



Indoor farming facilities and plant growth rooms



Tailor-made solutions engineered for controlled environment horticulture and research

Custom-built at all times

We don't believe in standard solutions. Every single refrigeration or climate issue is different. All our systems are optimally matching your products, quality requirements and business operations. We carefully select components to achieve the most effective and economical configuration for your situation. Operational reliability is an absolute prerequisite.

Based on our expertise and technological know-how, we design truly custom-built systems. We are constantly on the lookout for innovative technology and smart solutions that allow us to reduce both environmental impact and energy consumption. Applying advanced heat recovery and energy saving technology from industrial refrigeration, we provide you with highly energy-efficient solutions.

TAILOR-MADE SOLUTIONS UNIQUELY DESIGNED TO YOUR SPECIFICATIONS

- Highest precision in controlling all environmental variables (temperature, humidity, airflow, additive CO₂, lights, air pressure, irrigation and fertilisation)
- Fully customizable dimensions, seamlessly integrated into your facility
- Space efficiency, e.g. rolling benches, multi-tier modular platforms, variable size and configuration
- User-friendly Nijssen computer control system
- Extensive data registration and option for data analyses
- Control and monitoring on site or remotely
- Always focused on energy efficiency
- Low maintenance costs





Indoor farming

Nijssen builds on decades of experience in controlled environment facilities for research. Customised HVAC creates significant energy savings. Collecting and analysing data is facilitated with our smart control software.

MyGrowthRoom

With MyGrowthRoom, Nijssen offers a mobile walk-in test room with extensive functionalities for horticultural research in Controlled Environment. Conduct your own research, plug and play!

Plant growth and research

Nijssen offers a wide range of phytotrons, e.g. for tissue culture, in vitro propagation, vernalisation, germination, entomological research and seed storage rooms.

Smart control

Our advanced Nijssen control systems ensure perfect conditions, using state-of-the-art technology for programming, logging and supervising all growth conditions. Define, store and recall an almost unlimited number of growth recipes.

AVAILABLE FOR EACH APPLICATION

- Filacell ultra-high humidity
- High containment GMO facilities
- Any LED lighting solution
- HEPA air filtering



Indoor Farming Facilities

- Improve crop yields and quality
- Use less energy and water
- Reduce losses to mold
- Increase profitability

Indoor farming is gaining momentum. Indoor climate-controlled growing facilities have been sprouting up in cities worldwide. Urban population is increasing and consumers are increasingly interested in locally sourced, all-natural foods. And climate change will impact conventional agriculture more and more.

Advanced climate and greenhouse technologies are driving down costs and improving yields. Collecting data plays an important role. Optimal growth conditions are specific for every crop and each growth stage.

With our wealth of experience in controlled environment rooms for plant growth research, we provide you with state-of-the-art solutions that will give you a head start in this rapidly growing market.

Adequate airflow is key

The rapidly emerging indoor agriculture industries face significant HVAC and dehumidification challenges. Adequate airflow is key - to reduce plant disease and pests, to remove excess heat and humidity, and to control air quality.

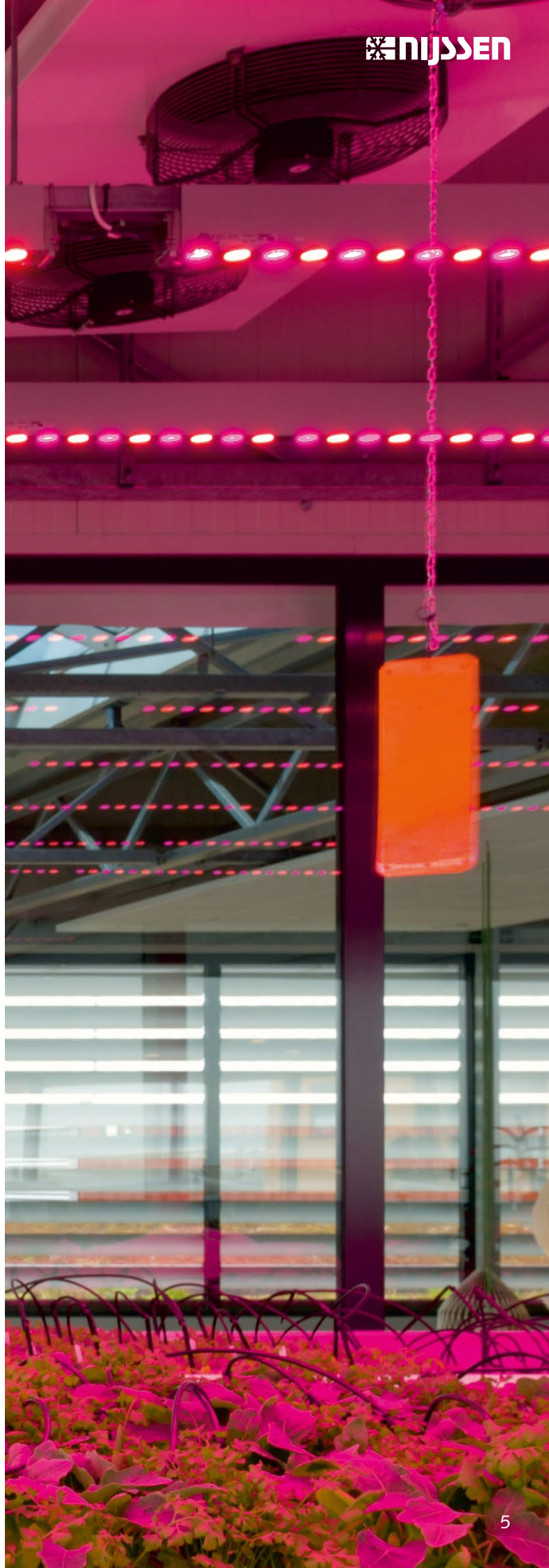
BENCHMARK:

40% ENERGY SAVINGS

Standard chillers and dehumidifiers were specified in the Terms of Reference for a large scale indoor farming facility.

Our engineers designed a fully customized HVAC system with carefully selected components. Applying heat recovery and other smart solutions, they were able to reduce energy consumption with 40% compared to the initial design.

Improve your business model with a huge reduction in operational costs, each year again.



MyGrowthRoom

Multi-purpose mobile research room

MyGrowthRoom enables you to carry out your own high-quality product research. Testing varieties, testing to optimize yield, to optimize nutritional density, texture and taste. Perform your own tests in an efficient, accurate and flexible way!

- Fully controllable growing conditions in a clean and sterile environment, totally closed to natural light and air
- Suitable for any lighting system
- Fully customizable interior provides maximum flexibility
- Data logging guarantees reproducibility
- One-click definition of growth recipes
- Touch screen control with intuitive and easy to use interface
- Easily portable, it can be positioned anywhere
- Plug & play

MyGrowthRoom provides you with a complete climate system to fully control all environmental variables.

The multilayer setup facilitates simultaneous tests in uniform conditions. With its flexible interior layout it can be used with any cultivation system.

Our control system makes it easy to set up, monitor and log plant growth parameters.

An efficient, accurate and flexible way to develop optimal growth recipes and light recipes for your crops!



Testing and defining recipes for your crops has never been so easy!

- What is the best light recipe for a specific crop?
- Which LED solution invokes the optimal plant response?
- How to maximize yield relative to energy used?
- How can I differentiate in taste, colour and texture with my light recipes?
- Does the light output meet manufacturers specifications?
- How do I compare test results for fluorescent and led lights?

Content with the results of your trial? All settings have been logged and can easily be saved as a growth recipe, for any growth stage, for every variety.

LED SYSTEMS: TRIAL FIRST

Specific combinations of wavelengths and lighting strategies result in a particular plant response – different for each LED and for every crop.

Prior to investing, it is vital to select the lighting system that suits your crops and objectives best.

MyGrowthRoom provides the ideal solution for setting up a small-scale trial of several luminaires and plants.

MyGrowthRoom also facilitates a gradual shift to LED. Simultaneous tests in uniform conditions provide you with reference values for both fluorescent and led light.

'We're testing varieties, we're testing to optimize yield, to optimize nutritional density, texture and taste.'





Plant growth and research rooms

- Uniform conditions with optimal precision
- Extensive data logging and monitoring options
- Pre-defined tests ensure repeatability
- Maximum flexibility in design

Nijssen offers a wide range of phytotrons and climate rooms for testing and storage. We construct any room size to meet your requirements - from small walk-in rooms to large production facilities.

We bring decades of experience in designing, building, installing and servicing plant growth rooms for renowned research institutes.

Our tailor-made design guarantees maximum flexibility in climate facilities, lighting options, control systems, construction materials and mechanical components, windows, and custom sizes.

All rooms are controlled with the Nijssen Control software with intuitive user interface and visualisation, extensive options for monitoring and evaluation and the possibility of tailored integration with your existing systems.



Tissue Culture Growth Rooms

Reliable in vitro propagation requires a controlled, sterile environment with optimal conditions. Since any configuration of airflow, light, and shelving is possible, Nijssen Tissue Culture Rooms will always meet your requirements.

- Uniform airflow prevents condensation
- Multi-tier design maximises available growth area
- Shelf cooling of shelved items and lighting fixtures
- Lighting controlled for each individual shelf
- Dimmable lighting for assimilation schedules
- Also applicable for phytopathology and GMO research

Germination rooms

Nijssen Seed Germination Rooms are specifically designed to reach the optimal germination conditions for each crop. Available with a full range of options to suit your needs. Custom sizes guarantee the largest growth area within the available space.

- Light systems integrated in Danish trolleys
- Heating and cooling system developed for quick ramp when changing day and night conditions
- Horizontal airflow guarantees uniform temperature and humidity
- Ultra-high humidity ensures adequate moisture for germination
- Uniform light intensities enable consistent germination



Vernalisation rooms

Nijssen Vernalisation Rooms are specifically designed for the artificial exposure of plants (or seeds) to low temperatures in order to stimulate flowering or to enhance seed production.

- Antibacterial coating prevents growth of bacteria and fungi
- Air flow optimisation, e.g. with air socks, air turns and perforated walls
- Lighting controlled for each individual shelf

Entomological research rooms

Nijssen Entomology Chambers provide uniform environmental conditions for incubation and entomology experiments. Multiple optional accessories are available, allowing you to cost-effectively customize the room according to your specific requirements.

- Wide temperature and humidity range
- Optional assimilation lighting to simulate day/night conditions
- Robust materials to resist corrosive effects of acidic secretions



Seed storage rooms

To preserve seed viability and quality, proper storage under controlled conditions is a prerequisite. Nijssen Seed Storage Rooms with highest quality dehumidifiers offer optimal protection of your investment.

- Temperature set to storage application (long term or medium term)
- Low humidity ($\pm 30\%$)
- System redundancy to guarantee maximum operational reliability

Steam disinfection rooms

The Nijssen Steam Disinfection Rooms provide an environmentally friendly method of disinfecting planting containers, reservoirs and propagation equipment.

- Stainless steel walls
- Programmable disinfection routines with adjustable temperature and time schedules

Respiration chambers

Nijssen Respiration Chambers are used for research on energy metabolism (indirect calorimetry), nutrition and digestion, gas emission (CO_2 , $^{13}\text{CO}_2$, NH_3 , CH_4 , etc.) and related environmental impact. Highly flexible through movable airtight wall parts. Applicable for patients, trial subjects and both individually and group housed animals.

- HEPA filtering and high overpressure in the rooms
- Suitable for multiple types of research

Product/material testing

Nijssen designs Environmental Rooms that accurately reproduce a wide range of atmospheric conditions to test your products. Using latest state of the art design and manufacturing criteria, we offer reliable, efficient and cost effective solutions to achieve stable test results.

- Paints & coatings, corrosion tests, automotive tests, thermal stress screening and more
- Highest possible uniformity and accuracy
- Tailor-made design for particular environmental conditions

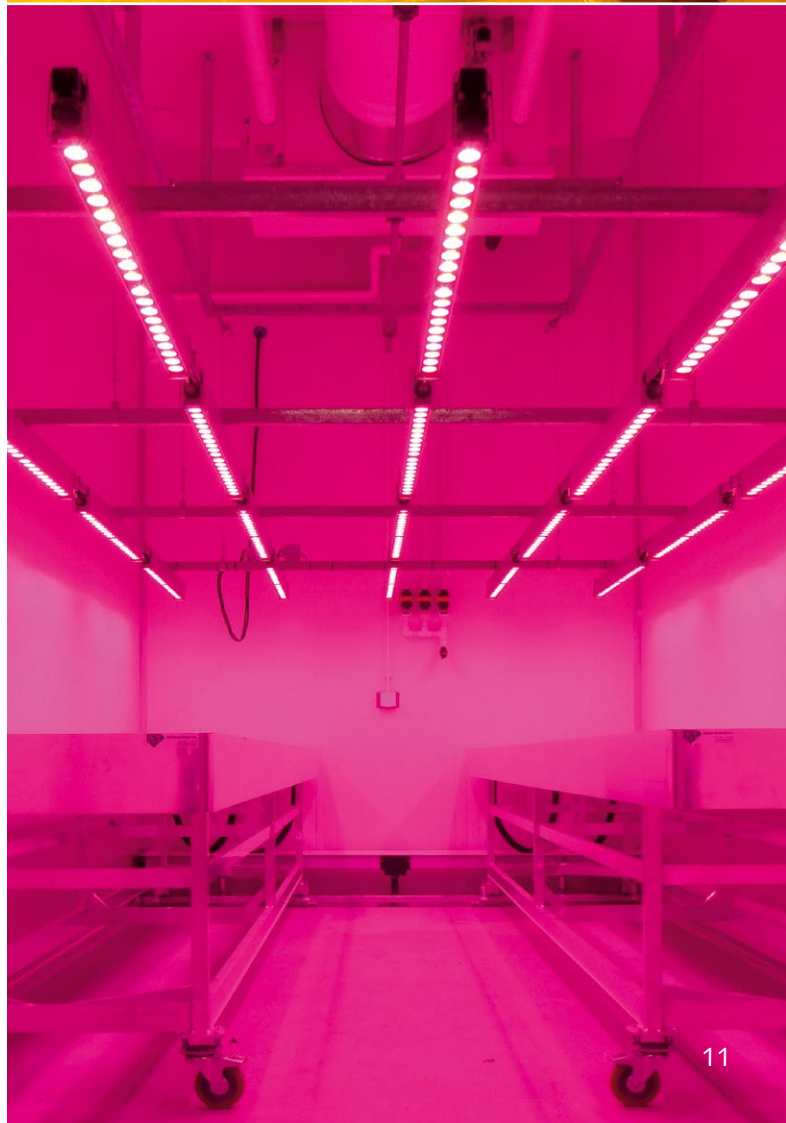
Pharmaceutical applications

Nijssen offers tailor-made solutions for specific testing and storage needs, in a secure and reliable environment. Ideally suited for biological material storage, incubation and dehydration. Fully compliant with ICH guidelines. Optional ultra-low temperature freezers.

- ICH stability testing, single-point testing, photostability testing, humidity testing
- Biophysical research. e.g. protein crystallography
- Constant monitoring and protection

CUSTOM SOLUTIONS

For other applications and specific environmental control we design custom solutions. Please contact our engineering specialists to discuss your objectives, products and processes.

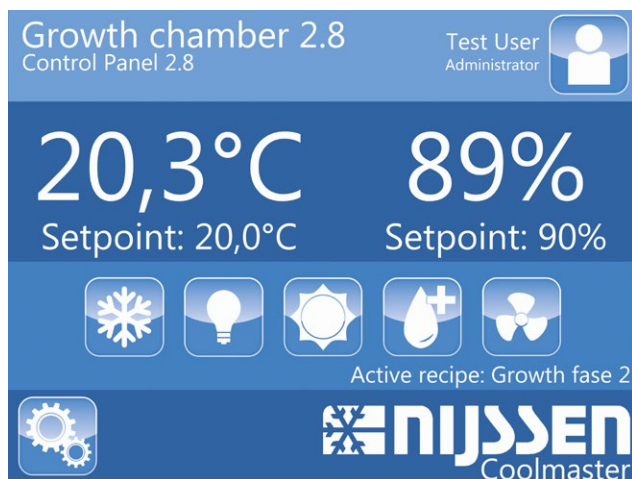


Smart Control for optimal conditions

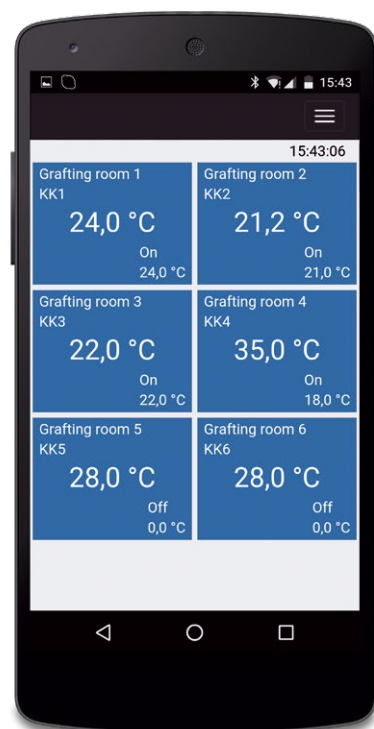
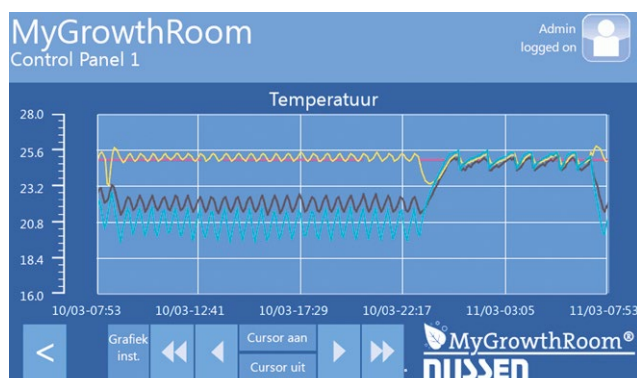
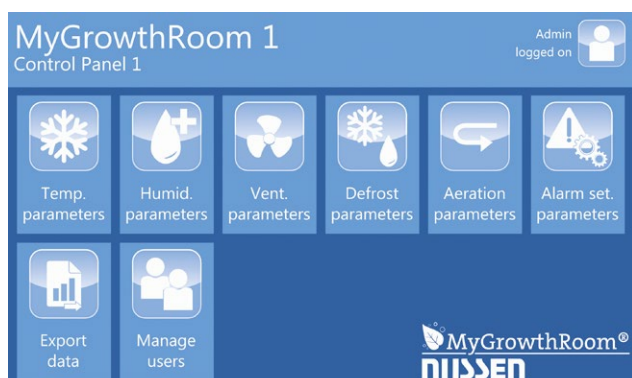
With the Nijssen Control systems, our in-house control software, we provide maximum control and monitoring of all essential and critical processes. From basic controllers for stand-alone units to complete end-to-end control systems for large scale production facilities – always tailored to your situation.

Basic growth controller

Our easy to operate controller for stand-alone units comes with a comprehensive functionality in an all-in-1-module. The dashboard display provides real-time supervision with a clear overview of setpoints and actual conditions.



- Accurate control of basic setpoints: lights, temperature, humidity and airflow
- Expandable with extra parameters, e.g. defrost, CO₂, irrigation and fertilisation
- Operated via touch screen with intuitive interface
- Easy-to-understand charts and tables
- Trend graphs viewed directly on screen
- Storage of measurement data with export to csv
- Alarm thresholds can be set for any measured data
- User management with password protection
- Can be expanded or integrated into our advanced control system





Advanced customised control system

State-of-the-art technology for programming, logging and supervising all growth conditions. Software and configuration can be adjusted to meet your needs in process control and automation, monitoring and registering. The ideal solution for efficient management of multiple plant growth units or large scale indoor farming production facilities.

Control your lighting

Set up any colour spectrum while controlling total light intensity. Regulate lighting independent per shelf or trolley with time and group scenarios.

Determine optimal growth recipes

Define, store and recall an almost unlimited number of growth recipes. Create your own recipe database with opportunities for extensive analysis. Find optimal growth recipes with minimal energy consumption.

Reduce your TCO with smart energy management

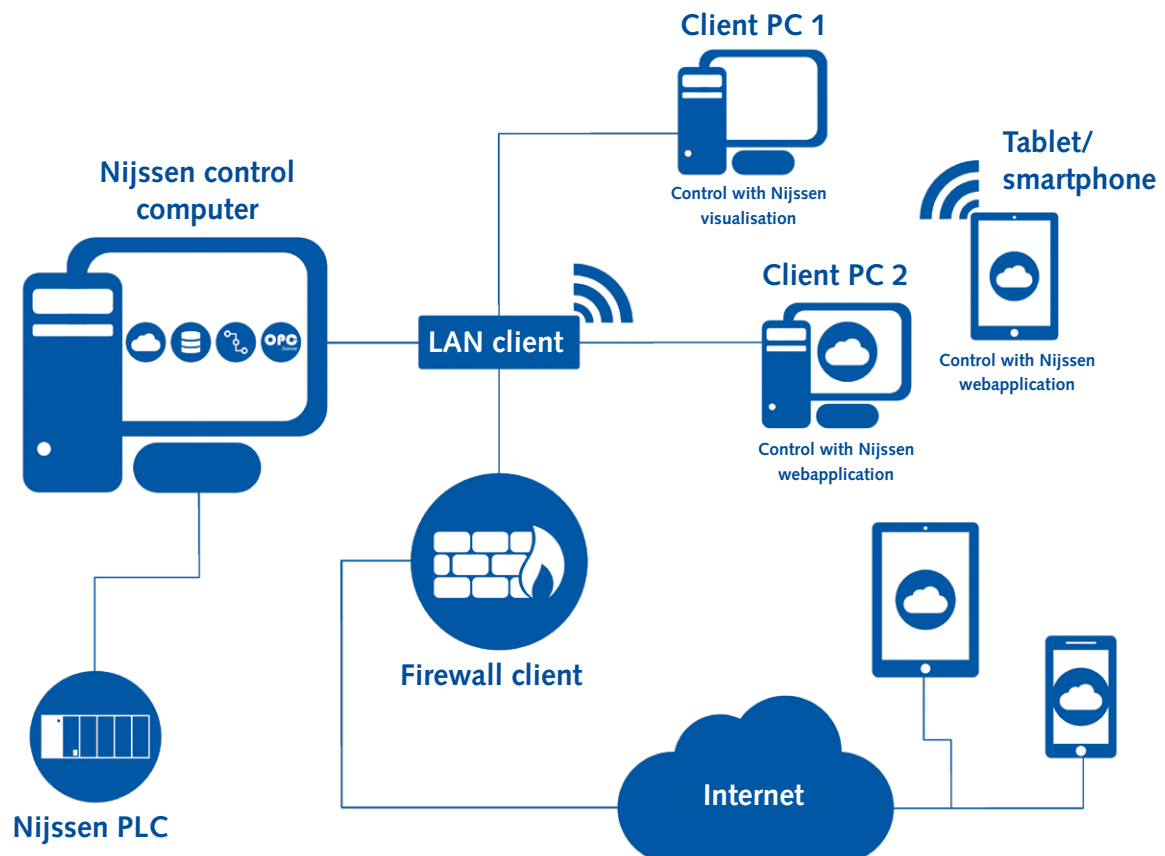
Identify energy saving potentials with our graphical analysis tools. Evaluate measures for increasing energy efficiency. Improve your business case through better profitability.

- Controls all environmental variables (temperature, humidity, airflow, additive CO₂-injection, lights, pressure, irrigation and fertilisation)
- All set-points are logged and can be easily saved in manually adjustable growth recipes with multiple phases
- Graphic editor for easy creation of control cycles and test programs
- User-defined trend graphs, viewed directly on screen for both set-point and actual conditions
- Analysis via illustrative graphics and calculating options
- Extensive user-defined reports, easily exported and/or printed
- Storage of measurement data with export options to other software
- Extensive set of alarms customised based upon user requirements
- Password protection with multiple authorisation levels



- Integrated central command of multiple units, and/or on site control per unit
- Optional integration with existing building management system
- Web-based remote control
- Remote access and helpdesk 24/7 available
- Software available in multiple languages

*Any other requirements?
Our automation engineers will be
pleased to find the best suitable
solution, together with you.*





Among our clients

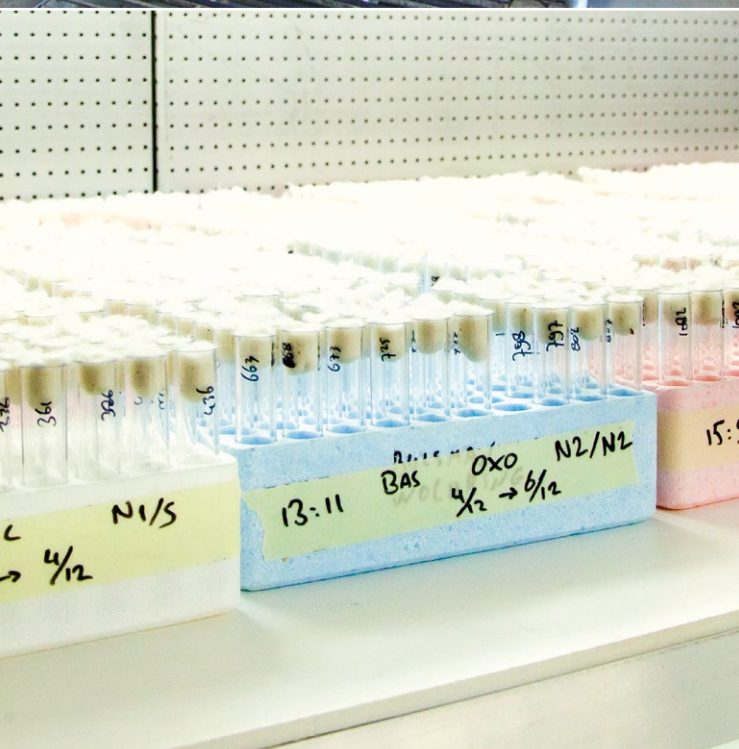
Nijssen climate technology

Universities and Research Institutes, e.g.

- Wageningen University, Netherlands
- Radboud University Nijmegen, Netherlands
- VU University Amsterdam, Netherlands
- University of Groningen, Netherlands
- Leuven University, Belgium
- Naktuinbouw, Netherlands
- IRS/Cosun, Netherlands

Private sector, e.g.

- Syngenta, UK / Germany / Netherlands
- Bayer / Monsanto, Netherlands
- Enza Zaden, Netherlands
- BASF/Nunhems Seeds, Netherlands
- Limagrain, Netherlands
- HZPC, Netherlands
- Florensis, Netherlands
- Vitro Plus, Netherlands
- BVB Substrates, Netherlands
- Janssen Biologics, Netherlands
- Yara, Netherlands



Nijssen industrial refrigeration

Fruit, Vegetables and Potatoes, Food Industry and Distribution centers, e.g.

- The Greenery, Netherlands
- Fruitmasters, Netherlands
- Lidl, Germany/ Netherlands
- Van Gelder, Netherlands
- Rosenbaum, Germany
- Special Fruit, Belgium
- Jumbo, Netherlands
- Kloosterboer, Netherlands
- Friesland Campina, Netherlands





The Nijssen family started in the refrigeration engineering business in 1948 and made its name developing state-of-the-art custom-built industrial refrigeration systems, ripening chambers and plant cultivation chambers. We expanded to become a prominent player in our industry, both at home and abroad.

Nijssen has always led the way in refrigeration technology development. As early as the 1960s, Nijssen marketed the world's best refrigeration system Filacell, an energy-efficient pre-cooling system that guarantees minimum loss of moisture and an even air distribution.

In 1986, Nijssen was the first Dutch supplier of patented LED plant growth lights. In joint research with Wageningen University we explored specific light recipes for different crops. The Nijssen Light Division was sold to a renowned lighting manufacturer. With the rapid developments in

LED technology we focus on offering our clients the LED solution that best meets their requirements. Over the years, we accumulated a wealth of expertise and experience on LED lighting.

The advanced control system we developed enables the various climate conditions to be regulated exactly, and continuously monitored and registered. Our Nijssen Power Saving system is a breakthrough in energy savings and managing humidity levels.

At Nijssen you will find specialists with a passion for refrigeration engineering. Our key concepts are strong commitment, short lines of communication, continuity and excellent business relationships. We look forward to discussing your situation and developing a solution specific to your unique requirements.

Contact us today!



www.nijssen.com

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