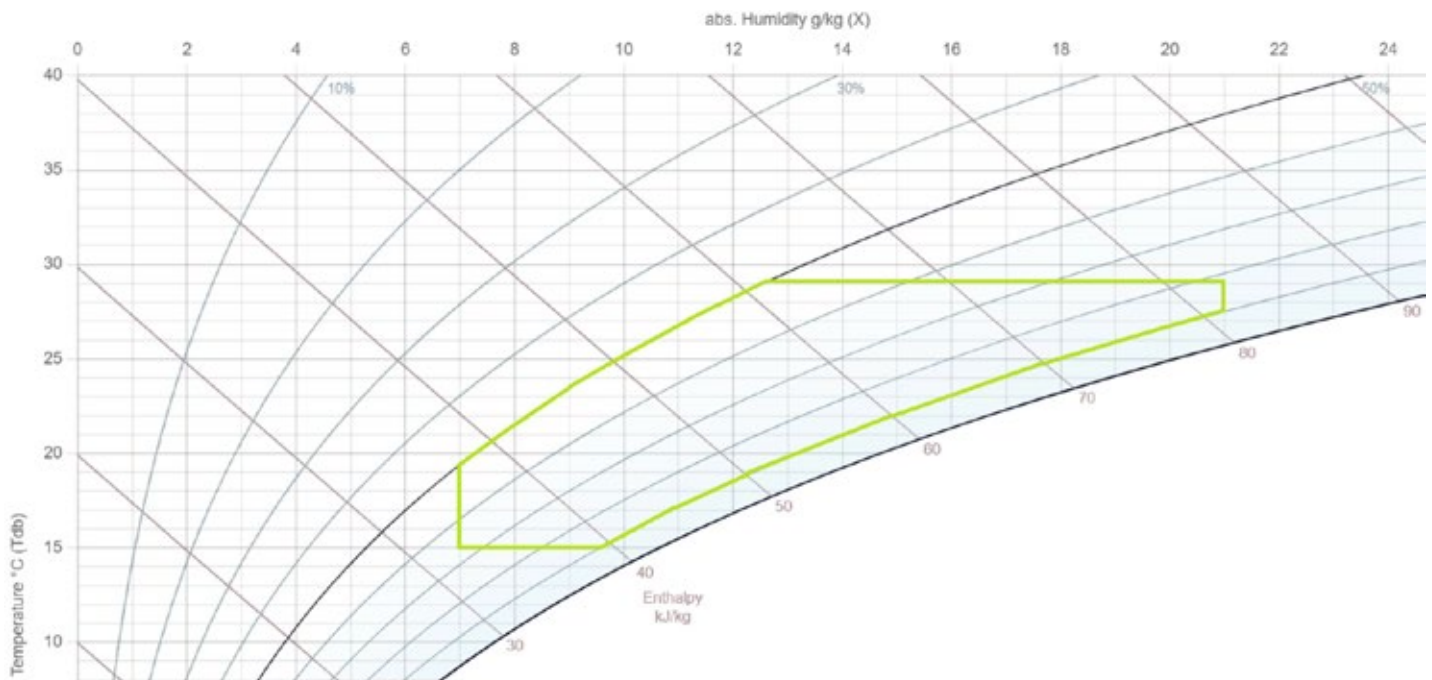
- It allows for a higher humidity level, because the transpiration gets moved away:
 - This keeps the stomata open, causing higher CO₂ uptake and thus higher photosynthesis
 - Without the increased risk of diseases
- All leaves of the plants get fresh air:
 - The humidity does not get too high near the lower leaves
 - The CO₂ level stays high near the stomata
 - All leaves stay active
 - There is no build-up of ethylene
- The temperature and humidity level is static during the growth of the plant. Leaves that were built for a certain humidity level stay in this humidity level during growth.



CEM PROPERTIES

Transport capacity:	Range min	Range max	Tolerance +/-
Temperature (°C)	15	28	1
Absolute humidity (gr/KG)	5	17	1
Relative humidity (%)	50	90	1

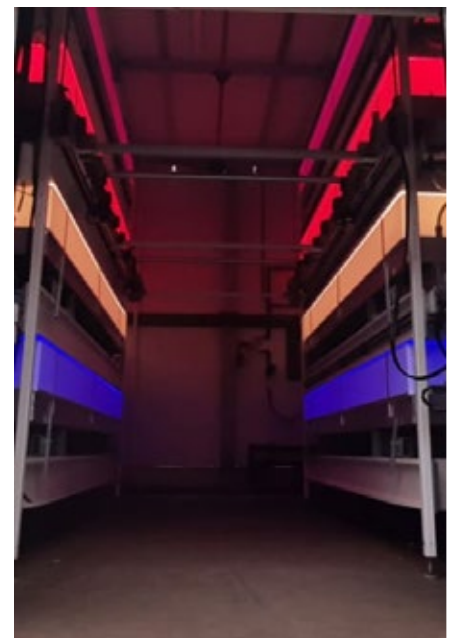
Climate range



Outside dimensions			Inside dimensions			Plant
Length	Width	Height	Length	Width	Height	Maximum height
3.90 m	1.78 m	1.55 m	3.60 m	1.60 m	0.55 m	30 cm

Led lights

Spectrum Flora Pixels	Power (Watt)	Intensity ($\mu\text{mol}/\text{m}^2\cdot\text{s}$)
Red	0-365	0-290
Blue	0-175	0-80
Far red	0-185	0-10
White	0-400	0-210
Max. simultaneous power	600	



SENSORS

Name	Location	Quantity[Unit]	Accuracy	Interval	Function	Option
Air after passing plants	Suction opening in ceiling	Temperature [°C]	0.2 °C	10s	System functioning	no
		Humidity [%RH]	1%			
Air towards bench	Under the padwall	Temperature [°C]	0.2 °C	10s	System functioning	no
		Humidity [%RH]	1%			
Air at the plants	Hanging from the ceiling	Temperature [°C]	0.2 °C	10s	Recipe control	no
		Humidity [%RH]	1%			
Chilled water supply	In the chilled water supply pipe	Temperature [°C]	0.2 °C	10s	System functioning	no
Chilled water outlet	In the chilled water return pipe	Temperature [°C]	0.2 °C	10s	System functioning	no
Electricity consumption	After the power switch	Watt, kWh	1% +/- 1 kWh	10s	System functioning	no
(extra T/RV Sensor, Max 20)		Temperature [°C]	0.2 °C	10s	Check for homogeneity	yes
		Humidity [%RH]	1%			
CO2 level near plants	Hanging from the ceiling	CO2 level [PPM]	0.3 °C	60s	Recipe control	no
		Temperature [°C]	5%			
		Humidity [%RH]				
Drain water temperature	In de drain water pipe	Temperature [°C]	0.2 °C	10s	System functioning	yes
Water supply temperature	In the circulation pipe, or the mixing pipe	Temperature [°C]	0.2 °C	10s	System functioning	yes
Dissolved oxygen in water supply	In the circulation pipe, or the mixing pipe	Oxygen concentration [ml/liter]	0.05 mg/L	10s	System functioning	yes
EC supply water	In the circulation pipe, or the mixing pipe	Conductivity [mS/cm]	2%	10s	Recipe control	yes
pH suply water	In the circulation pipe, or the mixing pipe	Acidity [pH]	2%	10s	Recipe control	yes
Dosing pump A mix	In the circulation pipe, or the mixing pipe	Volume, [mL]	2% +1ml	10s	System functioning	yes
Dosing pump B mix	In the circulation pipe, or the mixing pipe	Volume, [mL]	2% +1ml	10s	System functioning	yes
Dosing pump acid	In the circulation pipe, or the mixing pipe	Volume, [mL]	2% +1ml	10s	System functioning	yes
Dosing pump base	In the circulation pipe, or the mixing pipe	Volume, [mL]	2% +1ml	10s	System functioning	yes
EC drain water	In de drain water pipe	Conductivity [mS/cm]	+/-2%	10s	Recipe control	yes
pH drain water	In de drain water pipe	Acidity pH	+/- 0.002	10s	Recipe control	yes
Dissolved oxygen in drain water	In de drain water pipe	Oxygen concentration [ml/liter]	+/- 0.05 mg/L	10s	System functioning	yes
Water flow rate	In the water supply pipe	Flow rate [liter/minute]	+/- 10%	10s	System functioning	yes
Camera	On the ceiling	Crop inspection	8 MP (4k)	15min	Crop inspection	yes

POWER CONSUMPTION

A single module has a peak power consumption of 2,5 kW.
 The average usage is 1 kW.
 It can be connected to a standard 230 Vac outlet with a 16A fuse.



PARTNERS



QUANTIFIED
sensor technology

Leiden | The Netherlands

REFERENCES



Bleiswijk | The Netherlands



's Gravenzande | The Netherlands



Bergen op Zoom | The Netherlands



Rotterdam | The Netherlands



Venlo | The Netherlands

Logiqs



Maasdijk | The Netherlands

Logiqs has more than 45 years of experience and know-how, gained in the field of internal transport and logistics systems for greenhouses.

Our industry leading solutions help our clients achieve a higher profitability and a stronger competitive position within the worldwide horticultural marketplace.

We advise, design, produce and install complete logistical systems, manual or completely automated, for growers specialized in: potted plants, young plants, cut flowers, tree nurseries, flower bulbs and vegetables.

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