

VKIN Indoor Cultivation Precision Temperature and Humidity Control System

VKIN ENVIRONMENT TECH CO.,LTD

CONTENTS

01 | **Common Pain
Points**

02 | **Problem Analysis**

03 | **Solutions**

04 | **Product
Introduction**

05 | **Target
Applications**

06 | **Company
Introduction**

01

Common Pain Points

Common Pain Points in Indoor Planting

- High Temperatures Stunt Growth: Excessive heat reduces enzyme activity, stifles carbohydrate synthesis, and inhibits healthy plant development.
- High Humidity Induces Diseases: High humidity is prone to breeding fungi and bacteria, leading to plant diseases and rot.
- Poor Ventilation Amplifies Humidity: Inadequate air circulation creates moisture pockets. Combined with irrigation and plant transpiration, this severely exacerbates relative humidity (RH) levels.



Vegetable & Fruit Planting: High Humidity - The Silent Killer of Fruit Set

Impaired Pollination & Bud/Fruit Drop:



When relative humidity exceeds 80%, pollen grains absorb excess moisture and rupture, leading to a sharp decline in pollination success and frequent fruit drop in fruiting crops (e.g., melons and nightshades).

High Incidence of Diseases, Increased Pesticide Residue Risk:



Under high humidity conditions, leaves are prone to becoming a breeding ground for downy mildew, powdery mildew, etc. Repeated pesticide application is required, falling into a vicious cycle of "high humidity - diseases - pesticide residues".



Flower Planting: Abnormal Temperature and Humidity Reduce Commercial Value

Missing the Golden Sales Period:



Elevated nocturnal humidity triggers ethylene accumulation, resulting in up to a 30% bud abortion (drop) rate and missed sales windows during peak holidays like Valentine's Day and Mother's Day.

Deterioration of Appearance and Quality:



Daytime temperatures above 28°C can cause cellular scorch and necrotic spots. Furthermore, an inadequate DIF (day/night temperature differential) causes elongation (stretching) and a loose plant structure, cutting shelf life in half.



Herbal Planting: Unsuitable Temperature and Humidity Lead to Loss of Medicinal Value

Obstructed Synthesis of Active Ingredients:



When temperature and humidity deviate from the suitable range, it will disrupt the physiological metabolism of medicinal botanicals, suppressing the synthesis and accumulation of core active compounds (secondary metabolites). This results in sub-par potency and a severe loss of market value.

Rot and Disuse of Medicinal Parts:



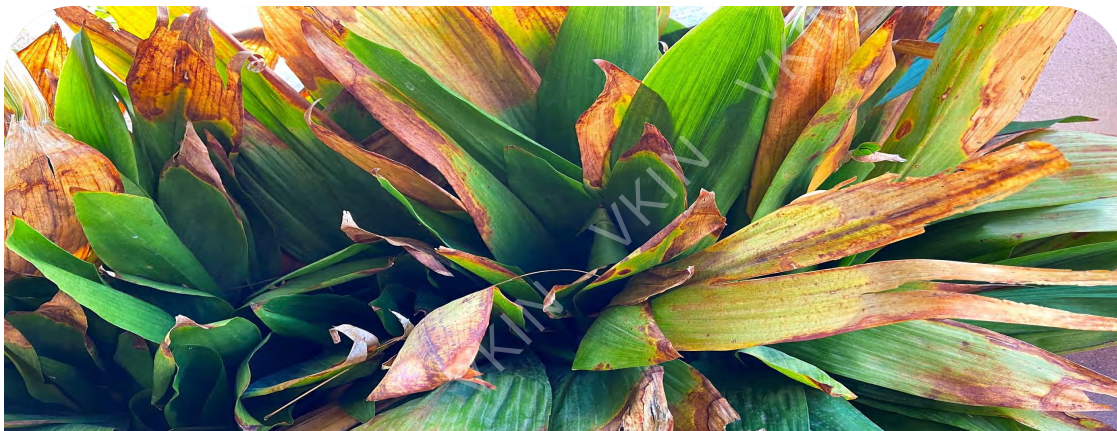
Continuous high temperature and high humidity environments are prone to inducing diseases such as root rot, leading to rot and necrosis of the medicinal parts of rhizome medicinal materials.



02

Problem Analysis

Problem Analysis

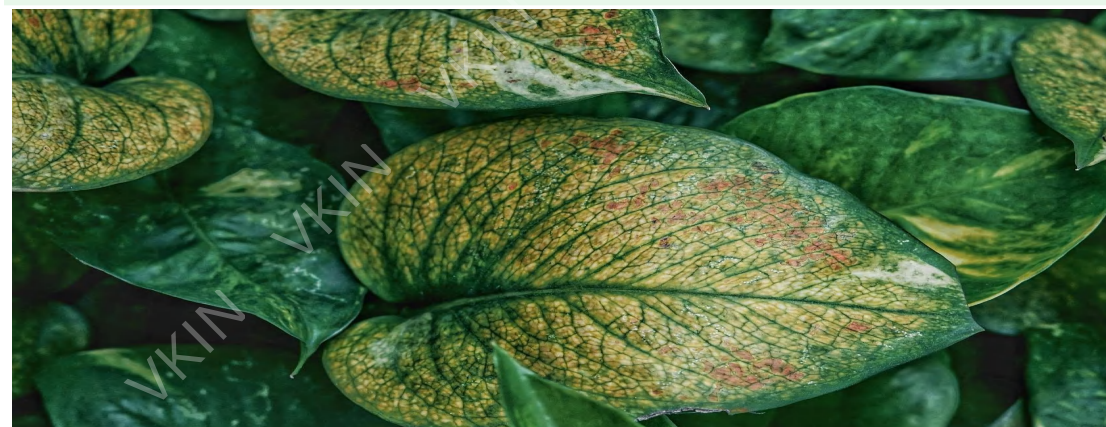


High Temperature and High Humidity

In indoor high-temperature and high-humidity environments, roots are highly susceptible to hypoxia and root rot; Southern Blight (white silk disease) and powdery mildew proliferate at the stem base... Stagnant, stuffy air accelerates the breeding of aphids and two-spotted spider mites.

High Temperature and Low Humidity

In indoor high-temperature and dry environments, the water evaporation of leaves is greater than absorption, resulting in scorched and brittle edges and wilting plants; blind water spraying will burn the mesophyll and form brown spots; the rapid evaporation of surface water leads to soil compaction, making it difficult for roots to take root and causing "stunted seedlings".



Problem Analysis

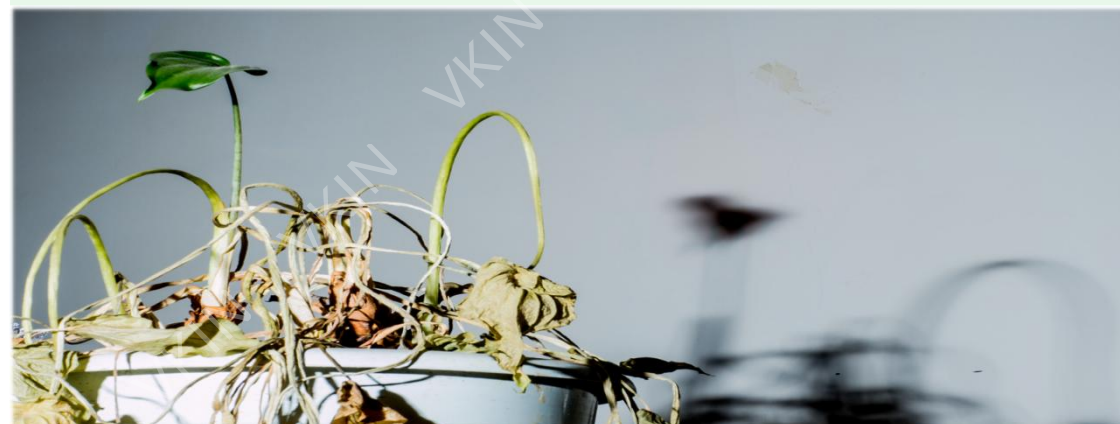


Low Temperature and High Humidity

In indoor cold and humid places, respiration and photosynthesis are weakened, and growth stagnates; dew formation on leaves and stems induces gray mold; root activity decreases, leading to root rot, yellow leaves and leaf fall, and even the whole plant lodging and rotting in severe cases.

Low Temperature and Low Humidity

In indoor low-temperature and dry environments, leaf water loss intensifies, resulting in dry and yellow leaf tips and old leaf fall; plants enter semi-dormancy, and new buds dry up; if too much water is watered at this time, the soil water is difficult to evaporate, and the roots are anoxic and rotten.



03

Solutions

Solutions

VKIN Constant Temperature and Humidity Control **REHEAT** Air Conditioner provides a full-cycle, high-precision, low-energy consumption overall solution for indoor planting.

Intelligent Humidity Control & Variable Speed Full DC Inverter Technology

Leveraging full DC inverter technology and **REHEAT** hot-gas heat recovery, the system shifts environmental management from reactive control to proactive climate curation. Based on the optimal temperature and humidity curve of crops, it realizes stepless adjustment of cooling and heating output and precise humidity control, achieving a stable temperature and humidity range, and providing stable and reliable environmental support for various indoor plant growth scenarios.



04

Product Introduction

Dc Inverter Reheat Air Conditioner

R454B Dc Inverter 3-pipe ReHeat Air Conditioner Heat Pump						
Model		HP	UCHA-18TDC	UCHA-24TDC	UCHA-36TDC	UCHA-60TDC
Power Supply		Ph-V-Hz	1, 208~230V ,60Hz			
Dehumidification in refrigeration mode	DB80.6F / WB70.16F ,RH60%	pint/day	139.92	215.04	273.84	403.68
	DB69.8F / WB60.8F ,RH60%	pint/day	144.00	193.68	207.84	236.4
	DB86F / WB80.1F ,RH80%	pint/day	393.12	604.8	687.36	758.88
Constant temperature dehumidification mode	DB80.6F / WB75.56F , RH80%	pint/day	192.72	296.64	367.68	482.88
Rated humidification amount		pint/day	101.28	101.28	External Humidifier	External Humidifier
Cooling	Capacity	Btu/h	18000 (9000-20000)	24000 (12000-28000)	36000 (17500-41000)	54000 (24000-56400)
	EER2	Btu/W	11.96	10.66	12.20	9.11
	Capacity @ 5°F	Btu/h	18766	25931	37532	59710
	EER2 @ 5°F	Btu/W	28.6	26.2	22.2	15.7
Heating	Capacity	Btu/h	18000 (15000-22000)	24000 (12000-30000)	36000 (19600-42600)	54000 (24000-58000)
	COP	W/W	2.93	2.81	3.20	3.10
	Capacity @ 5°F	Btu/h	13306	20130	23542	40944
	COP @ 5°F	W/W	2.70	2.56	2.15	2.00
Electric auxiliary heating		kW	0.85	1.20	/	/
SEER2		Btu.h/W.h	19.30	17.40	16.30	15.50
HSPF2 IV/V		Btu.h/W.h	11/8.7	10.4/8.4	10.9/8.2	9.3/8
ESP	Rated	In W.C	0		0.5	
	Range	In W.C	0~0.12	0~0.12	0~0.8	0~0.8
Indoor air flow Rated(Hi/Med/Lo)		CFM	530/500/441/400/365/290	706/670/589/500/450	1178/1020/942/706/589	2002/1795/1602/1201/1003
Indoor unit	Dimension (W*H*D)	Inch	44.3×10.6×22.8	47.2×10.6×22.8	42.3×31.5×16.1	30.5×53.5×19.6
	Throttle type	—	EEV*2	EEV*2	EEV*2	EEV*2
	Controller	—	Wired Controller	Wired Controller	Wired Controller	Wired Controller
	Noise level	dB(A)	28-43	32-46	36-52	≤62
Outdoor unit	Dimension (W*H*D)	Inch	33.3×23.8×11.2	37.8×31.9×15.6	36.2×49.4×15.2	37.8×49.6×14.6
	Throttle type	—	EEV*1	EEV*1	/	/
	Noise level	dB(A)	≤52	≤53	≤56	≤58
Liquid/Gas/Reheat		In	1/4 - 3/8 - 1/2	3/8 - 1/2 - 5/8	3/8-1/2-5/8	3/8-1/2-5/8
Refrigerant type			R454B	R454B	R454B	R454B
Operating temperature range		°F	50 ~ 88			
Humidity setting		%RH	30% to 90%			
Ambient temp		°F	5 ~ 118		-13 ~ 118	

Energy saving

>76%

Temperature
control accuracy

±1°C

Precision of humidity
control

±2%RH

Model: UCHA-18TDC (1.5ton)

- Intelligent control: Both temperature and humidity are adjustable; high-precision electronic temperature and humidity sensor is more sensitive.
- Ultra-wide operating temperature range: Indoor: 50~88°F , Outdoor: 5~118°F .
- Inverter technology: Precise humidity control within $\pm 2\%RH$.
- Intelligent hot refrigerant defrosting: Prevents evaporator from freezing and shutdown.
- Low static pressure concealed unit design: High-efficiency DC motor, automatic air speed with five adjustable gears. Automatically adjusts fan speed according to room temperature to reduce energy consumption.
- 4-inch color touch screen digital controller.
- Quick connection pipe: Supports DIY installation (optional).
- Modbus/WiFi communication (optional).



Model: UCHA-24TDC (2Ton)

- Intelligent control: Both temperature and humidity are adjustable; high-precision electronic temperature and humidity sensor is more sensitive.
- Ultra-wide operating temperature range: Indoor: 50~88°F , Outdoor: 5~118°F .
- Inverter technology: Precise humidity control within $\pm 2\%RH$.
- Intelligent hot refrigerant defrosting: Prevents evaporator from freezing and shutdown.
- Low static pressure concealed unit design: High-efficiency DC motor, automatic air speed with five adjustable gears. Automatically adjusts fan speed according to room temperature to reduce energy consumption.
- 4-inch color touch screen digital controller.
- Quick connection pipe: Supports DIY installation (optional).
- Modbus/WiFi communication (optional).



Model: UCHA-36TDC(3Ton)

- Intelligent control: Both temperature and humidity are adjustable; high-precision electronic temperature and humidity sensor is more sensitive.
- Ultra-wide operating temperature range: Indoor: 50~88°F , Outdoor: -5~118°F .
- Inverter technology: Precise humidity control within $\pm 2\%RH$.
- Intelligent hot refrigerant defrosting: Prevents evaporator from freezing and shutdown.
- High static pressure concealed unit design: Airflow can be delivered over long distances.
- High-efficiency DC ECM motor: Automatic air speed with five adjustable gears. Automatically adjusts fan speed according to current room temperature to reduce energy consumption.
- Excellent MERV-13 filtration performance.
- 4-inch color touch screen digital controller.
- Quick connection pipe: Supports DIY installation (optional).
- Modbus/WiFi communication (optional).



Model: UCHA-60TDC(5Ton)

- Intelligent control: Both temperature and humidity are adjustable; high-precision electronic temperature and humidity sensor is more sensitive.
- Ultra-wide operating temperature range: Indoor: 50~88°F , Outdoor: -5~118°F .
- Inverter technology: Precise humidity control within $\pm 2\%$ RH.
- Intelligent hot refrigerant defrosting: Prevents evaporator from freezing and shutdown.
- High static pressure concealed unit design: Airflow can be delivered over long distances.
- High-efficiency DC ECM motor: Automatic air speed with five adjustable gears. Automatically adjusts fan speed according to current room temperature to reduce energy consumption.
- Excellent MERV-13 filtration performance.
- 4-inch color touch screen digital controller.
- Quick connection pipe: Supports DIY installation (optional).
- Modbus/WiFi communication (optional).



Dc Inverter Split Type Dehumidifier

R454B Dc Inverter Split type Dehumidifier				
Model			UCDA-D360DCT	UCDA-D510DCT
Type			Duct	Duct
Power supply		V/ph/Hz	208~230/1/60	208~230/1/60
Dehumidification mode	Indoor and outdoor environment temperature: DB80°F , Relative humidity:60%	Water Removal (pint/Day)	365	528
		Cooling capacity (Btuh)	20000	27000
		Power (W)	1750	2320
		Efficiency (pint/kWh)	8.7	9.5
		Energy Factor (L/kWh)	4.1	4.5
	Indoor and outdoor environment temperature: DB75°F , Relative humidity:50%	Water Removal (pint/Day)	233	338
		Cooling capacity (Btuh)	12800	17280
	Indoor and outdoor environment temperature: DB65°F , Relative humidity:50%	Water Removal (pint/Day)	128	185
		Cooling capacity (Btuh)	8000	10800
Constant temperature dehumidification mode	Indoor and outdoor environment temperature: DB80°F , Relative humidity:60%	Water Removal (pint/Day)	379	547
		Cooling capacity (Btuh)	7500	11000
		Efficiency (pint/kWh)	8.8	9.6
		Energy Factor (L/kWh)	4.2	4.5
	Indoor and outdoor environment temperature: DB75°F , Relative humidity:50%	Water Removal (pint/Day)	273	394
		Cooling capacity (Btuh)	5250	7700
	Indoor and outdoor environment temperature: DB65°F , Relative humidity:50%	Water Removal (pint/Day)	163	235
		Cooling capacity (Btuh)	3675	5390
Indoor air flow Rated(Hi/Med/Lo)		CFM	800/650/500	1150/800/600
ESP	Rated	In W.C	0	0
	Range	In W.C	0~0.8	0~0.8
Indoor noise level (Hi/Med/Lo)		dB(A)	46/37/28	49/45/36
Indoor unit	Dimension (W*H*D)	Inch	33×27×18	37×30×19
Drain Connection (outer diameter)		Inch	1/2"	1/2"
Controller			Wired control / 24V thermostat	Wired control / 24V thermostat
Outdoor noise level (sound pressure) Hi		dB(A)	51	53
Throttle type			EEV	EEV
Refrigerant	Type		R454B	R454B
Outdoor unit	Dimension (W*H*D)	Inch	33.2×27.8×13.3	37.8×31.9×15.6
Refrigerant piping	Liquid/Gas/Reheat	Inch	1/4 - 3/8 - 1/2	3/8 - 1/2 - 5/8
	Max. pipe length	ft	100	100
	Max. difference in level	ft	33	33
Operating temperature range	Indoor	°F	41-88	41-88
	Outdoor	°F	5 - 118	5 - 118

Load-Dependent
Energy Saving

100%

Precision of humidity
control

±2%RH

High efficiency filtration

MERV-13

Model: UCDA-D360DCT 365Pt/day

- R454B DC inverter dehumidifier.
- Cooling and dehumidification, split-type three-pipe heat recovery system.
- **Separated IDU & ODU: 100% non-heat emission indoor side.**
- Ultra-wide operating temperature range: Indoor: 41~88°F , Outdoor: 5~118°F .
- Reduces indoor heat load, energy saving over 100%.
- Dc Inverter technology: Precise humidity control within $\pm 2\%$ RH.
- DC inverter compressor/EEV control technology for powerful cooling and dehumidification.
- Intelligent hot refrigerant defrosting: Prevents evaporator from freezing and shutdown.
- Excellent MERV-13 filtration performance.
- 24V AC thermostat control.
- Complies with California Title 24.
- 4-inch color touch screen digital controller (optional).
- Quick connection pipe: Supports DIY installation (optional).
- Modbus/WiFi communication (optional).



Model: UCDA-D510DCT 528Pt/day

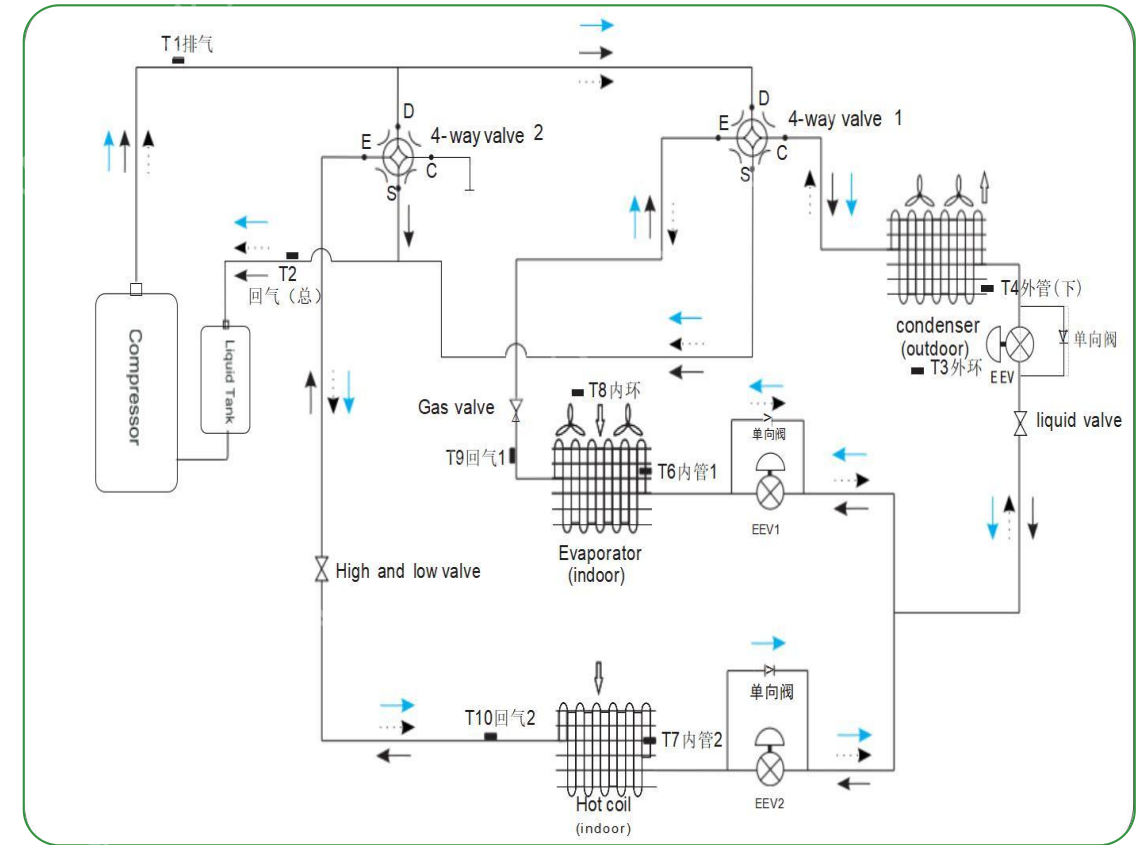
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- Intelligent hot refrigerant defrosting: Prevents evaporator from freezing and shutdown.
- Excellent MERV-13 filtration performance.
- 24V AC thermostat control.
- Complies with California Title 24.
- 4-inch color touch screen digital controller (optional).
- Quick connection pipe: Supports DIY installation (optional).
- Modbus/WiFi communication (optional).



Core Technology

REHEAT 3-Pipe Heat Recovery Technology

The indoor unit adopts two sets of independent heat exchangers + double EEV. Under conventional cooling and heating functions, the heat exchange functions of these two sets of heat exchangers are the same; under the constant temperature and humidity control function, one set of heat exchangers acts as an evaporator to cool and dehumidify according to the target humidity setpoint; the other set of heat exchangers acts as a reheating coil to balance the temperature by recovering the gaseous refrigerant emitted during the refrigeration process according to the setting temperature. At the same time, since the entire unit adopts a DC inverter compressor, DC motor and EEV electronic expansion valve equipped with each heat exchanger, relying on the independently developed third-generation control algorithm, it dynamically adjusts the refrigerant flow, compressor speed and heat exchange air volume according to the real-time indoor temperature and humidity load to achieve precise temperature and humidity control and ensure the optimal indoor environment VPD value.



Core Advantages: Extreme Precision, Locking the Optimal Growth Range

The precise temperature and humidity control algorithm technology solves the humidity problem.

Supported by the core temperature and humidity control algorithm, data collection and calculation are performed using reliable high-precision temperature and humidity sensors to achieve $\pm 1^{\circ}\text{C}$ temperature difference and $\pm 2\%$ RH humidity difference control.

The settable temperature ranges from $10\sim 31^{\circ}\text{C}$, and the settable humidity ranges from $30\% \sim 90\%$ RH.

The dehumidification/humidification dual-mode switches intelligently, solving the humidity problem, covering the entire growth cycle, and adapting to multiple types of crops..



Core Advantages:



High Efficiency and Low Consumption, In Line with Low-Carbon Trends

Equipped with REHEAT three-pipe heat recovery technology, it does not require traditional electric heating, saving more than 76% energy compared with traditional combined air handling systems; combined with a full DC inverter system, it dynamically adapts to the load, improves the annual seasonal energy efficiency ratio, reduces operating costs, and conforms to the "low-carbon CEA" trend.

Stable Adaptability, Balancing Flexibility and Reliability

Continuous cooling at 5°F (-15°C) outdoor ambient temperature and stable heating at -4°F (-20°C) outdoor ambient temperature, operating 24/7. Core components are anti-interference and corrosion-resistant, adapting to complex power grids (165~265VAC) and high-humidity environments; supporting the selection of multiple accessories to accurately match the needs of different scenarios.



Core Functions



Comprehensive Basic Regulation

Integrates constant temperature and humidity control, cooling, heating, dehumidification, humidification and ventilation functions.



Intelligent and Convenient Control

Standard 4-inch LCD touch controller, optional 8-inch high-definition model, supporting local operation, data recording, error code analysis and after-sales technical support; compatible with remote control, adapting to unattended scenarios.



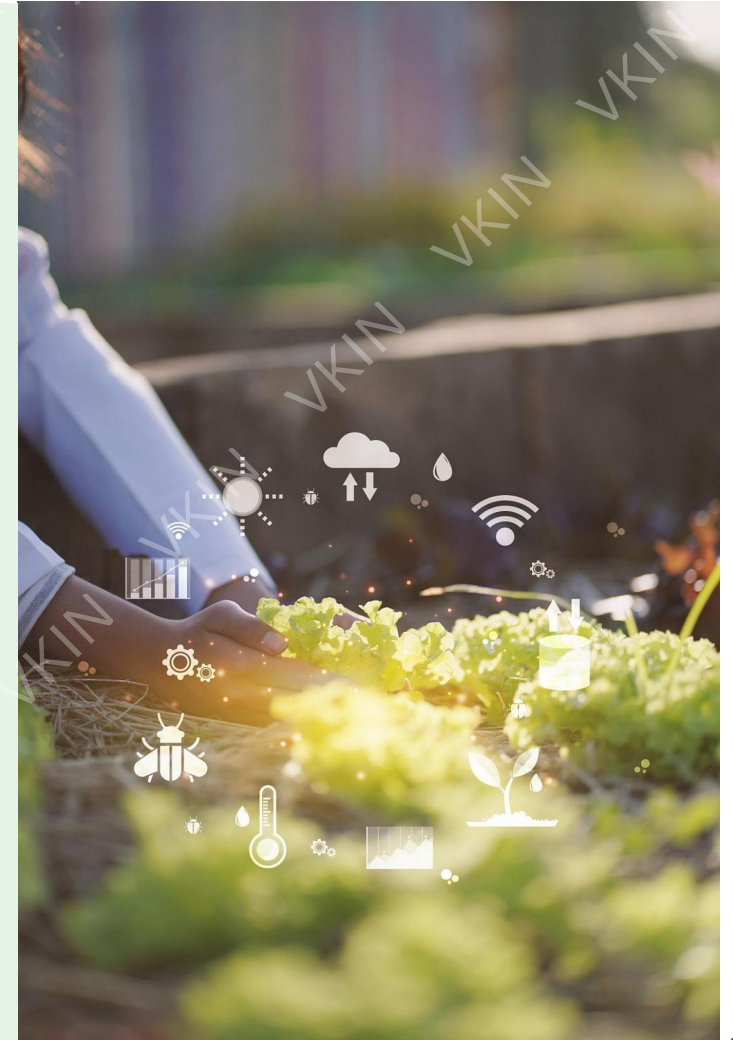
IoT Integrated Management and Control

Suitable for plant factories, RS485 communication, can be connected to IoT panels, real-time collection of multi-dimensional environmental data, and realization of intelligent integrated management.



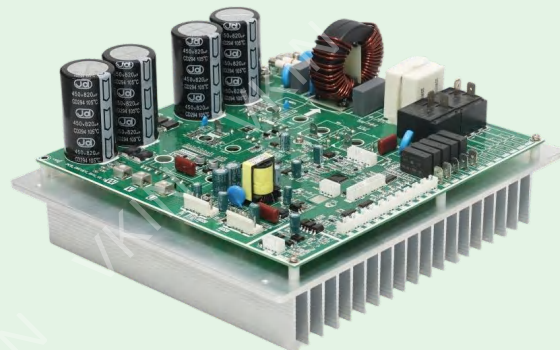
Value-Added Modular Adaptation

Optional air purification module to meet the high cleanliness requirements of tissue culture rooms.



Core Components

DC Inverter Controller



DC Inverter Compressor



Wired Controller



Core Components



DC Fan Motor



ECM Fan Blower



**EEV- Electronic
Expansion Valve**



**Oxygen-Free Copper
Tube and Aluminum Fin
Heat Exchanger**

05

Application Scenarios

Application Scenarios



Seedling Room

Remote Monitoring + Low Loss: Supports 24/7 remote data monitoring and parameter adjustment, reduces human error, effectively avoids seedling death caused by environmental fluctuations, and lowers seedling raising costs.

Tissue Culture Room

High Cleanliness + Low Pollution: By selecting high-efficiency filters and negative pressure exhaust design, it meets the air cleanliness requirements, reduces the contamination rate of tissue culture seedlings, and provides a stable environmental guarantee for the inoculation of tissue culture seedlings.



Application Scenarios



Cultivation Room

Growth Curve Adaptation + Precise Regulation:
The temperature and humidity curve can be preset according to the needs of indoor planting to meet the needs of plants in various growth periods and effectively promote the healthy growth of plants.

Plant Factory

Multi-Factor Linkage + Intelligence: Seamlessly connects to the IoT system to realize the coordinated regulation of multiple environmental factors such as "temperature and humidity - light - CO₂ ", adapting to the intelligent development trend of future plant factories, and improving the consistency of crop growth and quality stability.

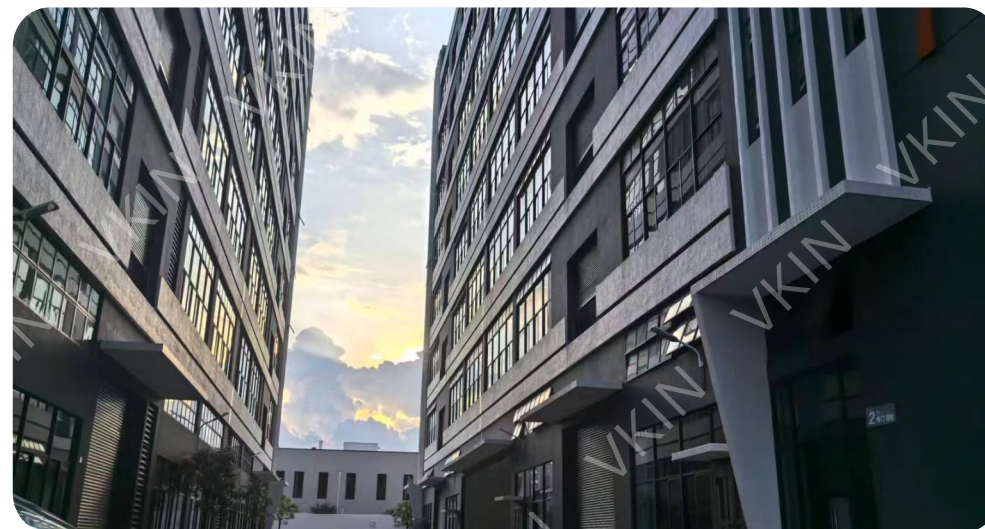


06

Company Introduction

Company Overview

Founded in 2007, VKIN Environment Technology Co., Ltd. focuses on indoor planting constant temperature and humidity intelligent environmental control solutions. The core team consists of senior professionals with 20~30 years of experience in the industry, laying a solid foundation for technology and services. With years of in-depth industry experience, VKIN has been awarded the qualifications of "National High-Tech Enterprise" and "Recognized as a "Specialized, Refined, and Innovative Enterprise" by the government"; it has strong R&D capabilities, built a top-tier testing laboratories, and accumulated over 80 patents and software copyrights; and built up the Intelligent Artificial Environment Engineering Technology Research Center. The products have been mainly exported to North America over 18 years, passed world-class certifications such as UL/ETL/cETL/AHRI/CEE/CEC/ENERGY STAR/NEEP/NEEA, and the products quality have been highly recognized & tested by the international market.



Company Advantages

The company's core advantage is the integrated service system of "R&D - Manufacturing - Operation and Maintenance", which fully guarantees customer needs.

- **R&D Advantage: Technology Leadership, Innovation Empowerment:** R&D leadership: Supported by a top-tier enthalpy difference laboratory and 60 core patents, it can customize and develop precise control solutions, and the technology has been verified by the market.
- **Manufacturing Advantage: Controllable Quality, Stable Supply:** Reliable manufacturing: Inheriting North American quality control experience, 3 professional production lines with an annual output of 50,000 units, balancing quality and stable supply.
- **Operation and Maintenance Advantage: Full-Cycle Guarantee, Worry-Free Service:** Worry-free operation and maintenance: Professional design for indoor planting scenarios, ensuring stable operation through differentiated core equipment, providing pre-sales and after-sales technical support, and full-chain after-sales service including remote diagnosis + on-site disposal, covering the entire life cycle.





Certificate CN14/31417

The management system of

UTL AIR CONDITIONING TECHNOLOGY CO., LTD.

Unified Social Credit Code: 914401156899637234

Business Registration Address: Room 10th, Block No. 2, No. 200-233, Shijie Road, Nanhai District, GuangZhou,

Guangdong, P.R. China

Business Operation Address: Room 10th, Block No. 2, No. 200-233, Shijie Road, Nanhai District, GuangZhou, Guangdong, P.R. China

Has been assessed and certified as meeting the requirements of

ISO 9001:2015

For the following activities:

Design and manufacture of air conditioning machines and air source heat pumps

This certificate is valid from 04 December 2013 until 03 December 2016 and remains valid subject to satisfactory surveillance audits.

Issue 1. Certified since 04 December 2014

John A. Hall

Authorized by

John A. Hall

Global Head - Certification Services

SGS United Kingdom Ltd

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THE END

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