NNC-Group
New Nitrogen Concepts

NNC-LIN MS GmbH

# Introduction to our concepts and products

## Large-capacity cascade cooling

www.nnc-lin.com
Am Kleinbahnhof 18-30 – 25746 Heide (DE)
info@nnc-lin.com – +49(0)481 81787763

# Our cooling concept

COOLING WITH LN2 / N2
SIMPLE / EFFECTIVE / SAFE

www.nnc-lin.com
Am Kleinbahnhof 18-30 – 25746 Heide (DE)
info@nnc-lin.com – +49(0)481 81787763

# Our possibilities, examples

LN2 Primary Cooling

N2 Secondary Cooling

**Cascade use**

Subsequent use for building air conditioning

Subsequent use for cold water generation

Subsequent use as a fire protection measure

Reuse for the inerting of rooms

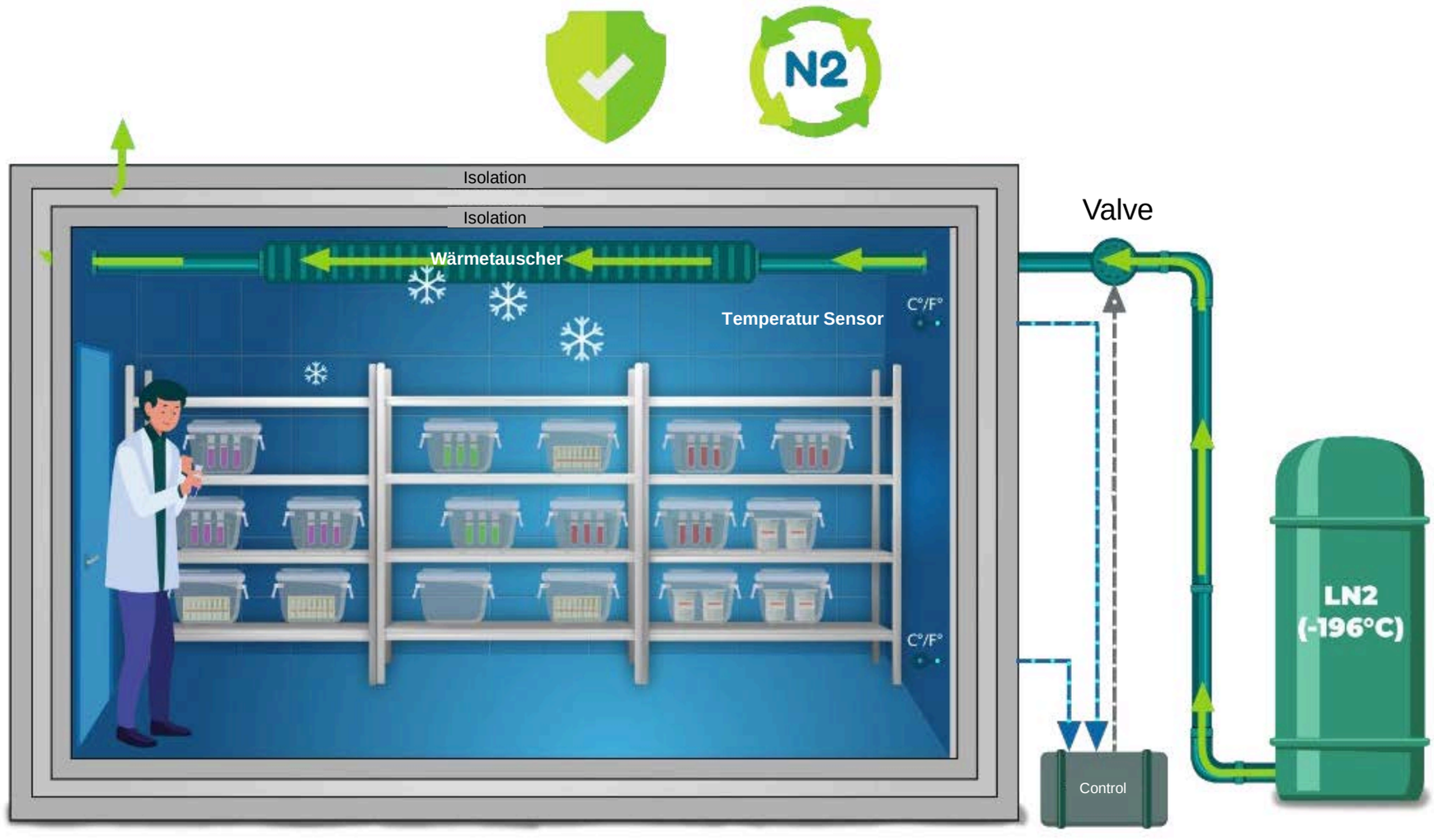
Further possibilities in coordination

## COOLING WITH LN2 / N2
## SIMPLE / EFFECTIVE / SAFE

www.nnc-lin.com
Am Kleinbahnhof 18-30 – 25746 Heide (DE)
info@nnc-lin.com – +49(0)481 81787763

# All our cooling concepts follow the same principles and contain these basic components

1. High-performance insulation
2. Heat exchanger
3. Valves
4. „Cryo Supply-Box“
5. Temperature Sensors
6. Control unit
7. Stainless Steel Pipes
8. "Thermoblock"
9. Gas Tank containing Liquid nitrogen (LN2)



# 1. High-performance insulation

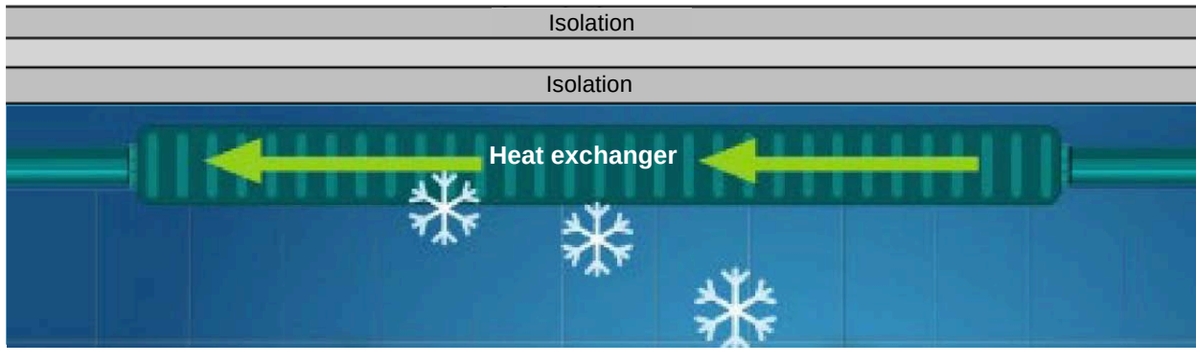

The base for all cold storage is a good insulation. Our systems have multiple layers. This saves energy and protects the insulation from intense stress caused by temperature differences.

The $LN_2$ Consumption depends on room size (10m² to 500m² and more), as well as the temperature and other factors.
This can mean a range of 20 kg -1.000kg and more per day

**Consumption can be greatly reduced by systematic NNC cascade use for other applications**

The Price for $LN_2$ depends on the supplier and the amount purchased. At least 12 to 15 cents / kg

# 2. Heat exchanger




Cooling in all our systems is handled by our Heat Exchangers. These are strategically placed at the ceiling and are getting injected with liquid nitrogen which is has a temperature of -196°. The warm air passes the surface of the Heat Exchanger and is getting cooled rapidly.

Warm air rising and cold air falling is creating its own thermal convection without any electric fans. This way the temperature gets into every corner.

The Liquid Nitrogen passes through the Heat exchanger and is being expelled into pipes that pass it on to another system or the outside.

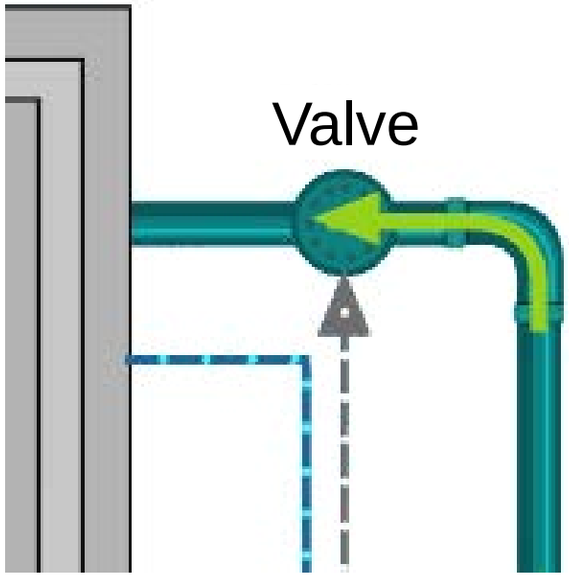
In large rooms with shelving systems, WT panels can also be used for static functional parts. This saves material and increases stability. Sustainability is in demand.

The design used, approx. 15mm thick, and the adapted, individual adaptation to the cooling requirement and the regional assignment, result in previously unknown cooling capacities and temperature patterns, +/- 1-2 degrees Celsius, even in large rooms.

The cascade application results in extreme cost advantages compared to conventional cooling systems.

In cooperation with fire protection professionals, the advantages of the cascade structure are used for inerting and, if necessary, extinguishing fires in the making. Why repairing damage when you can avoid it.

# 3. Ventile





To inject the Liquid nitrogen into the Heat exchangers we use specific valves that are specially suited for this temperature range.

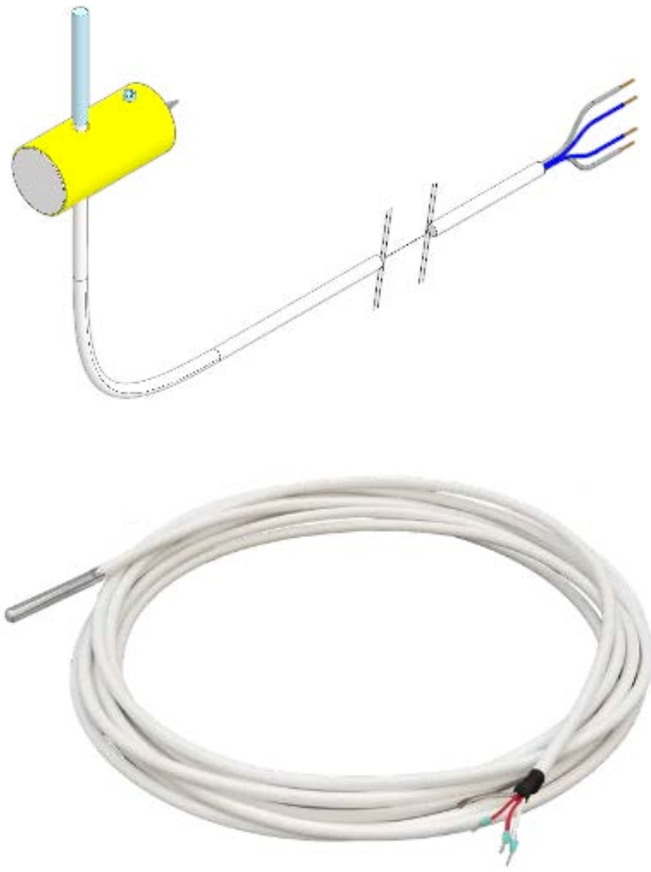
# 4. „Kryo-Verteiler“

Our valves are usually housed in an insulated housing. This prevents excessive moisture and subsequent ice formation on the pipes and valves

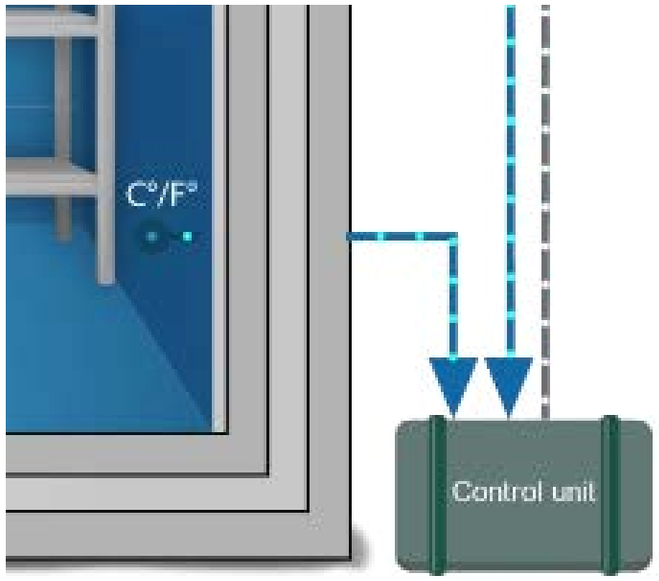
# 5. Temperatur Sensoren


Sensors are methodically placed at multiple spots inside the storage area to monitor the temperature and give the impulse for the valves to release liquid nitrogen into the Heat Exchangers.

We typically use pt100 / pt1000 sensors that are 3-Point calibrated and meet all demands for certification and quality control like GMP.



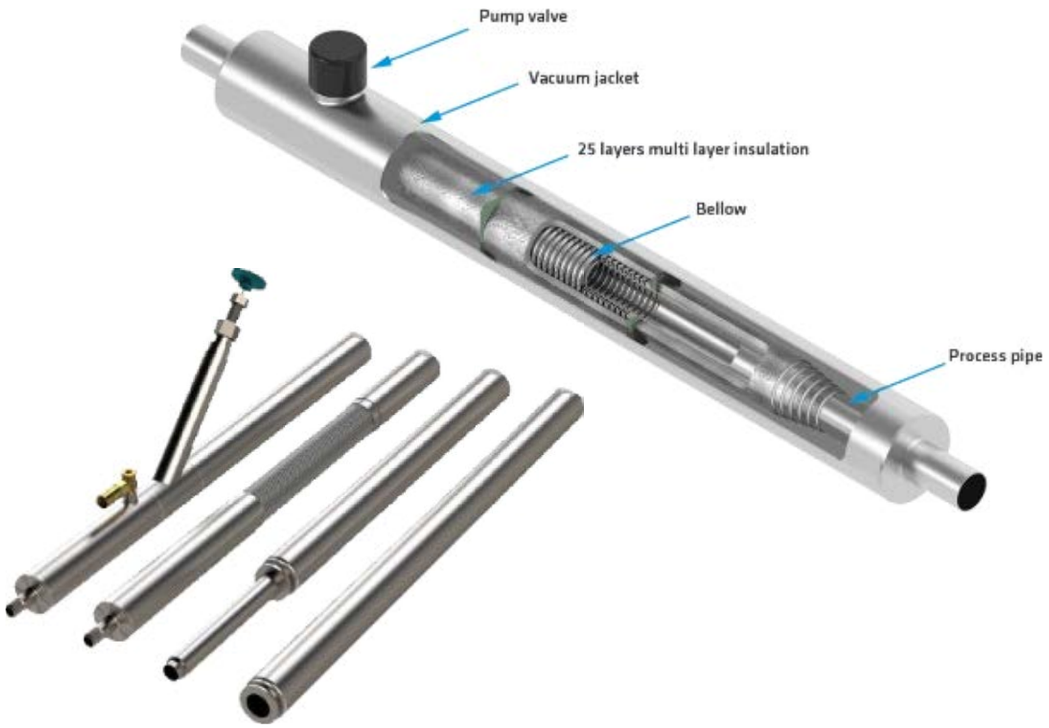
# 6. Control unit





Every aspect in our systems is monitored and controlled by the control unit. The capabilities and size vary depending on the requirements. For small standalone systems, a small to medium size control panel with integrated user interface may be enough. For our open plan rooms with multiple sections a bigger unit is required.

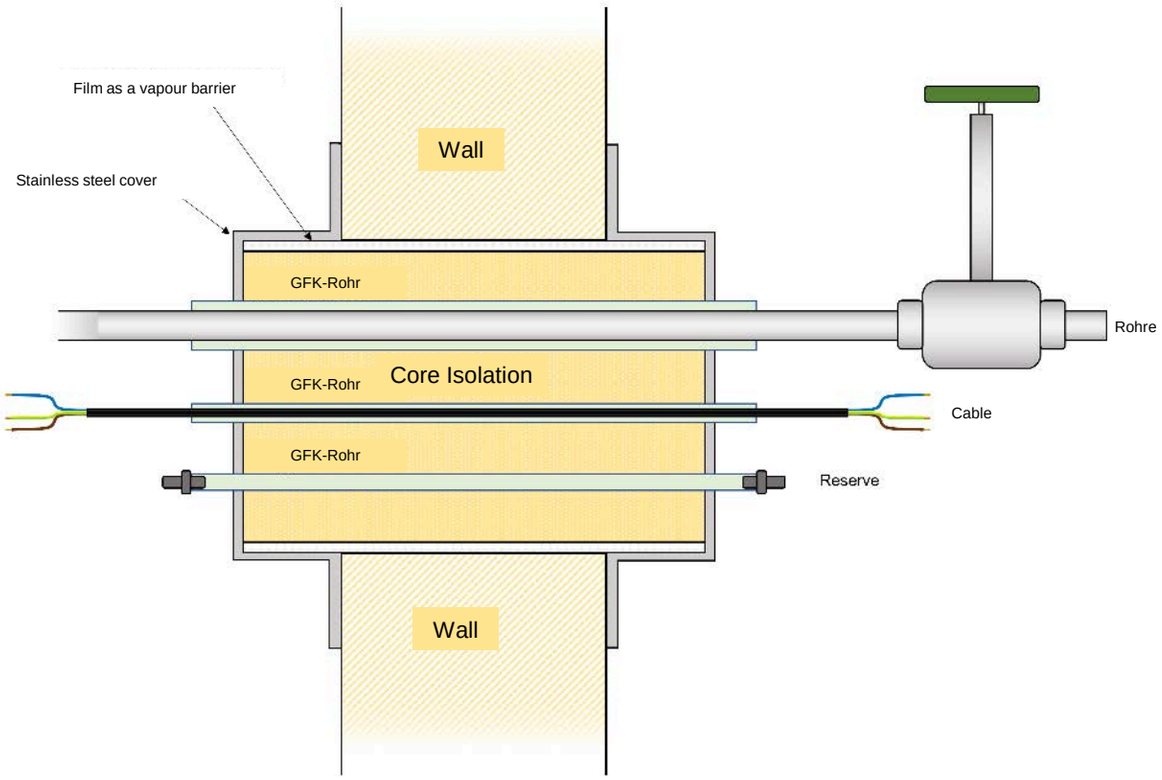
# 7. Stainless steel pipes and fittings

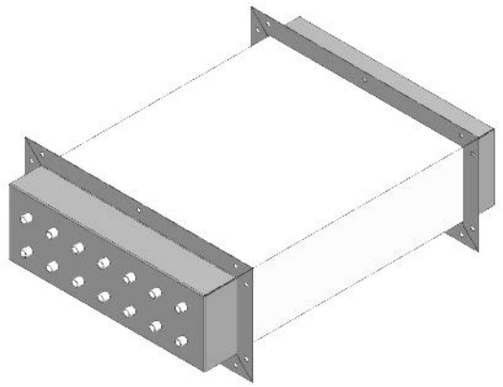



Vacuum-insulated pipes are used for the majority of the way to the system. These are specially designed for the transport of liquefied gases at very cold temperatures.

Inside the system, uninsulated stainless steel pipes are used, which are connected via high-performance fittings that can withstand pressures of up to 300 bar. This is an aspect that reduces the probability of a leak to almost zero.

# 8. „Thermoblock“



Whenever we need to run pipes or cables through an insulated wall, we use our Thermoblock. It shields the insulation from the temperatures and possible condensation emanating from pipes or cables running through the wall.

# 9. Gas tank with liquid nitrogen (LN2)


Depending on the application, the amount of LN2 required and the size of the gas tank may vary. For less demanding, stand-alone systems, a small mobile tank system may be sufficient. For larger multi-room applications, a stationary tank is required.

These tank systems are well insulated and equipped to provide a steady stream of liquid nitrogen

# Overview of key features and specifications

- NNC-Cooling system, working with $LN_2$ (approx. -196.3°C)
- High performance piping in a closed system, open at the end, with cascade options
  - ✓ No nitrogen in the room surrounding the system
  - ✓ No nitrogen in the systems storage room
  - ✓ low 2.5 to 3 bar line pressure
- Customized safety and redundancy system based on your requirements
  - ✓ Multi-way supply, ring line
  - ✓ 2 gas tanks
  - ✓ Redundant supply valves for every section
- UPS-backup for the control and mission critical systems
- Full monitoring system
- Connection to in-house network and monitoring components, GL
- and much more, as agreed with the customer
- .....

# NNC system comparisons >> to Conventional compressor systems

## Failure possibilities in NNC systems >> prevention / Downtime:

1. Main tank empty or defective >> Redundant Tank-system for protection / no failure
2. Supply line defective >> Ring line for supply / no failure
3. Power outage >> Power outage >> Backup with 1KW UPS / no outage
4. Control failure >> have a replacement control unit on standby / maximum 1 hour
5. Component defective >> have Replacement for common parts on standby / maximum 1-2 hours

## Failure possibilities in conventional Compressor systems >> prevention / Downtime:

1. Compressor defective >> drain refrigerant, replace compressor, charge refrigerant / ?? hours
2. Refrigerant leak >> drain refrigerant, check/replace lines, fill refrigerant / ?? hours
3. Motor, drive defective >> Motor replacement / up to one day if component on site
4. Power failure >> 1 hour to several days
5. Control failure >> Analyze / replace replacement control parts, ?? hours
6. Components defective >> all technical components can be damaged as they are subject to wear and tear
7. Air conditioning overloaded >> Very high technical effort
8. Overheating of rooms due to waste heat
9. Many technical components that can fail
10…….

# Security Concerns

## SAFETY AND BACKUP

www.nnc-lin.com
Am Kleinbahnhof 18-30 – 25746 Heide (DE)
info@nnc-lin.com – +49(0)481 81787763

# Frequently Asked Questions and Concerns

## What happens if there is a $LN_2$ leak in the storage area, what happens to the stored products?

We can assure you that it is virtually impossible to experience leaks after acceptance/testing in the storage area.

1. the system is pressure tested before delivery
2. all materials (Pipes, fittings, components, cooling plates ) are tested to at least 30 Bar/ 430PSI.

However, we can also provide additional measures in the event of increased safety requirements, spare room, stand-by devices and much more, even if it does not seem necessary to us.

Our systems and installations are always demonstrably safer than all technical refrigeration systems, as the temperature does not have to be generated on site but must be conducted in the needed manner.

## What measures are planned if there is a leak in the storage room and people need to be protected?

In principle, we rule out the possibility of a leak because we do everything necessary in advance.
But the rooms are monitored for oxygen and a pneumatic valve can be fitted to the tank, which closes if too much LN2 is being drawn.
It should also be noted that we do not have any open nitrogen outside the system, as is the case with all other systems available on the market.
These systems vent into the room, our systems vent outside into the environment.
In addition to the monitoring system, indicator lights and signaling devices are installed. This indicates danger.
Further safeguards can be agreed with the customer if required.

We would also like to point out that nitrogen is 78% of the air we breathe and is therefore CO2 neutral and very suitable as a refrigerant.

## What happens if the tank stops releasing nitrogen despite all precautions? Is there a back-up?

Yes, the pharmaceutical industry prefers 2 tanks instead of one. The systems run redundantly and back each other up. The automatic supply system ensures that refueling takes place when the filling level reaches 40%.

## Is there a back-up supply line?

A single line is very safe and usually needs no redundancy, but…

1. An option is a ring line (circular) that can supply the systems in case one direction is blocked somehow
2. 2. Of course, another possibility is a complete second line

**We are happy to answer any questions you may have. We are confident enough to say that our systems are safer and more sustainable than all other systems for high-end applications.**

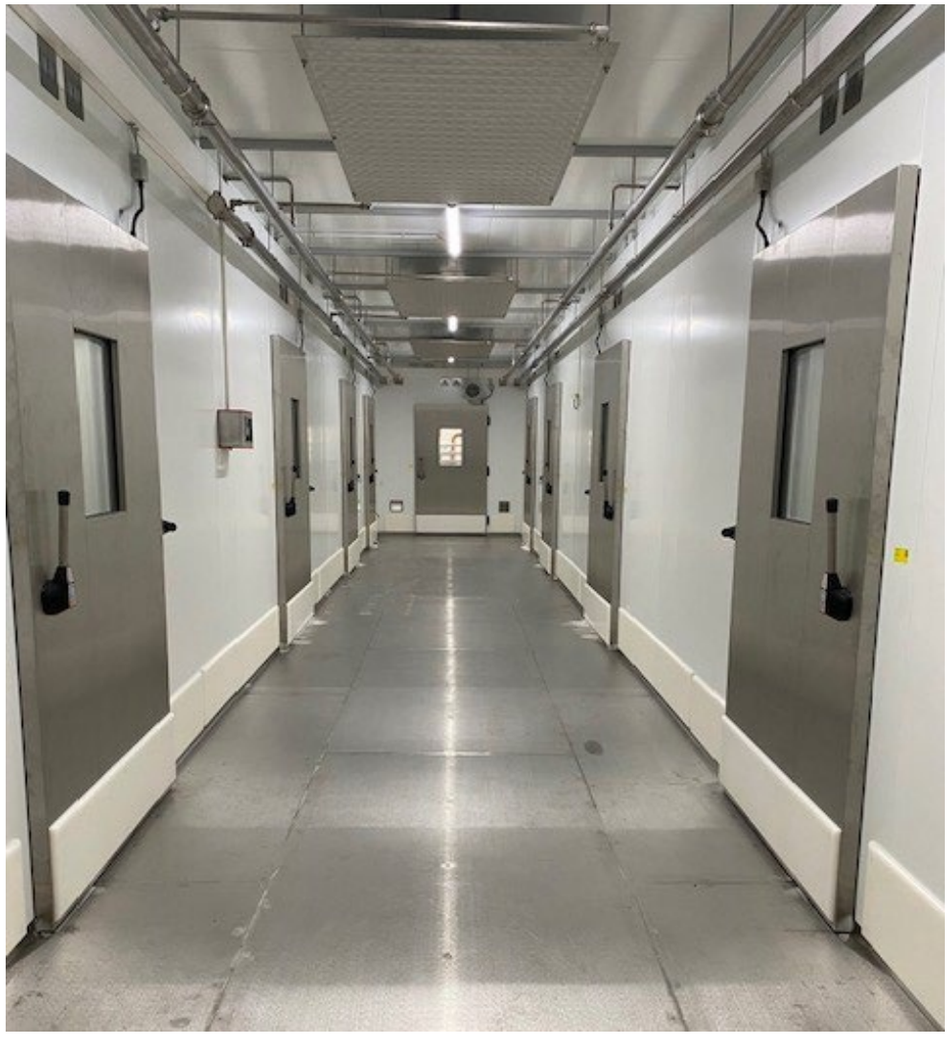
# *A deeper insight*

## A CLOSER LOOK AT OUR CONCEPTS AND SYSTEMS

www.nnc-lin.com
Am Kleinbahnhof 18-30 – 25746 Heide (DE)
info@nnc-lin.com – +49(0)481 81787763

# BOS Open Floor Plan
# Single or multi-room storage down to -80°C

Our open systems are designed from the ground up with the customer, for the customer and can be adapted to all needs



Anteroom -20°C passively cooled by cooling of the adjacent rooms and supported by active cooling.

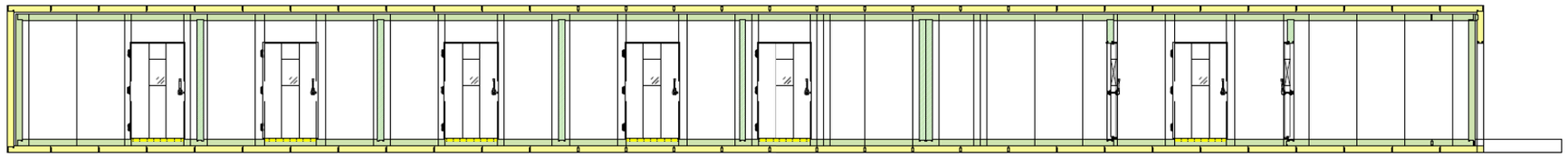
Storage room -75°C actively cooled by our heat exchanger plates. The remaining energy is used in other areas.

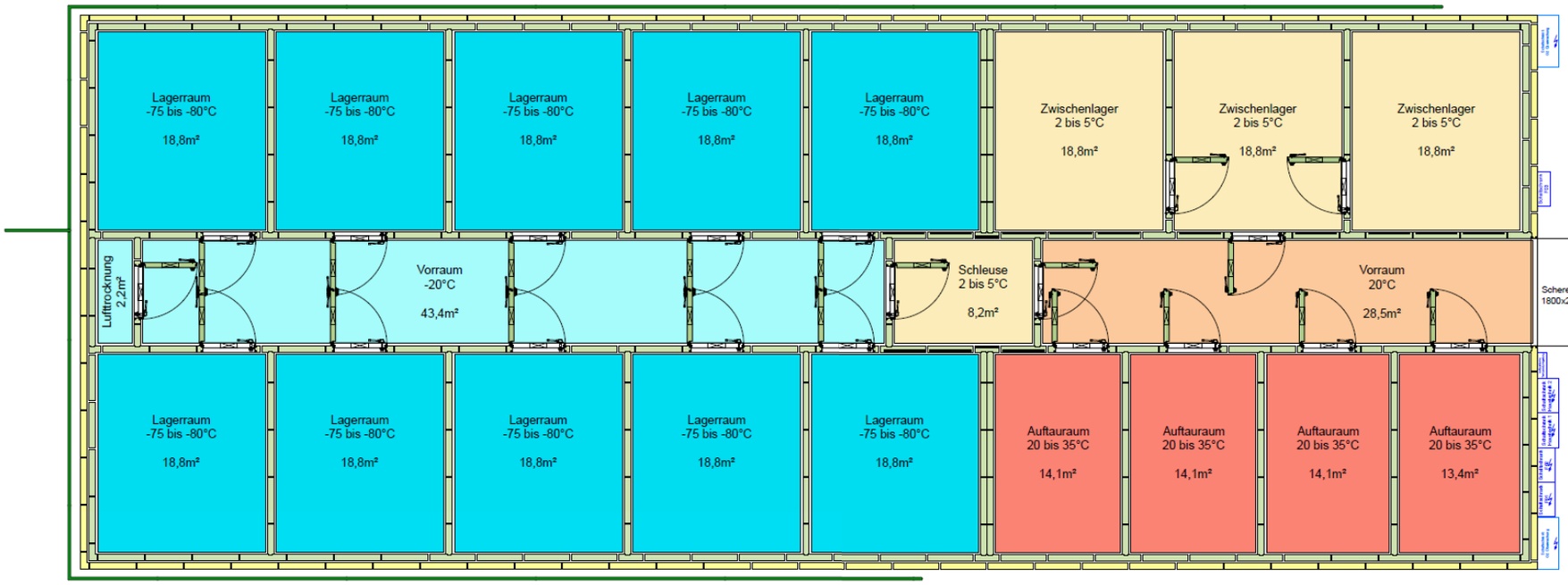
# BOS Open Floor Plan
# Single or multi-room storage down to -80°C

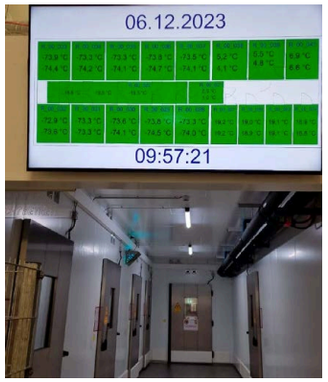
Interim storage 2-5°C passively cooled by cooling of the adjacent rooms and supported by active cooling.

Defrosting room 15-35°C actively heated by air conditioning under the ceiling.

# BOS Open Floor Plan
# Single or multi-room storage down to -80°C





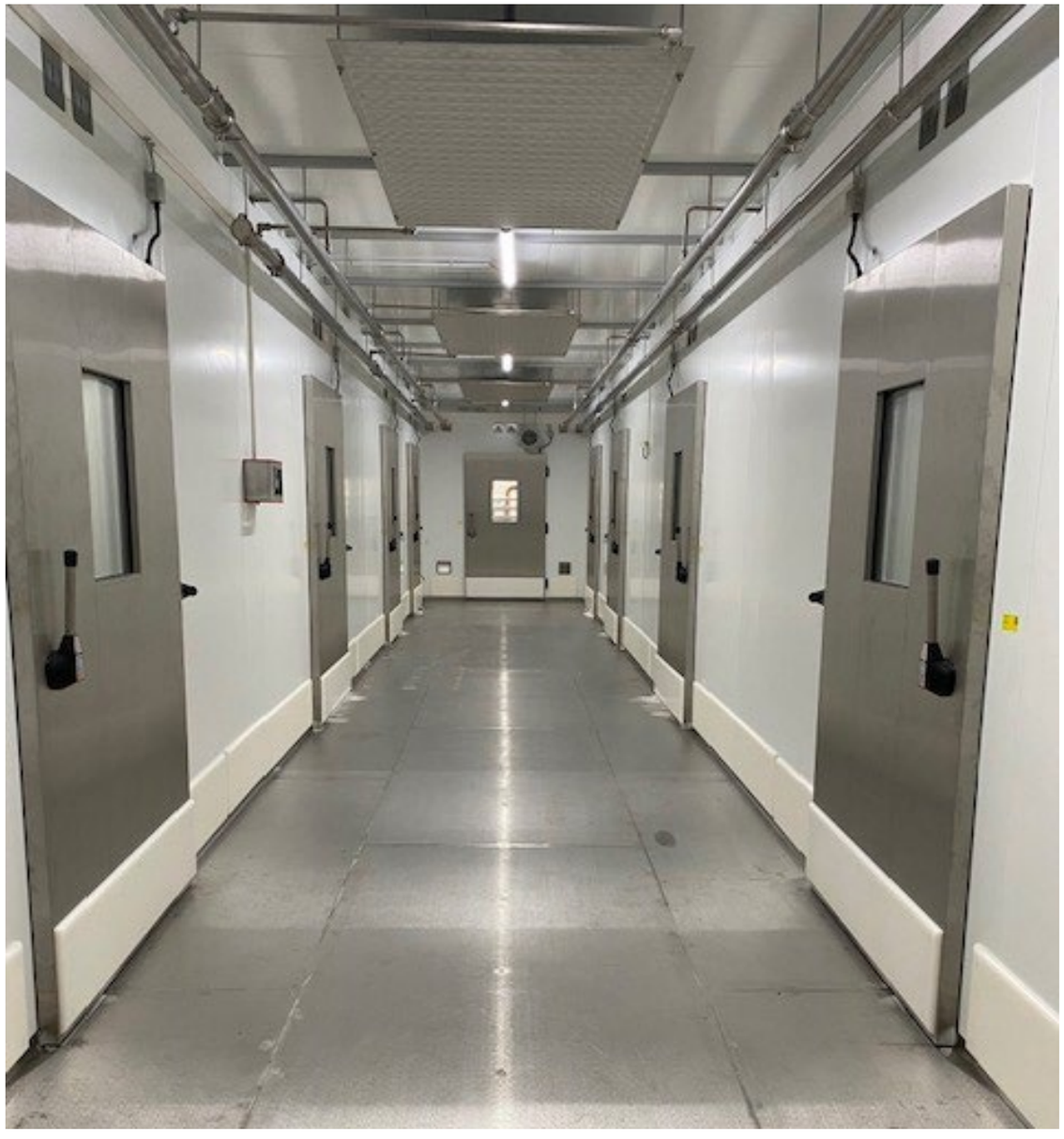

The installation costs vary greatly. Minimum costs for planning and installation can range from €1.000 to €1,000,000 and more, depending on the materials used and the location.

# References

## OUR CUSTOMERS

www.nnc-lin.com
Am Kleinbahnhof 18-30 – 25746 Heide (DE)
info@nnc-lin.com – +49(0)481 81787763

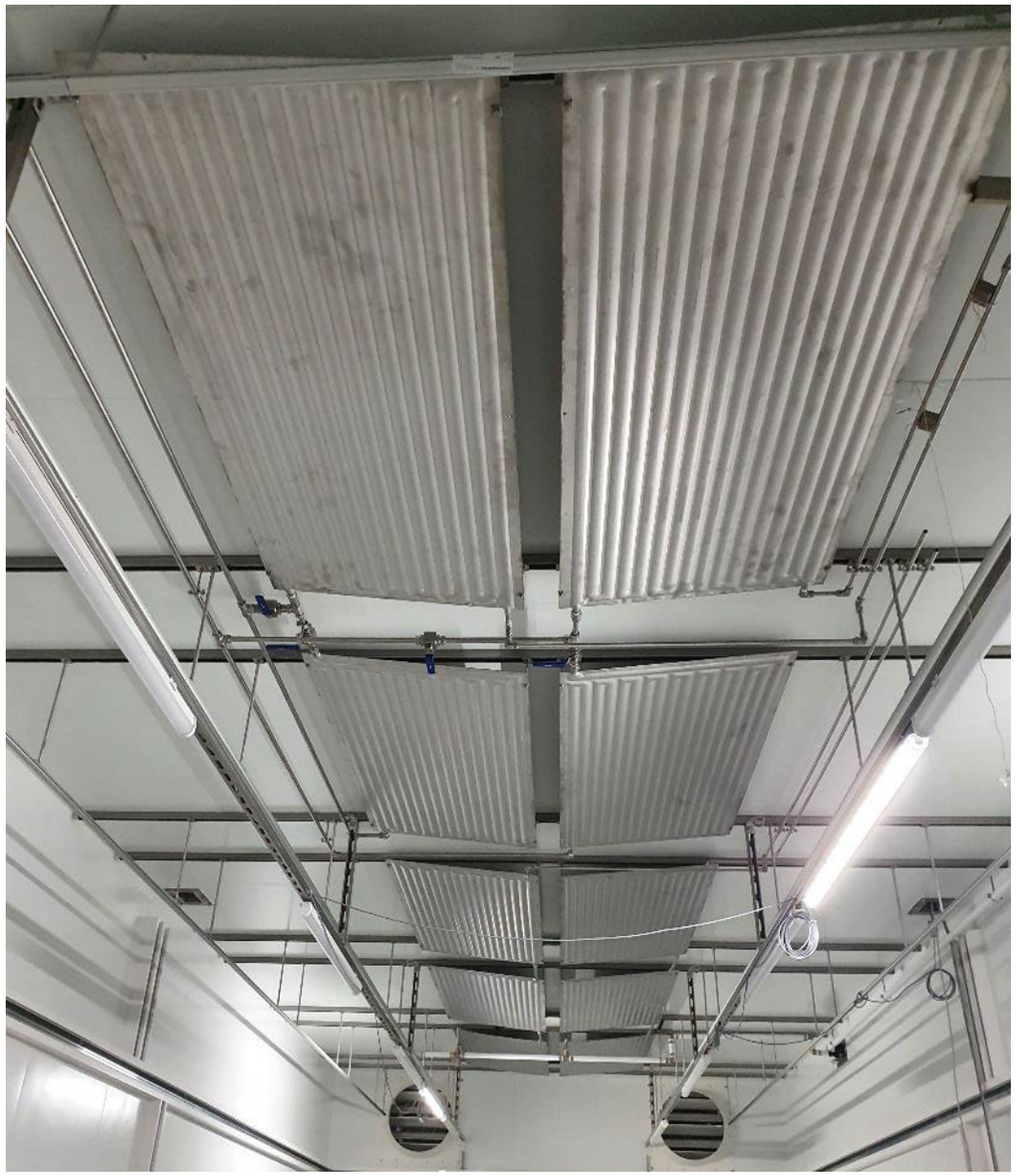
# References:
# IDT Biologika Dessau-Roßlau (DE)
# Pharmaceutical Storage

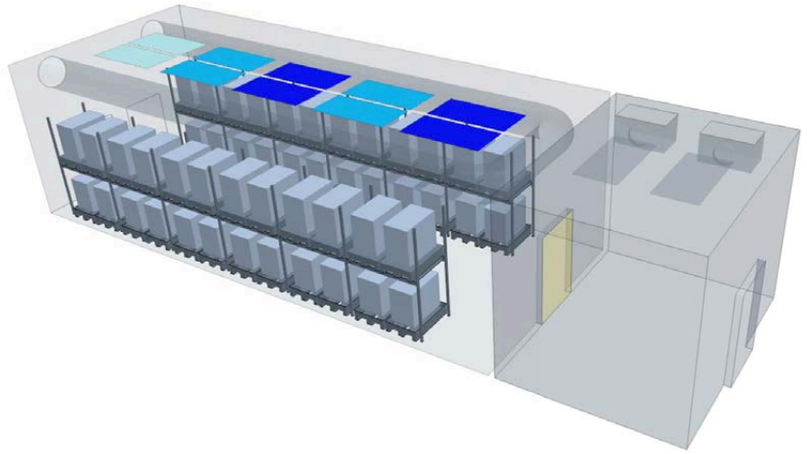


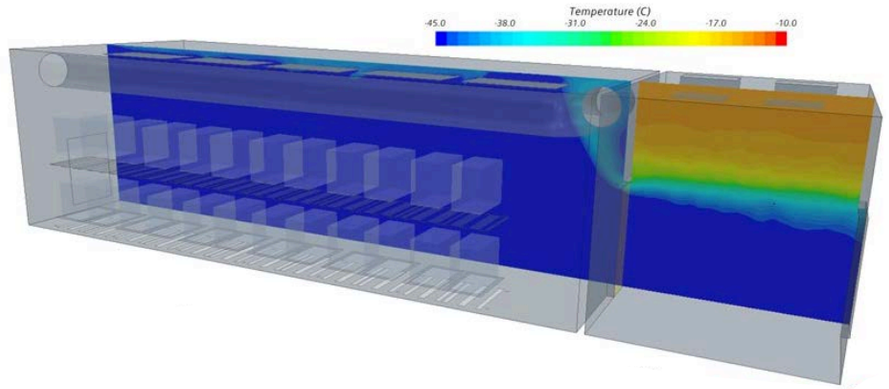

Open Plan System up to -80°C

Storage, Interim Storage, Defrosting

# References:
# Vetter Pharma Ravensburg (DE)
# Storage of pharmaceuticals

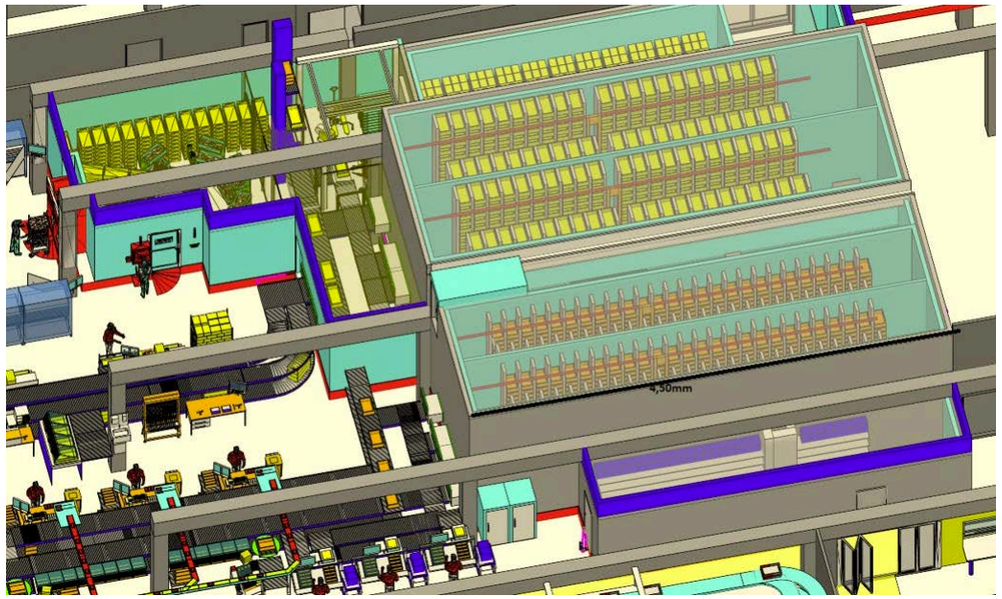







2-room system up to -40°C
Storage with transit zone
Active cooling with backup cooling

# References:
# Haema, Leipzig(DE)
# Production and storage of blood products

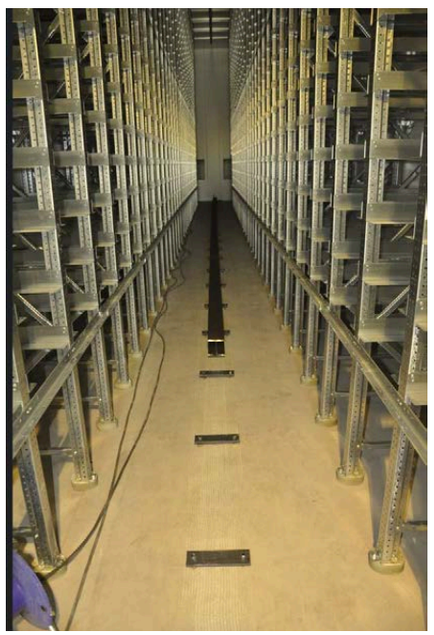


**Automated cold rooms**
between +4 and -40°C

Applied
***Cascade cooling***

**of the NNC Group**

with +4-6°
Chilled water generation
from the refrigeration, the
exhaust gas flow, to the
Centrifuge Refrigeration
as well as cooling
of the IT server room

# References:

## Universitäten

**Düsseldorf**

**Köln**

**Freiburg**

**Hamburg**

und mehr

## Rotes Kreuz

**Switzerland**

**Poland**

**Germany**

**Niederlande**

und mehr

## Industrie

**Haema Leipzig** /

**Vetter Pharm**. /

**IDT Pharm**. /

**Bayer AG**

und mehr

Contact:

NNC-LIN MS GmbH

Research & Development / Distribution

Am Kleinbahnhof 18-30 - 25746 Heide

Administration

Uhlenstroot 3 - 25797 Wöhrden

Phone: +49 (0) 481 817 877 65

+49 (0) 4839 865 99 82

Fax: +49 (0) 4839 865 99 81

Email: info@nnc-lin.com

www.nnc-lin.com

# VIELEN DANK

NNC-LIN MS GmbH

NNC-Group

New Nitrogen Concepts