

# Danfoss Condensing

## Introduction



# Our Result and Footprint

## Danfoss 2020

**27,000**

Employees

**EUR 5.8bn** (USD 6.6 bn)

Sales

**65 factories**

Globally

**Top 3 markets**

US, China & Germany

## Danfoss 2021 incl. Eaton Hydraulic

**37,000**

Employees

**EUR 7.2bn** (USD 8.1 bn)

Sales

**95 factories**

Globally

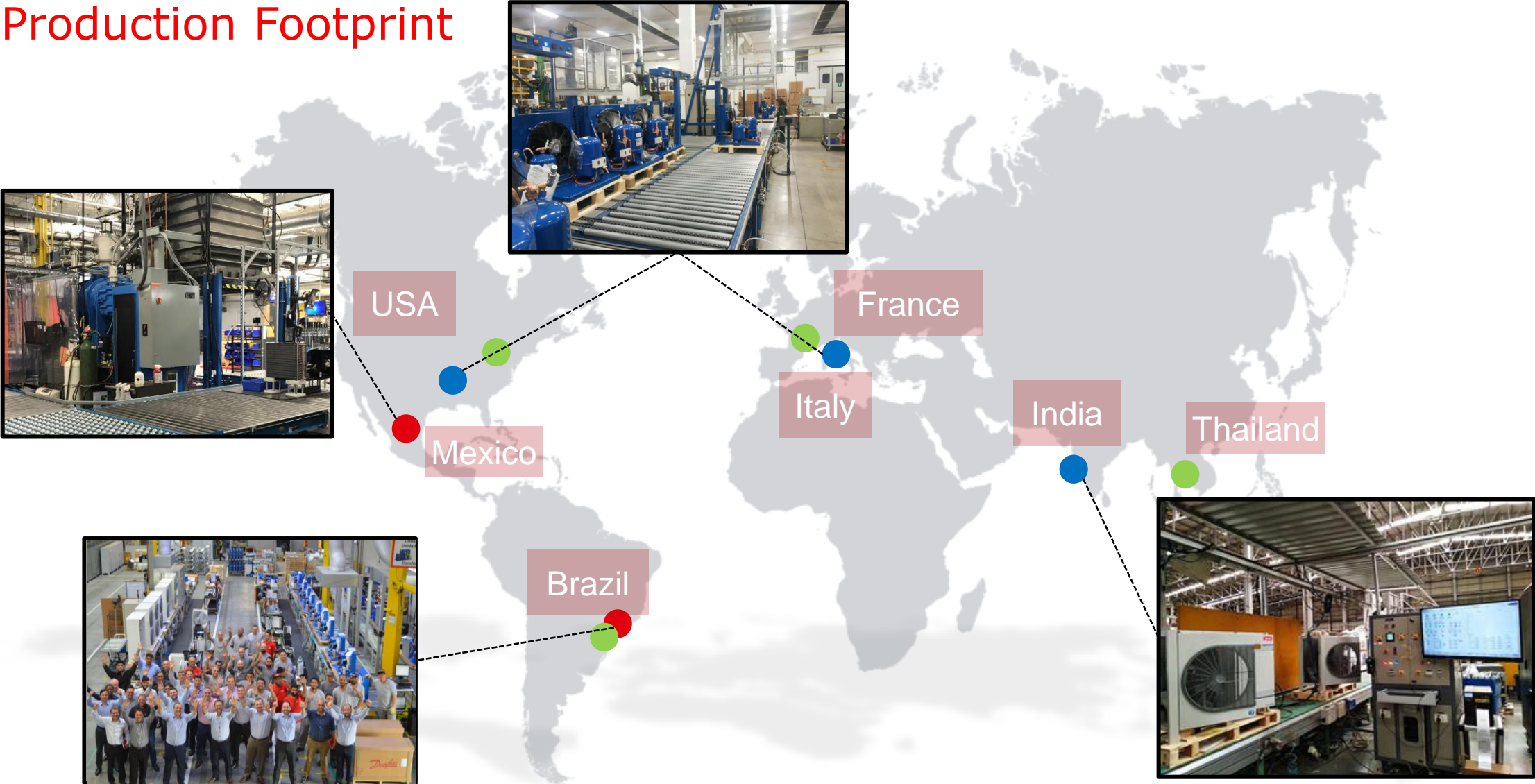
**Top 3 markets**

US, China & Germany

# Condensing Unit

## Production Footprint

- Danfoss production location
- Local Inspection Center (LIC)
- Contract Manufacturer (CM) / Original Design Manufacturer (ODM) production location





# Optyma Condensing Unit Range

Optyma bare and packaged condensing units for MBP and LBP applications. Featuring multiple lower-GWP refrigerants, high energy performance ratios and trouble-free installation.



Optyma™ **Light Commercial**



Optyma™ **Commercial**



Optyma™ **Slim Pack**

Optyma™ **Plus**

Optyma™ **Plus INVERTER**



Optyma™ **TRIO**

**Optyma bare**

**Optyma packaged**

# Optyma™ family outdoor/packaged units

Optyma™ **Slim Pack**



Compact and cost effective.  
When space, quiet operation  
efficiency and simple  
installation matter.

**With microchannel  
condenser**



Optyma™ **Plus**



Top performer. When quietness,  
high efficiency, connectivity  
and fastest installation and  
maintenance matter.

**With electronic controller**



Optyma™ **Plus INVERTER**



Premium unit. When top  
efficiency, fastest installation and  
maintenance, tight temperature  
and humidity control matter.

**With variable  
speed drive**



# Optyma™ Slim Pack

Light in refrigerant – Heavy in efficiency



- > **Environmentally friendly:** Units qualified for multiple low GWP refrigerants
- > **Weatherproof housing:** IP54 full metal housing for outdoor applications
- > **Compactness** and **lightweight** (from 1-13kg lighter than NBA): Easier handling coupled with lower transportation and storage costs
- > **Quiet solution** for installations in residential areas
- > **Quick connections** for suction & liquid lines: quick installation

# Optyma™ Slim Pack

## Unique inside

- > **Micro Channel Heat Exchanger:** Less refrigerant charge, corrosion resistant, easy cleaning & lighter weight
- > **Scroll/reciprocating technology:** Low noise and efficient compressors qualified for multiple Low GWP refrigerants
- > **Easy access** to all components: Save time on servicing and maintenance
- > **Easy Servicing** and operations thanks to shut off valves on receiver and service ports on service valves
- > **High Danfoss quality** and factory tests: less maintenance and operation costs



# Optyma™ Plus

Quietly efficient “plug&play” solution



- > **Extremely quiet and efficient** (sound level up to 25% lower than conventional systems & 20% higher COP compared to equivalent product offering) provides greater comfort in residential areas and saving on the energy bill
- > **Environmentally friendly:** Units qualified for low GWP refrigerants
- > **“Plug&Play”** for effortless installation
- > **Stack-mounting optimized weatherproof housing IP54 :** Robust and reliable mounting for outdoor applications



# Optyma™ **Plus**

## Exclusive inside

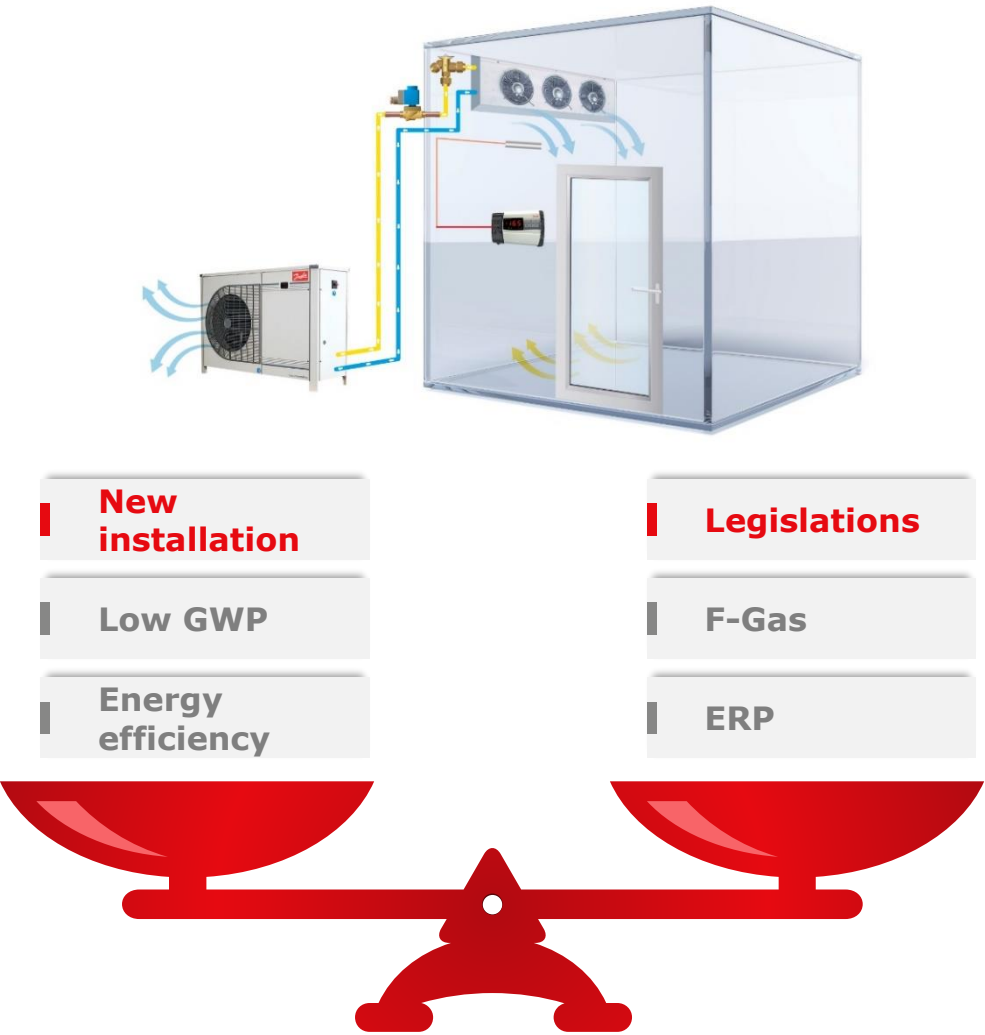
- > **Micro channel** Heat Exchanger: Less refrigerant charge & easy to clean
- > **Electronic controller** provides immediate information about pressure, temperature, fan speed control etc.
- > **3 access doors** for easy maintenance
- > **Acoustic insulated housing** for improved noise level



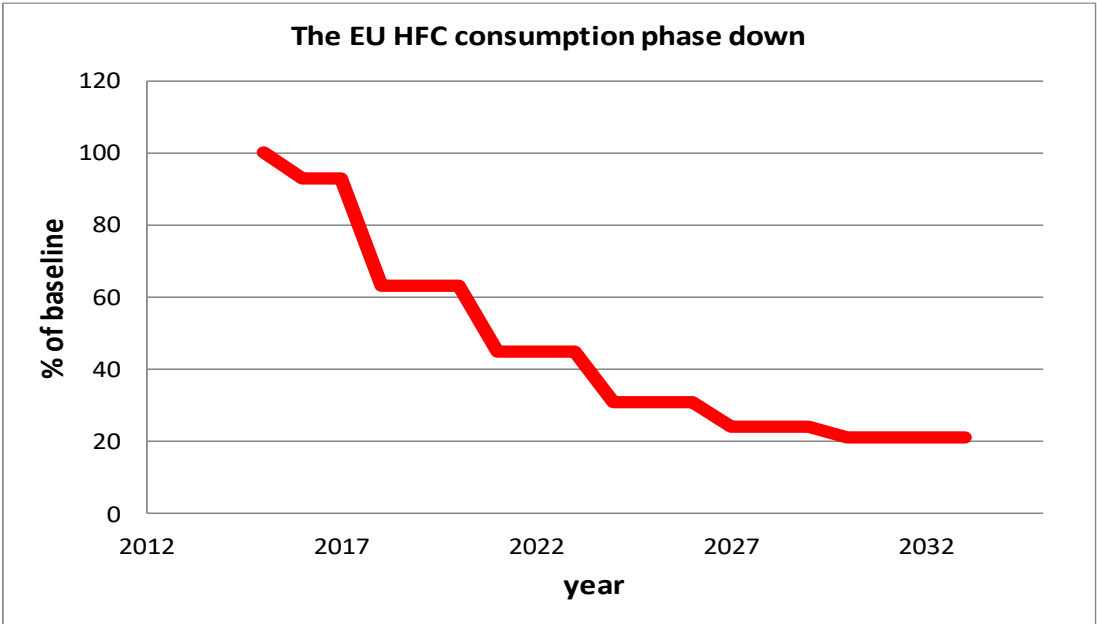
- > **Main switch** with motor-circuit-breaker (**MCB**) to protect the compressor
- > **Scroll/reciprocating technology:** Low noise and efficient compressors

# Condensing Unit

## Ultra Low GWP (Global Warming Potential)



F-Gas Regulation timing [EU517/2014]



# Condensing Unit

## Ultra Low GWP (Global Warming Potential)

### Light Flammable Solution (A2L)

Below 150 GWP

Low Flammability on large charges

**R455A / R454C / R1234yf**



### Hydrocarbons

Below 10 GWP

High Flammability

**R290 (Propane)**



High Pressure

**CO2**



# Cold Room Portfolio - Components

## CONDENSING UNIT

Microchannel Condenser



Pressure Switch



Sight Glass



Commercial Compressors



Fractional Compressors



Filter Drier



Ball Valve



Pressure Regulator



Fan Speed Regulator



## EVAPORATOR UNIT

Thermostatic Expansion Valve



Electric Expansion Valve



Solenoid Valve



## TEMPERATURE CONTROL

Electromechanical Control



Electronic Controller



Room Controller



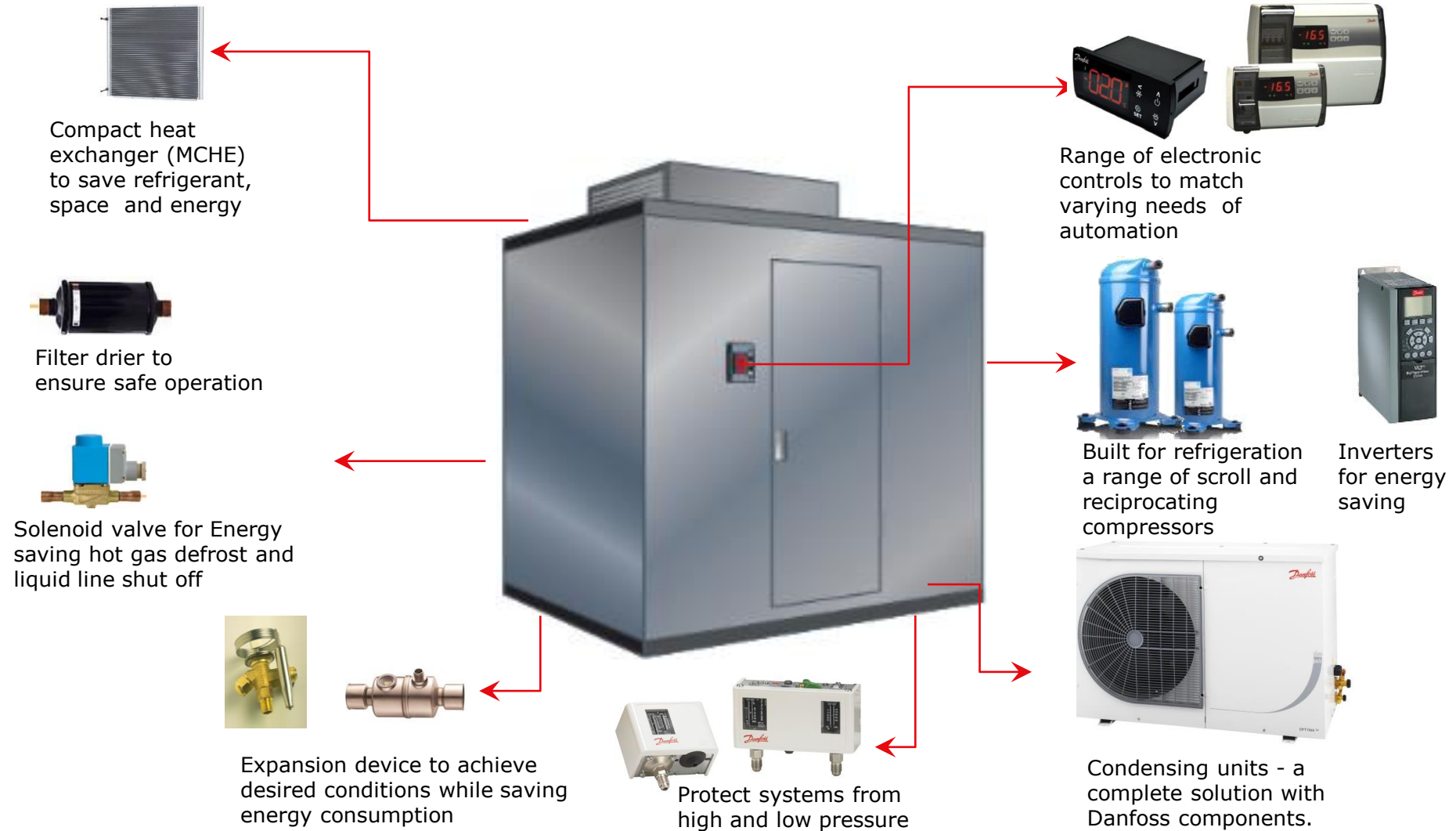
## INVERTER

Inverter for Refrigeration





# Solutions for Cold Rooms



# Optyma™ Plus INVERTER

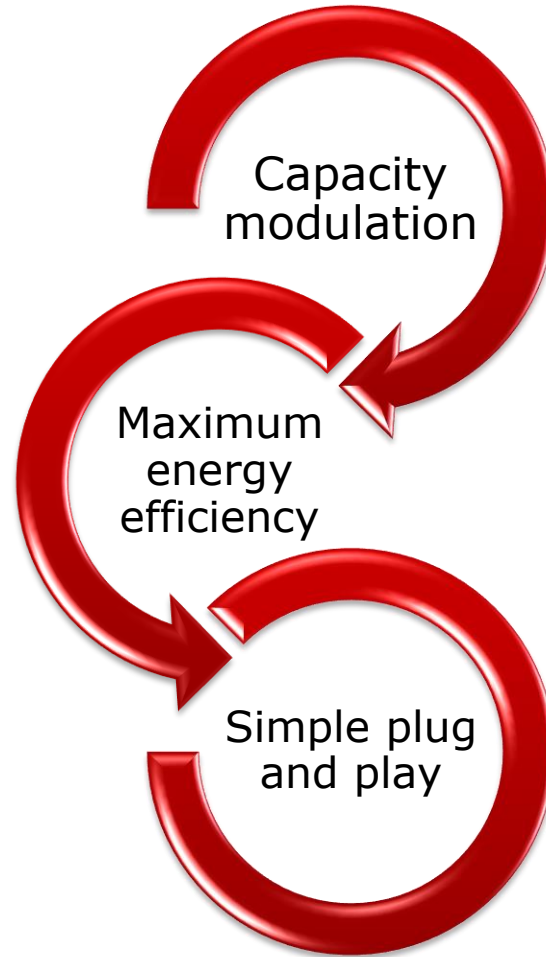
Capacity modulation in a simple plug and play package

Brings  
benefits  
for  
everyone



# Optyma™ **Plus INVERTER**

Brings benefits for everyone



Market  
**leading**  
expertise

in condensing unit design  
with the unique benefits  
of stepless inverter scroll  
technology.

**~1000+ units in field**

# Product highlight: Optyma™ Plus **INVERTER**: brings value for the end user



## End Users & Consulting Engineers

### Better food preservation...

Improved cooling quality with tight temperature and humidity control which increases food safety and quality

**+/- 0,3°C**  
control

### Best energy efficiency...

3,84 SEPR\* reduces operating costs

**+ 20/30%**  
vs alter.  
comp. tech

### Low refrigerant charge

Microchannel condensor reduces the refrigerant charge vs NBAs using F&T

**- 2,9 kg**  
vs alter.  
coil tech

### No need of machinery room

Replace multiple small indoor units with one Optyma Plus Inverter outdoor unit which can operate multiple evaporators

**4m²**  
vs alter.  
comp. tech

### Peace of mind

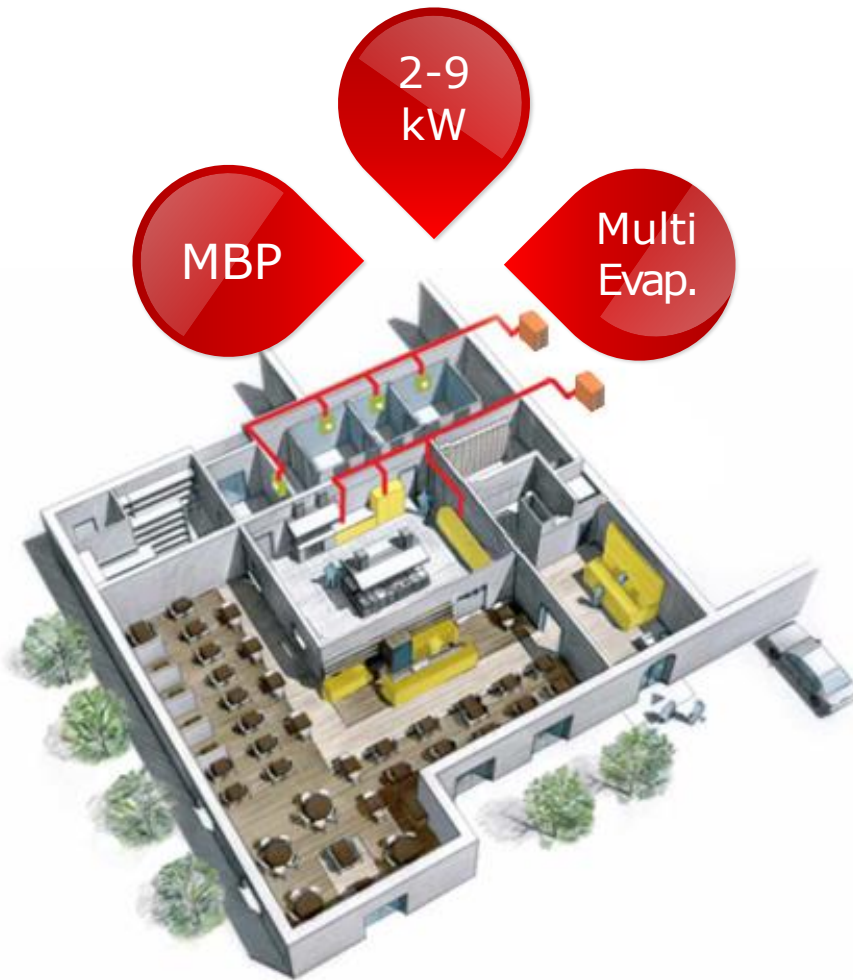
Robust housing and secured stable running conditions provides a strong reliable solution

**0**  
Unforeseen service  
cost

\* SEPR certified by Asercom



# Applications requiring **capacity modulation**



## **Unit connected to several evaporators:**

One unit cools several display cabinets, cold rooms, GDM or fermentation rooms that have different cooling needs at the same time

- Drive / Mini-markets / Supermarkets
- Convenience Stores
- Petrol Stations
- Restaurants
- Wine cellars
- Fish markets
- Butchers' shops
- Dairy and general food storages, etc.

## **Unit for “critical applications”:**

one unit is used in applications where capacity modulation ensure the **quantity and quality of goods produced** (typically fermentation rooms, ice making machines)

# Application Needs

**Several cabinets with different cooling needs:** one unit feeds several cabinets

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**Temperature and humidity controls:** need for very precise temp. and humidity for food quality and safety

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**Huge peaks and variations** in cooling demand in the day: need for continuous load matching

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**Lots of open / close doors:** need for continuous adjustment of cooling capacity

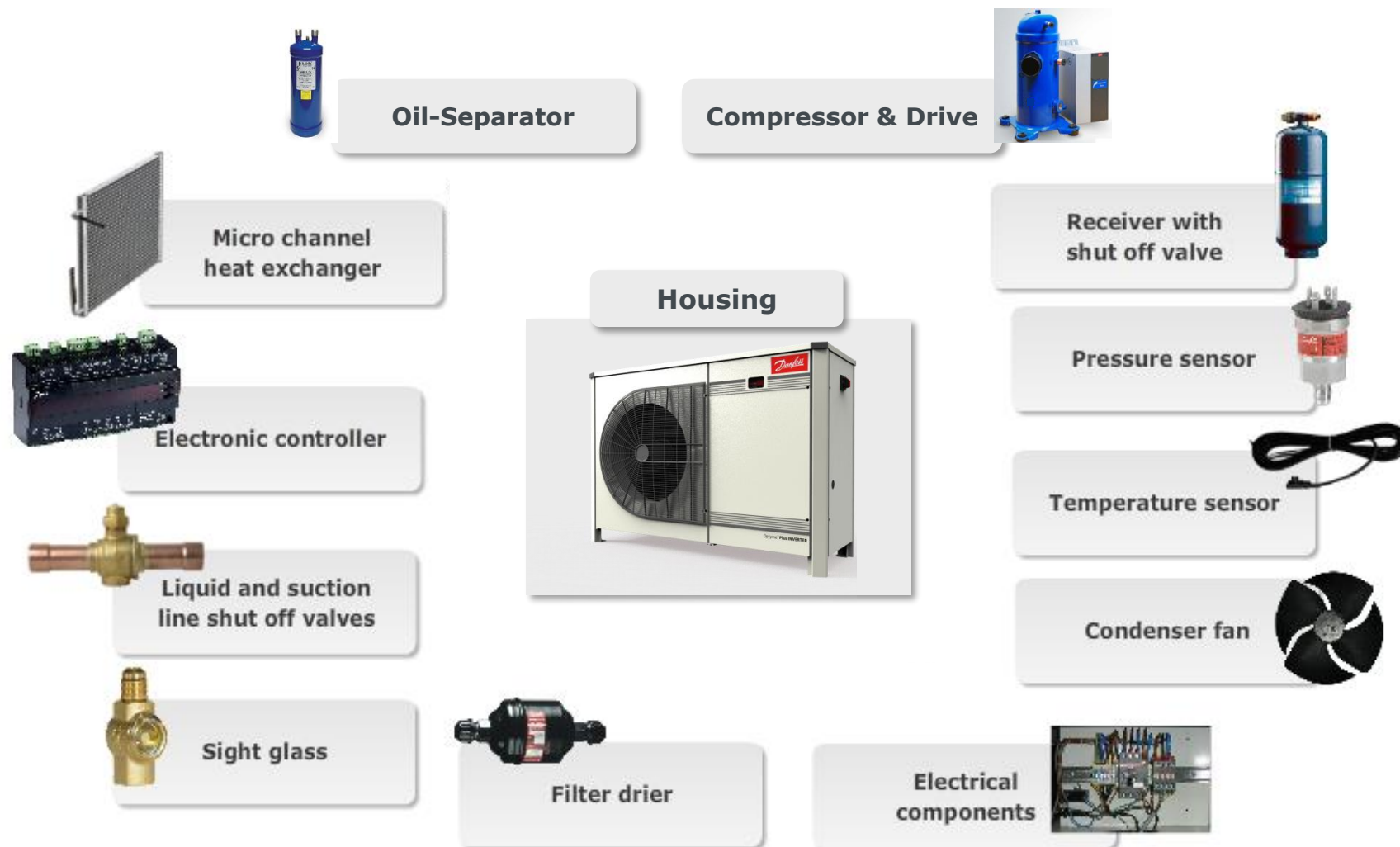
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# Optyma™ **Plus INVERTER**

Examples of applications



# Optyma™ Plus INVERTER Components



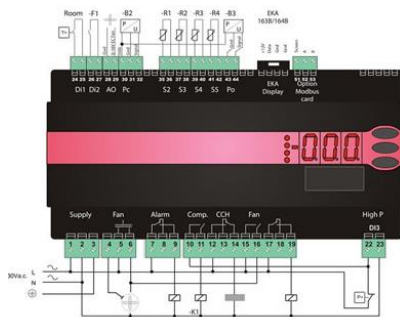


# Optyma™ Plus Controller

Based on the AK-CC550 platform

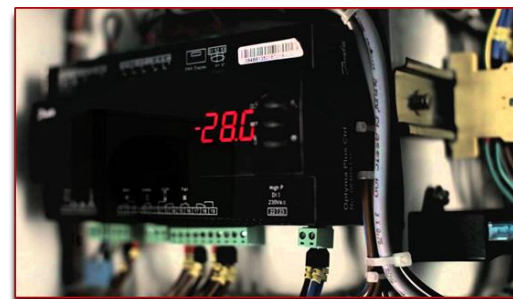
Modbus communication with our ADAP-KOOL® front-ends

## Features:



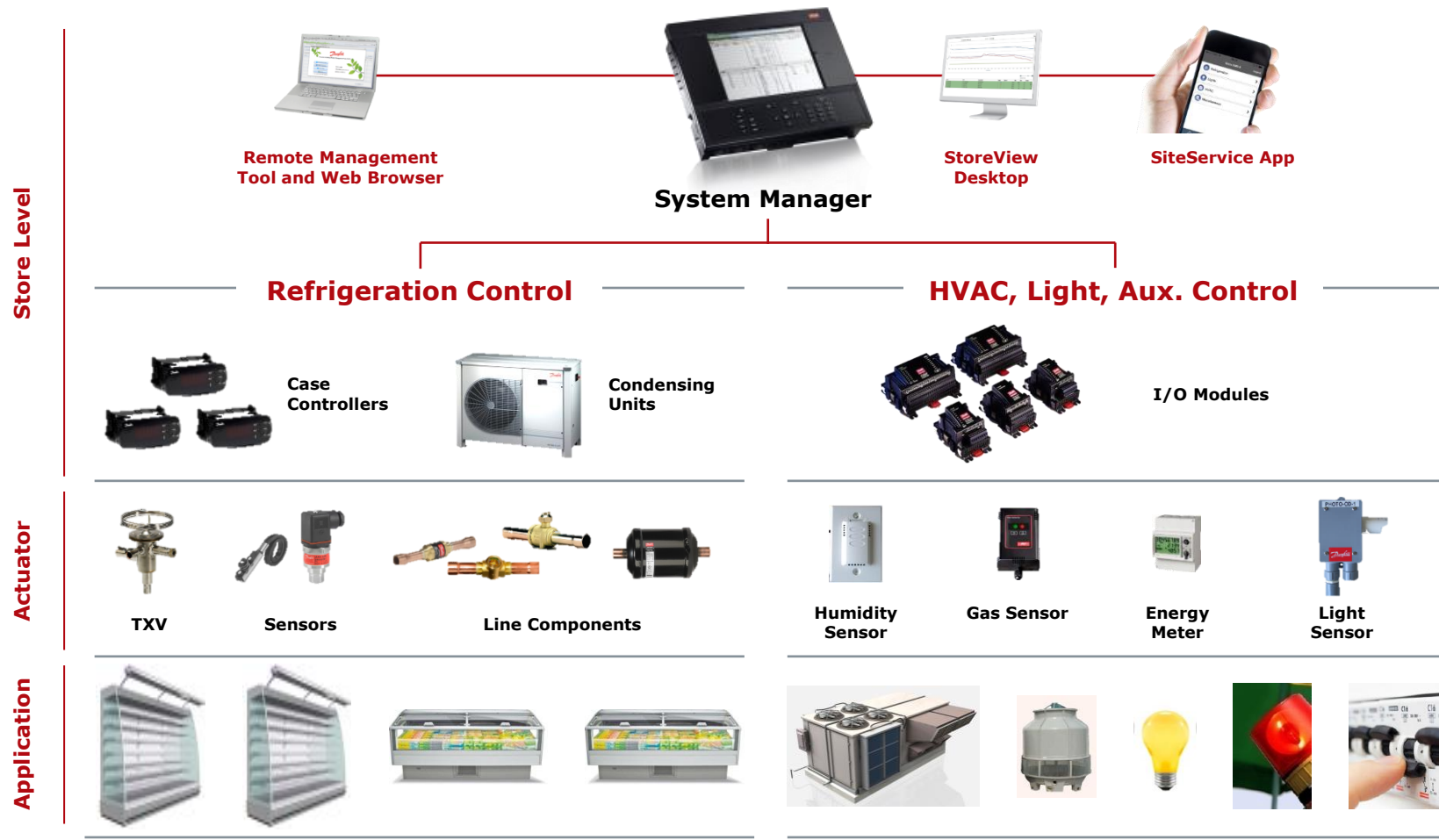
- Monitor pressures, temperatures, superheat
- Display alarms, status
- Control the condenser fan and compressor speed
- Control the crankcase heater load
- Day and night schedule for maximum condenser fan and compressor speed
- Remote alarm
- Remote display / setting modules
- Connect to ADAP-KOOL® front-ends via Modbus or optional LON-Bus module

## Benefits:



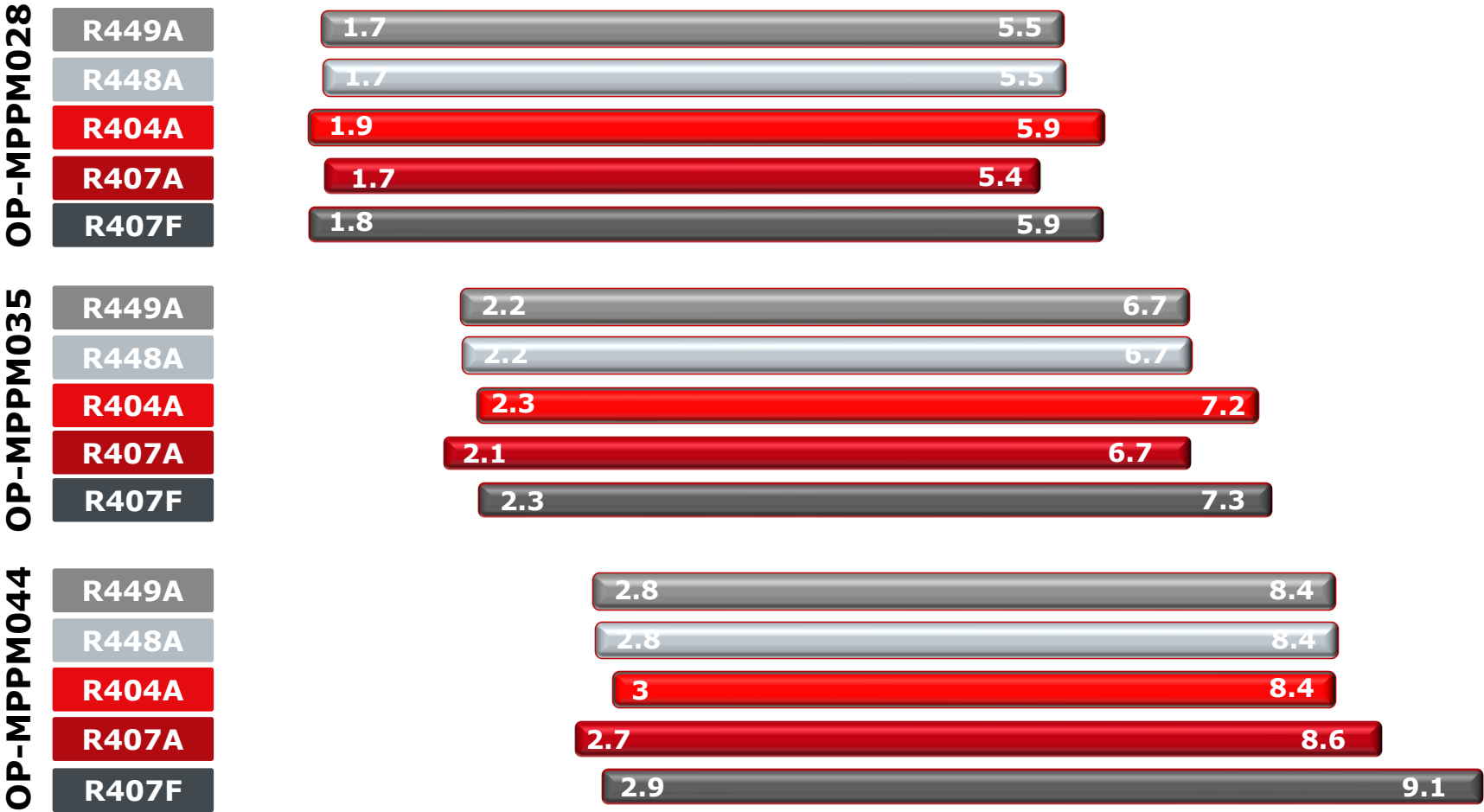
- Faster and easier installation
- No need to connect gauges or instruments
- Reduced risk of installation error
- Energy saving
- Additional temperature input
- Increased business opportunities

# Connectable to Danfoss System Manager



# Cooling Capacity Range MBP in kW

## 1800 rpm to 6000 rpm



Conditions: -10 °C evaporating temp, +32°C ambient temp., superheat 10K, subcooling 0K  
Note : Smallest Evap Capacity should atleast be equal to Minimum Capacity of Condensing unit for stable performance

# Optyma™ **Plus INVERTER** Features and Benefits:

Capacity modulation and best **energy efficiency** in a simple **Plug and Play** package

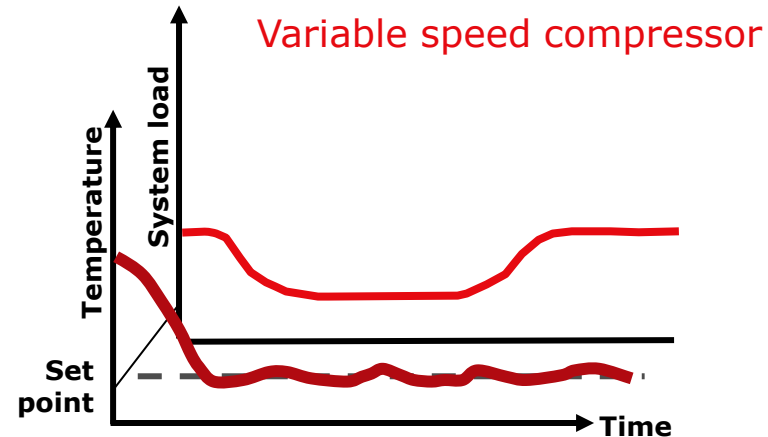
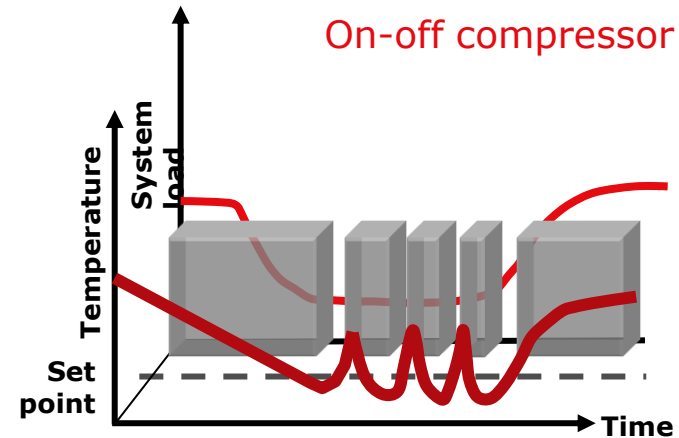
Features and benefits	
<b>End Users &amp; Consulting Engineers</b>	<ol style="list-style-type: none"><li>1. Better food preservation</li><li>2. Best energy efficiency</li><li>3. One CU for several cabinets</li><li>4. Compliant to F-Gas and LGWP refrigerants</li><li>5. Reduced refrigerant charge</li><li>6. Long lifetime</li></ol>
<b>Installers</b>	<ol style="list-style-type: none"><li>1. Peace of mind, reliable solution</li><li>2. Optyma™ <b>Plus</b> simple to install &amp; serviceable</li><li>3. Extensive support</li></ol>
<b>Wholesalers</b>	<ol style="list-style-type: none"><li>1. Low complexity</li><li>2. High tier solution for demanding customers</li><li>3. Compliant to Eco design &amp; F-Gas</li></ol>



# Inverter driven stepless modulation

Compressor capacity **always matches cooling demand**

1. **Better food preservation:** accurate temp/humidity controls of cold rooms and display cabinets
2. **Best energy efficiency,** even with large variations in cooling demand
3. One CU for several cabinets with different cooling needs **reduces investment cost** and space
4. No on/off pressure cycling and transient losses



# Optyma™ **Plus INVERTER**

## Specific Components

- **Danfoss Inverter scroll compressor & drive**

- Smart Logic CDS compressor drive
- VLZ compressor with patented IDV concept for dedicated refrigeration application



No setting modification on the drive:  
Drive is slave of the controller, all settings  
done via Optyma™ Controller

- Oil boost at lower speed
- Limitation in case of high Discharge Temperature
- Speed boost at low load condition at high ambient
- Reduce speed during night period

- **Oil Separator**

- Secure safe operations with multiple evaporators

Note : The use of RCD type B is required in combination with frequency drives

# Intermediate Discharge Valves

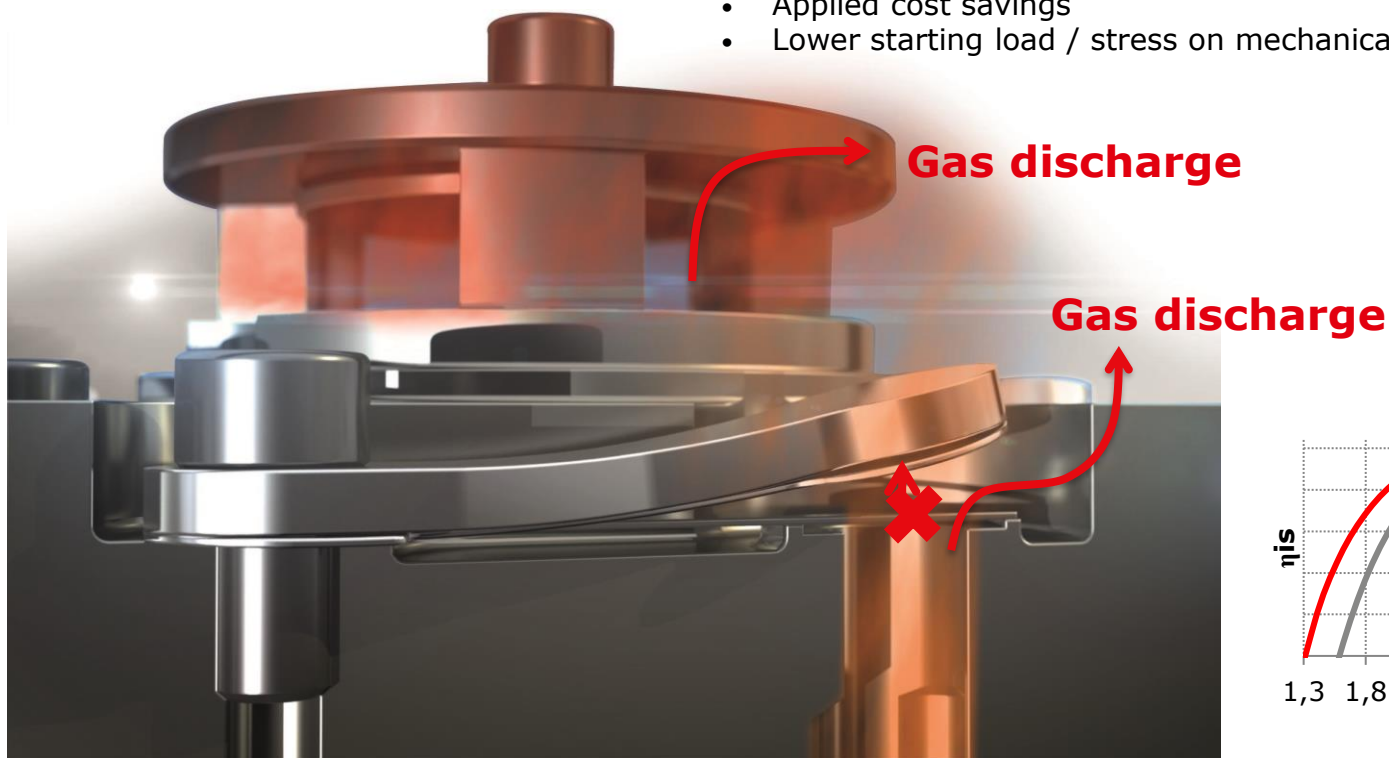
## Enhanced Part-Load Efficiency



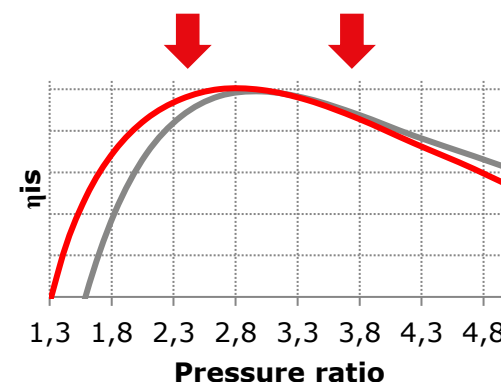
**Description:** Mechanical valve that reduce over compression of the refrigerant at low pressure ratio (part-load conditions) as they release the compressed refrigerant before the built-in pressure ratio.

### Main Benefits

- This early release of compressed refrigerant avoids extra effort to the scroll and to the motor and reduces energy consumption of the motor.
- Applied cost savings
- Lower starting load / stress on mechanical parts



High Pressure Ratio:  
IDVs close



# Microchannel vs Fin & Tube

## Features

- > Saves up to ~80% of refrigerant charge with MCHE compared to F&T condenser
- > It is easy to clean dust/dirt from the MCHE without occurring any damage to fins
- > More resistant to corrosion compared to Fin & Tube: after 960Hrs of CCT tests only salt deposits are visible on the MCHE while the Fin & Tube is damaged
- > Stronger than Fin & Tube: fin surface does not damage easily and brazed fins provide greater strength
- > Safer: less risk to cut fingers on fins
- > High resistance to aggressive environments (ammonia, hydrogen sulphide, acid nitric, sodium hydroxide solution)
- > Less risk of refrigerant emissions or leakages

## Benefits

### Refrigerant cost saving



**2.9kg**

Less  
refrigerant for  
more savings

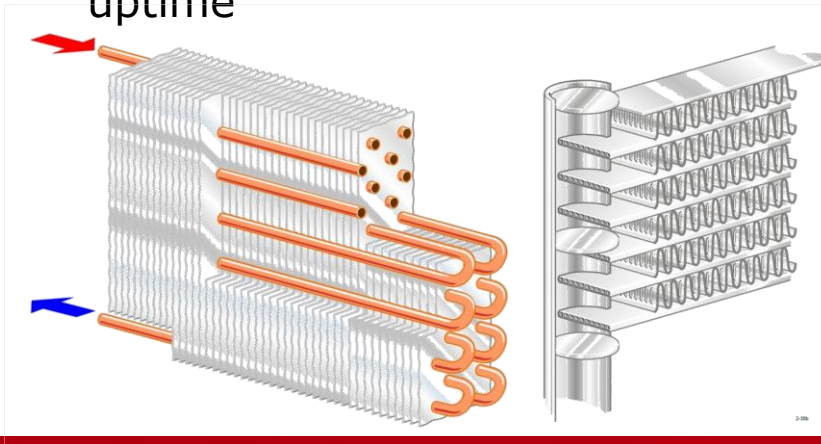


# Features & Benefits

## Features

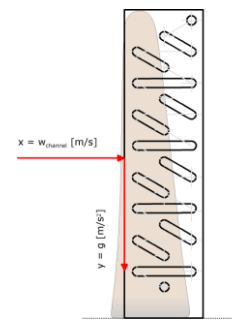
### Micros Channel condenser

- It is **easy to clean** dust/dirt from the MCHE without occurring any damage to fins
- Micro Channel Heat Exchangers (MCHE) are more efficient after cleaning compared to fin & tube ones
- Reduce maintenance and improve uptime



## Benefits

### Easy service



Fin & Tube

#### Dust/dirt

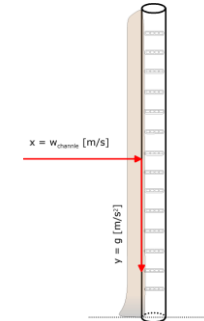
#### **Less visible**

Penetrates between fins

#### Cleaning

#### **Difficult**

Hard to remove dust/dirt between fins without damage.



MCHE

#### **Visible**

Accumulates on front

#### **Easy**

Brush and/or rinse front with water. Fins resist cleaning without damage.

# Features & Benefits

## Features

### Multi-refrigerant MLZ

- Units with MLZ Danfoss Scroll compressors are capable to work with multiple refrigerants (R134a, R404A/R507, R407A/F, R448/9A)
- All components are standard and available at wholesalers

## Benefits

### Stock optimization



# Features & Benefits

## Features

- Acoustic damping foam for quiet operation
- Low noise fan: day/night operation of fan speed controller.
- Fan speed controller to secure low speed rotation during low load & night
- Fan blade shape highly optimized for noise reduction
- Separate compartments for compressor & condenser airflow for noise reduction

## Benefits

### Quiet operation



# Cold Room Selection Software

Valves and Line Components

Components in Series

Commercial Applications

Industrial Applications

Compressors and Condensing Units

Electronic Controls

Sensors and Switches

Custom Applications

Coolselector2 - Untitled.cspj

File Options Tools Help About

Selections Report Bill of Materials

Search for product, code number...

Sync Operating Conditions Copy Selection Screen Dump


Cold Room - Step 1 of 5: Load Wizard

The following steps will help you calculate the required cooling capacity for a Cold Room.  
Using the Wizard will provide you with good default values, but you should always carefully review all values before using the results.

Use Wizard to Define Cold Room Load...

Manually Define Cold Room Load...

... You can always change values generated by the wizard in the next steps



Help

Wizard - Step 1 of 3: Dimensions and surroundings

Dimensions

Length: 6.00 m

Width: 5.00 m

Height: 3.60 m

Inner dimensions

Outer dimensions

Room surroundings:

Temperature of surroundings: 28.0 °C

Relative humidity: 55 %

Temperature below floor: 10.0 °C

Floor is insulated

Cancel

Next >

# Cold Room Selection Software

VALVES AND LINE COMPONENTS

COMPONENTS IN SERIES

COMMERCIAL APPLICATIONS

INDUSTRIAL APPLICATIONS

COMPRESSORS AND CONDENSING UNITS

ELECTRONIC CONTROLS

SENSORS AND SWITCHES

CUSTOM APPLICATIONS

Coolselector2 - Untitled.cspj

File Options Tools Help About

Selections Report Bill of Materials

Search for product, code number...

Sync Operatin

Cold Room - Step 2 of 5: Review Cold Room Load

The inputs below are necessary to calculate the required cooling capacity of the Cold Room:

Length: 6.00 m

Width: 5.00 m

Height: 3.60 m

☒ Inner dimensions

☐ Outer dimensions

Room conditions:

Temperature: -18.0 °C

Relative humidity: 85 %

Operating hours: 17.1 h

Goods:

Fish, frozen

Quantity per day: 4000 kg

Inlet temperature: -13.0 °C

Respiration heat load:

Total mass in room: 20000 kg

Air exchange (infiltration):

Temperature: 28.0 °C

Relative humidity: 55 %

☒ Door openings:

Regular

☐ Air exchange rate: 4.81

(times room volume per 24 hours)

Heat transfer:

☒ Standard panels

☐ Custom panels

Type: Polyurethane

Thickness: 120.0 mm

Temperature of surroundings: 28.0 °C

Temperature below floor: 10.0 °C

☒ Floor is insulated

Additional loads

Lights: 240 W

Fans: 222.5 W

People: 2 h/day

Other: 0 W

☒ Defrost

☒ Electric

☐ Natural

Power: 2160 W

Defrosts per day: 3

Defrost time: 30 min

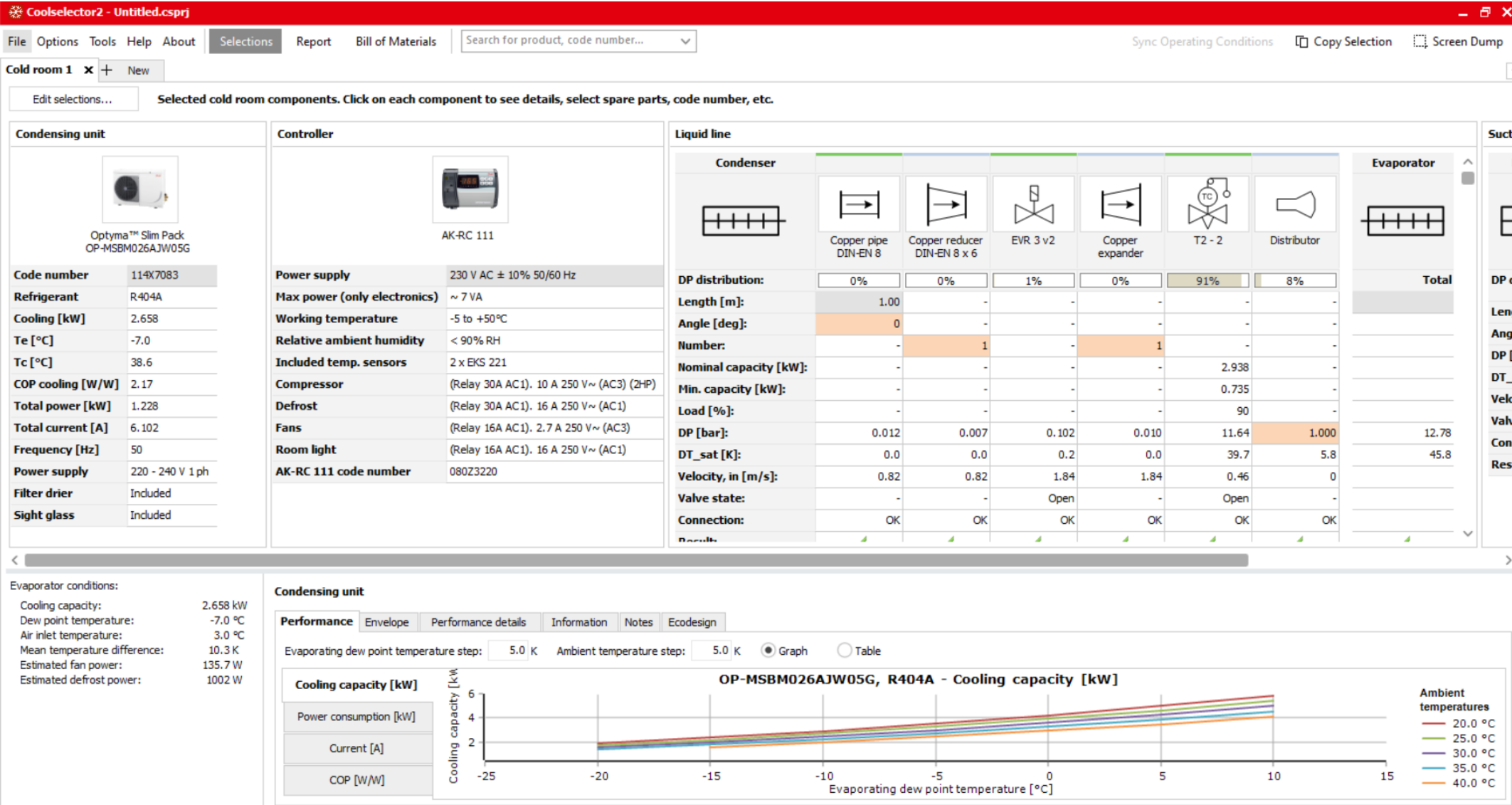
Help

< Prev

Next >



# Cold Room Selection Software



# Cold Room Selection Software

https://www.google.com/search?q=danfoss+coolselector&xsrf=ALiCzsZWrbGAJSQrz78CaOs786nPmWRyig%3A1665684478517&source=hp&e

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About 21,100 results (0.38 seconds)

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Coolselector®2: We did complex. You do awesome.

Mar 20, 2019 — Coolselector®2 is essential software for engineers, consultants, and system designers who work in the refrigeration and air conditioning ...



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Classified as Business

ENGINEERING TOMORROW





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