Industrial Refrigeration solutions

Products, systems, and expertise for efficient and reliable operation

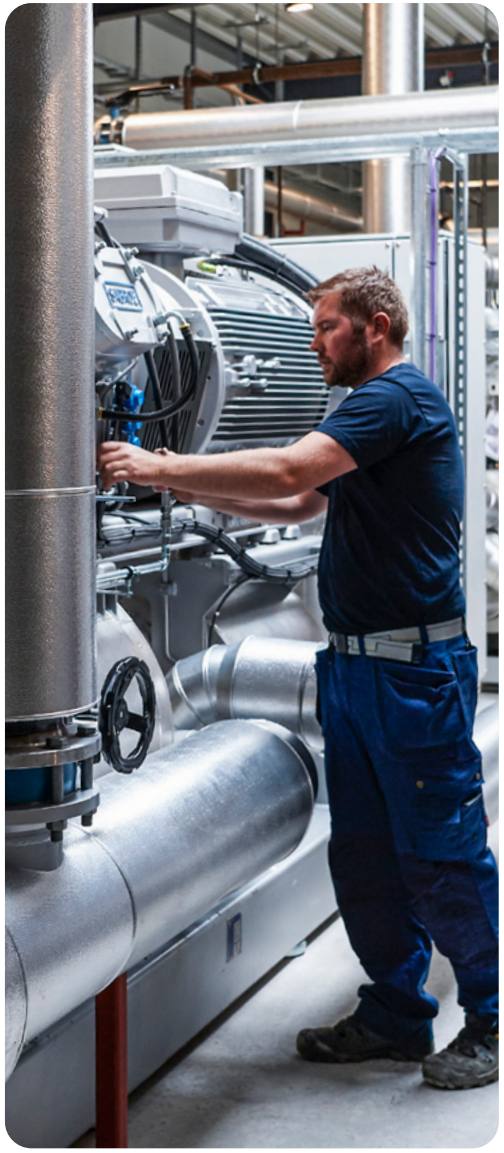
Industrial refrigeration

Danfoss Industrial Refrigeration safeguards food quality, ensures process stability, and supports energy-efficient operations in demanding industrial environments.

At Danfoss, we develop industrial refrigeration solutions that enable safe, efficient, and reliable system performance—today and in the future.

This E-brochure provides a clear, structured overview of our industrial refrigeration portfolio, bringing products, solutions, and application expertise together in one place.

Contents



Decades of expertise. Built for industrial performance.

For more than 80 years, Danfoss has developed Industrial Refrigeration solutions designed to ensure precise temperature control in demanding environments. Our solutions help protect food quality, improve food safety, and reduce food waste—while supporting reliable and energy-efficient operation.

Danfoss Industrial Refrigeration builds on deep application knowledge and strong expertise in natural refrigerants, with particular focus on ammonia (NH_3) and CO_2. Our comprehensive portfolio covers everything from core components to advanced controls and integrated solutions, enabling system designs that balance performance, safety, and total cost of ownership.

To support contractors and system designers, Danfoss also provides digital tools such as Coolselector®2, simplifying component selection, system calculation, and configuration.

Combined with system-level expertise, this helps reduce complexity across design, installation, and commissioning.

With Danfoss, customers gain a partner that understands the complete refrigeration system—and how to optimize it over time.

Danfoss Industrial Refrigeration

Danfoss Industrial Refrigeration solutions are applied wherever reliability, efficiency, and safety are essential. While system requirements differ, the need for stable, well-controlled refrigeration remains the same. Our application expertise and system-level approach enable consistent performance across a broad range of industrial environments.

Cold storage

Brewery

Slaughtering

Dairy

Frozen food

Fishery

District heating

Process heating

Chemical

Oil & gas

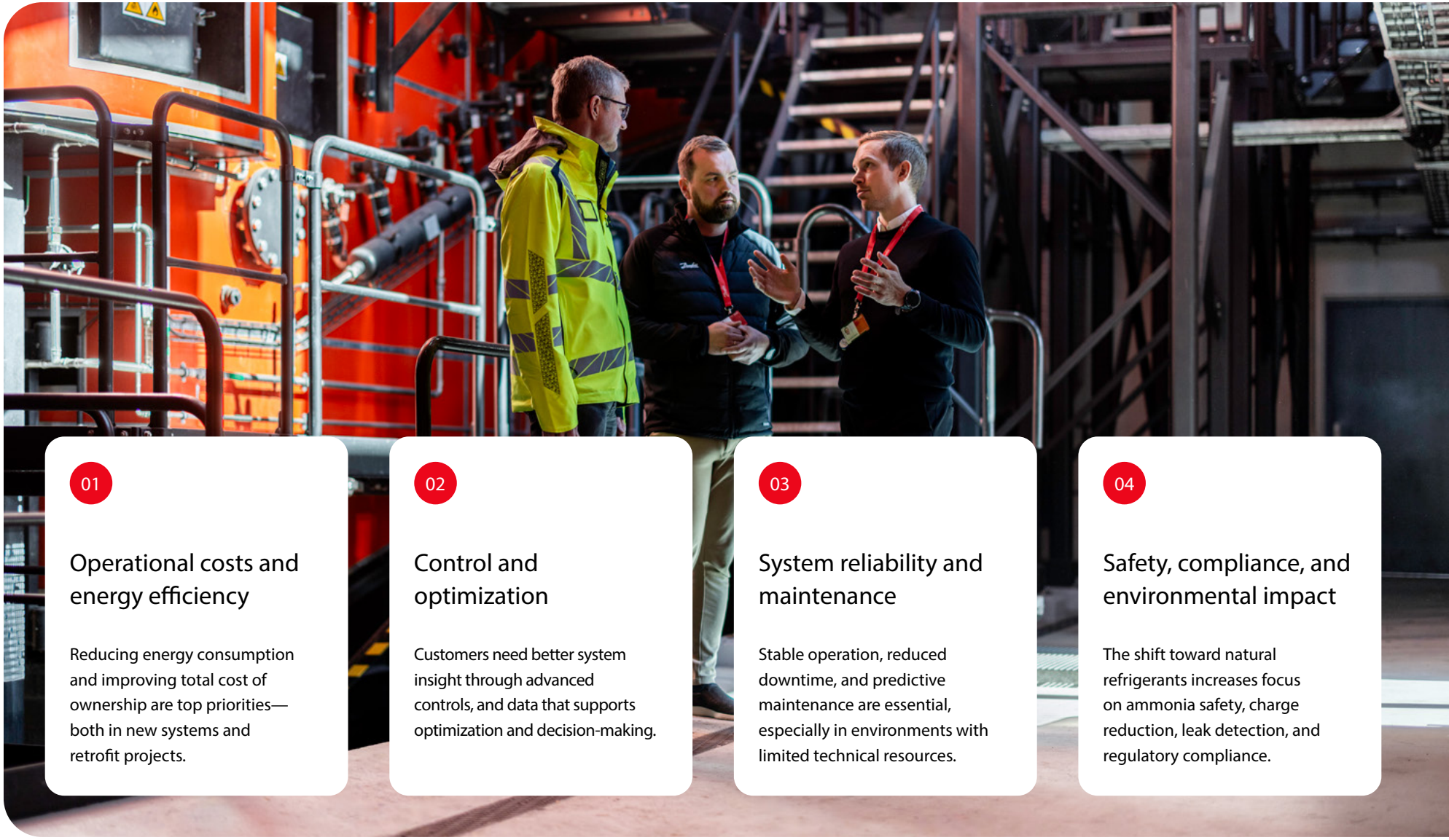
Shipbuilding

Customer realities. Clear priorities.

Industrial Refrigeration customers operate in a complex environment where performance, efficiency, and safety must be delivered consistently.

Across applications, four priorities define today's needs.

Danfoss develops Industrial Refrigeration solutions based on these realities—helping customers meet today's demands and prepare for the future.



01

Operational costs and energy efficiency

Reducing energy consumption and improving total cost of ownership are top priorities—both in new systems and retrofit projects.

02

Control and optimization

Customers need better system insight through advanced controls, and data that supports optimization and decision-making.

03

System reliability and maintenance

Stable operation, reduced downtime, and predictive maintenance are essential, especially in environments with limited technical resources.

04

Safety, compliance, and environmental impact

The shift toward natural refrigerants increases focus on ammonia safety, charge reduction, leak detection, and regulatory compliance.

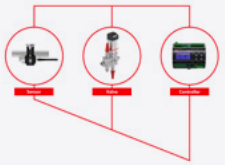
One portfolio.
Designed for every level of system complexity.

Automation and system complexity

Solutions and subsystems

Solutions


IPS 8


NeoCharge

Advanced control components

High End (ICF & EC)


ICF


Electronic controls


AKS 4100


LLS

Automatic system controls

Automatic regulating valves


ICS + Pilots


ICLX

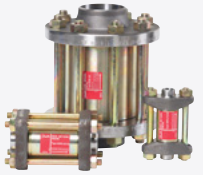

EVRA/T


ICM

Basic components

Manual & Safety Valves


SVL


NRVA

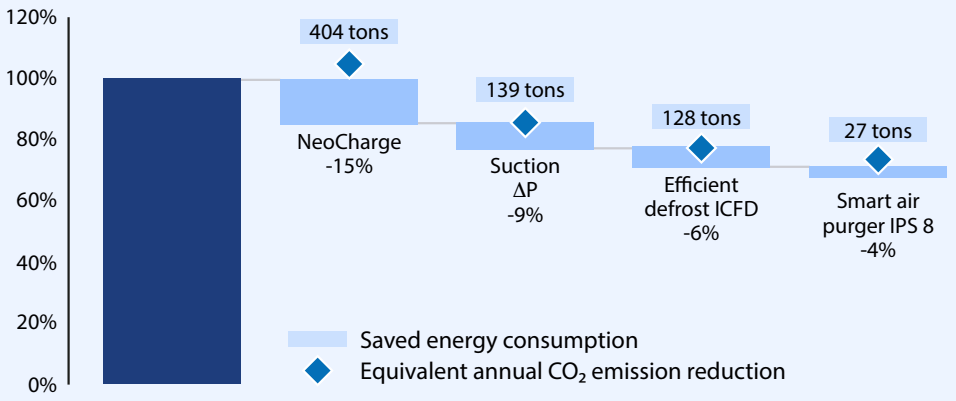

Safety valves

Energy efficiency starts with understanding energy consumption

Danfoss Industrial Refrigeration solutions are applied wherever reliability, efficiency, and safety are essential. While system requirements differ, the need for stable, well-controlled refrigeration remains the same.

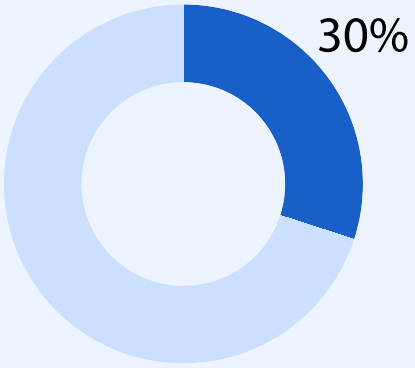
Our application expertise and system-level approach enable consistent performance across a broad range of industrial environments.

Energy savings in DX system with Danfoss Solutions



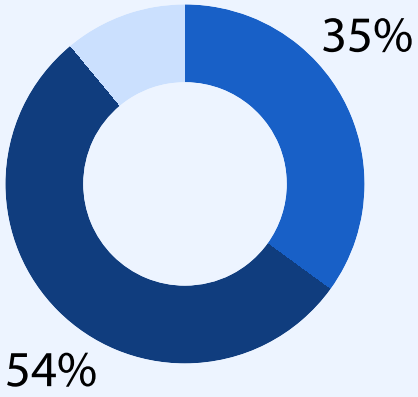
Up to **35%** reduction in energy consumption

Global electricity consumption



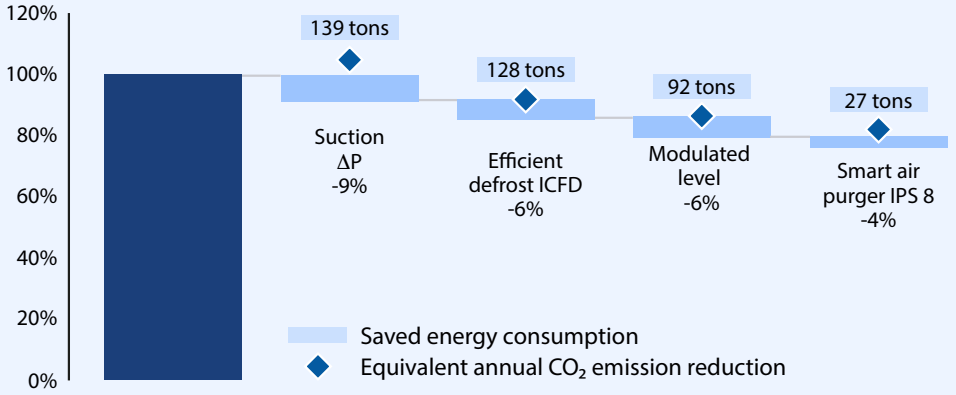
Food & Beverage Industry

Refrigeration energy consumption of energy bill[1,2]



Food processing Cold storage

Energy savings in recirculated refrigeration systems with Danfoss Solutions



Up to **700** metric ton of annual equivalent CO_2 emission reduction

1. Specific energy consumption values for various refrigerated food cold stores, I.A. Evans et.
2. Cold storage facilities energy savings guide, EnergyTrust of Oregon.

Key energy saving potentials in Industrial Refrigeration systems

Energy consumption in Industrial Refrigeration systems is driven by a few critical processes across the system. By addressing these areas directly, significant and measurable energy savings can be achieved without compromising reliability or safety.

Roof

Intelligent air purger - IPS 8

Reduced compressor load and energy consumption through on-demand air and non-condensable gas removal

Cold room/freezer

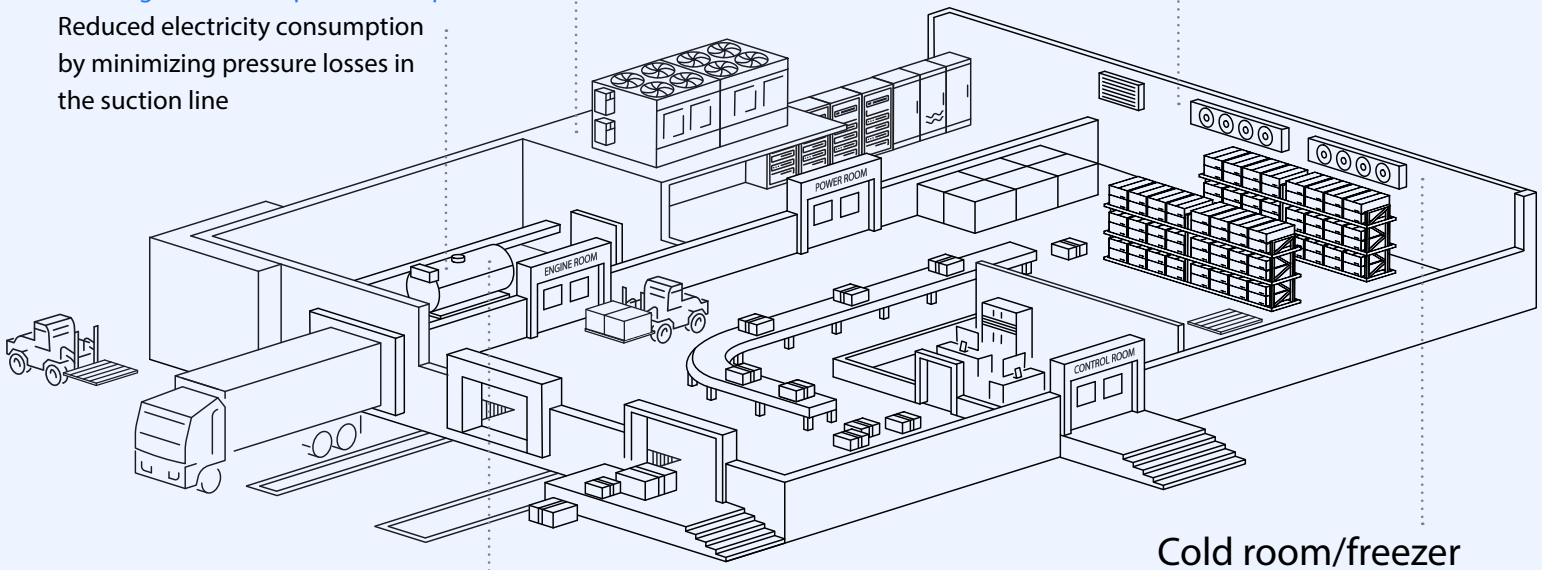
NeoCharge

Reduced energy consumption and refrigerant charge through optimized flow regulation

Engine room

Averting suction line pressure drop

Reduced electricity consumption by minimizing pressure losses in the suction line



Engine room

Modulated liquid level in pump separator

Improved energy efficiency through stable and precise liquid level control

Cold room/freezer

Liquid drain hot gas defrost - ICFD

Reduced power consumption and evaporator downtime through rapid, demand-driven defrosting

IPS 8 Air Purger

Air and non-condensable gas removal – reducing hidden energy losses

Air and non-condensable gases reduce heat transfer efficiency and increase condensing pressure, forcing compressors to work harder and consume more energy. The stand-alone, intelligent IPS 8 air purger removes air and non-condensable gases on demand, ensuring stable operation and improved energy efficiency.

Challenge

Air and non-condensable gases accumulate in the system, increasing condensing pressure and compressor workload.

Target

Efficiently remove air and non-condensable gases to reduce energy consumption and improve system efficiency.

Solution

The stand-alone, intelligent IPS 8 air purger:

- Purges on demand, using energy smartly
- Removes air from multiple accumulation points in the system
- Supports 8 purging points, expandable to 16 via an extension box
- Eliminates oil management through its own integrated cooling system
- Excellent retrofit solution with only one mechanical integration point

1. Calculation based on assumed 615kW high stage power consumption with 0.3 load coefficient and 1°K subcooling improvement.

Case story

Automated air purging reduces electricity consumption by 7%

A leading Brazilian meat processing company experienced rising energy consumption after commissioning a new –35°C freezing tunnel. The existing manual air purging system was no longer able to maintain efficient operation.

The challenge

Air and non-condensable gases accumulated in the system, increasing energy consumption. The manual purging system was unable to compensate for the higher load of the new freezing tunnel.

The solution

Danfoss implemented the IPS 8 intelligent air purger, enabling automated, on-demand removal of air and non-condensable gases based on actual system conditions.

The result

- The automated solution applied:
- 7% reduction in electricity consumption
- Improved operational stability
- Enhanced system safety

"The Danfoss air purging system is practical and intelligent, operating in an automated and optimized way.
We are very satisfied with the result."

↑ Customer M.E.

ICFD defrost module

Efficient defrosting – reducing unnecessary energy losses

Inefficient defrosting wastes large amounts of energy and reduces evaporator availability. Precise control of the defrost process is essential to minimize losses and maintain system performance.

Challenge

Air coolers operating below freezing accumulate ice, blocking heat transfer surfaces and reducing cooling capacity. This forces compressors to work harder and increases energy consumption.

Target

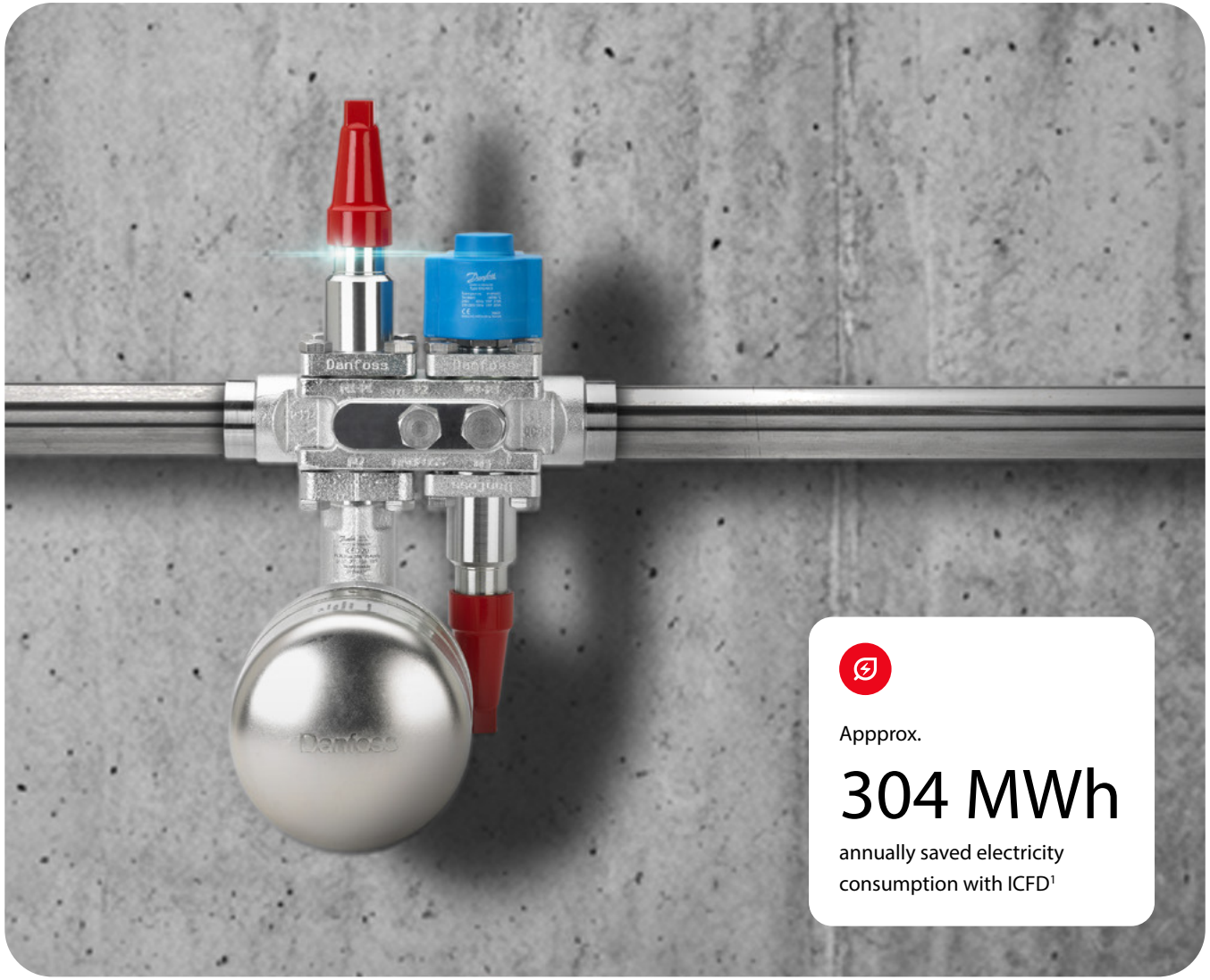
Remove ice efficiently while minimizing hot gas bypass, energy waste, and evaporator downtime.

Solution

Unlike conventional defrost systems that continue running beyond actual need, the ICFD shuts down defrost precisely when it is no longer required—preventing unnecessary energy consumption and compressor load.

The ICFD drain float control:

- Ends the defrost cycle immediately after all ice is removed
- Significantly reduces bypassed hot gas, avoiding unnecessary energy waste
- Shortens defrost time and improves evaporator availability

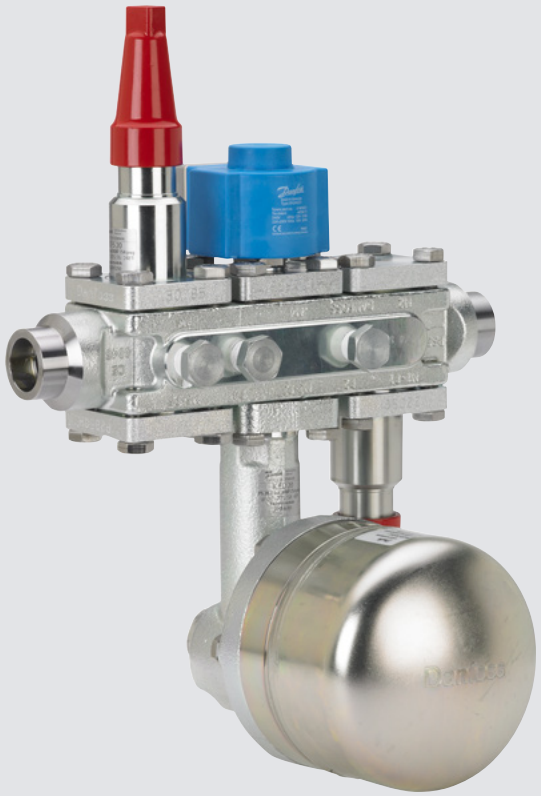


Appprox.

304 MWh

annually saved electricity consumption with ICFD[1]

*1. Assumption of a facility sizing 400 TR evaporator capacity, 3*30min defrosting per day.*



Appprox.

15%

of total refrigeration plant energy consumption saved

Case story

ICFD reduces defrost energy consumption by approximately 15%

Efficient defrosting can significantly reduce energy consumption without compromising cooling performance.

The challenge

The customer was looking for a way to reduce energy consumption during the defrost process. After achieving good results with ICFD on ammonia systems, they decided to test the solution on a CO_2 installation.

The solution

Danfoss implemented the ICFD float drain hot-gas defrost module, enabling precise control of the defrost process. Defrosting stops automatically as soon as all ice is removed, minimizing unnecessary hot gas flow and energy consumption.

The result

The ICFD solution applied:

- Approximately 15% reduction in total refrigeration plant energy consumption
- Payback time of 1 year and 7 months, including valve stations and installation
- Annual electricity savings of approximately 700 EUR per evaporator
- Reduced defrost time due to significantly lower hot gas flow

Precise liquid-level control – stable operation with lower energy consumption

Stable and accurate liquid feed is essential for efficient and reliable Industrial Refrigeration system operation.

Challenge

On/off liquid-level control in recirculated systems causes unstable operation, leading to energy losses and increased risk of liquid refrigerant returning to the compressor.

Target

Ensure steady and accurate liquid feed to improve energy efficiency while protecting system reliability.

Solution

Compared to on/off control, precise modulation delivers a more efficient and stable refrigeration process.

Modulated liquid-level control:

- Maintains operation close to the desired setpoint instead of oscillating above and below
- Reduces energy consumption through stable evaporator performance
- Improves system reliability by preventing liquid carryover to the compressor

Up to

6%

energy savings compared to ON/OFF control

NeoCharge >

NeoCharge – reducing system charge without compromising efficiency

Reducing refrigerant charge without sacrificing control or efficiency is a key challenge in modern Industrial Refrigeration systems.

Challenge

Modern refrigeration systems are efficient, still extra energy is used to prepare the refrigerant for the compressor (“superheat”). Depending on the design, this also results in extra refrigerant charge required to operate the system, causing safety and regulatory issues.

Target

To reduce ammonia system charge in the most efficient and reliable way.

Solution

The NeoCharge solution feeds each evaporator with the right charge required in any condition.

NeoCharge flow regulation:

- Decreases energy consumption by reducing superheat to zero while maintaining steady control
- Decreases recirculating ratio to near 1:1 thus reducing system charge

NeoCharge system architecture and control principle

NeoCharge enables precise refrigerant flow control by dynamically adjusting injection at evaporator level.

How NeoCharge works

Traditional systems rely on manual regulating valves without sensors, requiring excess refrigerant circulation and leading to high recirculation rates and liquid returning to the system.

NeoCharge introduces sensor-based control, measuring vapor quality at the evaporator outlet and dynamically adjusting the motorized valve to match actual load conditions. This ensures that injected refrigerant is fully evaporated.

By regulating vapor quality instead of temperature, NeoCharge shifts control from fixed setpoints to dynamic, load-dependent regulation, enabling stable operation at zero superheat while maintaining compressor protection.

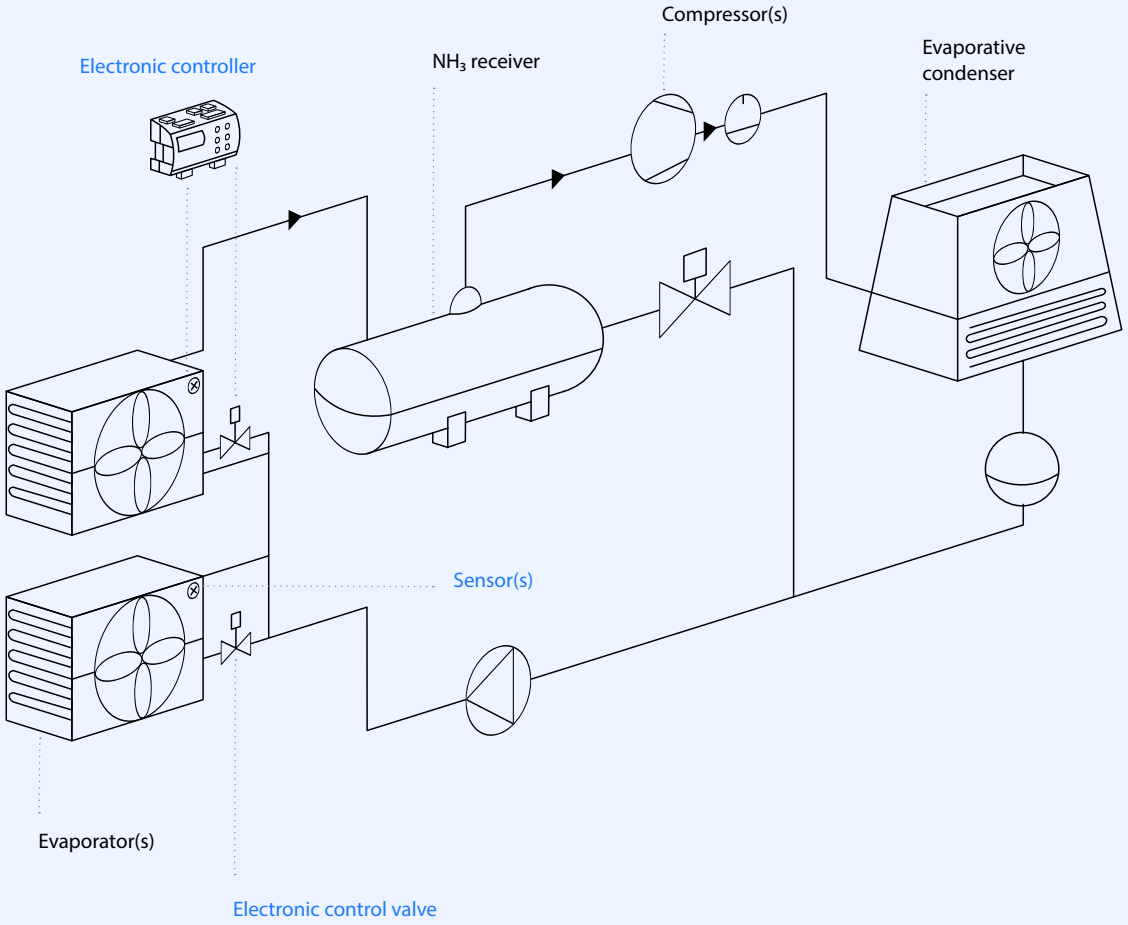
NeoCharge system components

Valve

Controller

Sensor

Controlled Circulating Rate



NeoCharge benefits – reducing charge, energy consumption, and system footprint

NeoCharge delivers measurable benefits by combining precise flow control with flexible system integration across new and existing Industrial Refrigeration systems.

Up to 40% refrigerant charge reduction

Improves safety, compliance, and confidence in system operation.

Lower energy consumption

Precise flow control reduces energy losses and operating costs.

Increased system capacity

Enables up to 40% capacity expansion without increasing total charge.

Flexible for new and existing systems

Applicable in both overfed and direct expansion designs, including retrofits.

Reduced system footprint

Lower charge allows smaller separators, piping, and overall system size.

Case story: YinLi Storage Park

Large-scale cold storage

Challenge

A highly complex cold storage facility with 64 air coolers across two 30-meter-high buildings needed to keep total ammonia charge below 10 tons while maintaining stable performance across multiple floors and load conditions.

Solution & result

NeoCharge enabled precise liquid flow control to each evaporator, reducing total system charge to less than 7 tons without impacting performance. Stable operation was achieved throughout the entire facility.

Case story: Perry's Ice Cream

Food processing

Challenge

A newly installed spiral freezer was unable to reach the required low air and evaporating temperatures. Despite operating at very low evaporating temperatures, system performance was unstable, resulting in low throughput of ice cream bars and increased energy consumption.

Solution & result

By retrofitting the freezer with NeoCharge, refrigerant flow was precisely controlled, stabilizing evaporator operation at lower temperatures. This enabled significantly improved performance and nearly tripled production output, reaching 22,500 ice cream bars per hour.

Case story: Sofrilog

Cold storage and freezing

Challenge

Sofrilog aimed to expand the cold room and freezing capacity of its ammonia-based refrigeration system while keeping the ammonia charge below 1.5 tons, maintaining performance and minimizing costs.

Solution & result

Sofrilog partnered with Danfoss to retrofit the system with NeoCharge injection control, upgrading air coolers and freezing tunnels. The solution reduced recirculation and optimized ammonia charge, enabling expansion without additional refrigerant.

Industrial CO_2 refrigeration solutions >

Design it.
Build it. Trust it.

Enhance your projects and secure long-term reliability and energy efficiency with the industry's most comprehensive CO_2 product range and expertise.

Benefit from solutions designed to support the scoping, construction, and maintenance of systems proven to perform across a wide range of applications and climates.

Danfoss offers a complete CO_2 product portfolio engineered for high-pressure Industrial Refrigeration systems. The range supports safe system design, flexible integration, and reliable operation, helping reduce complexity while ensuring consistent performance across applications.

BOCK® compressor

AKS 4100

ICMTS

SVL 65 bar

ICV platform (ICSH, ICS, ICM/ICAD)

SNV

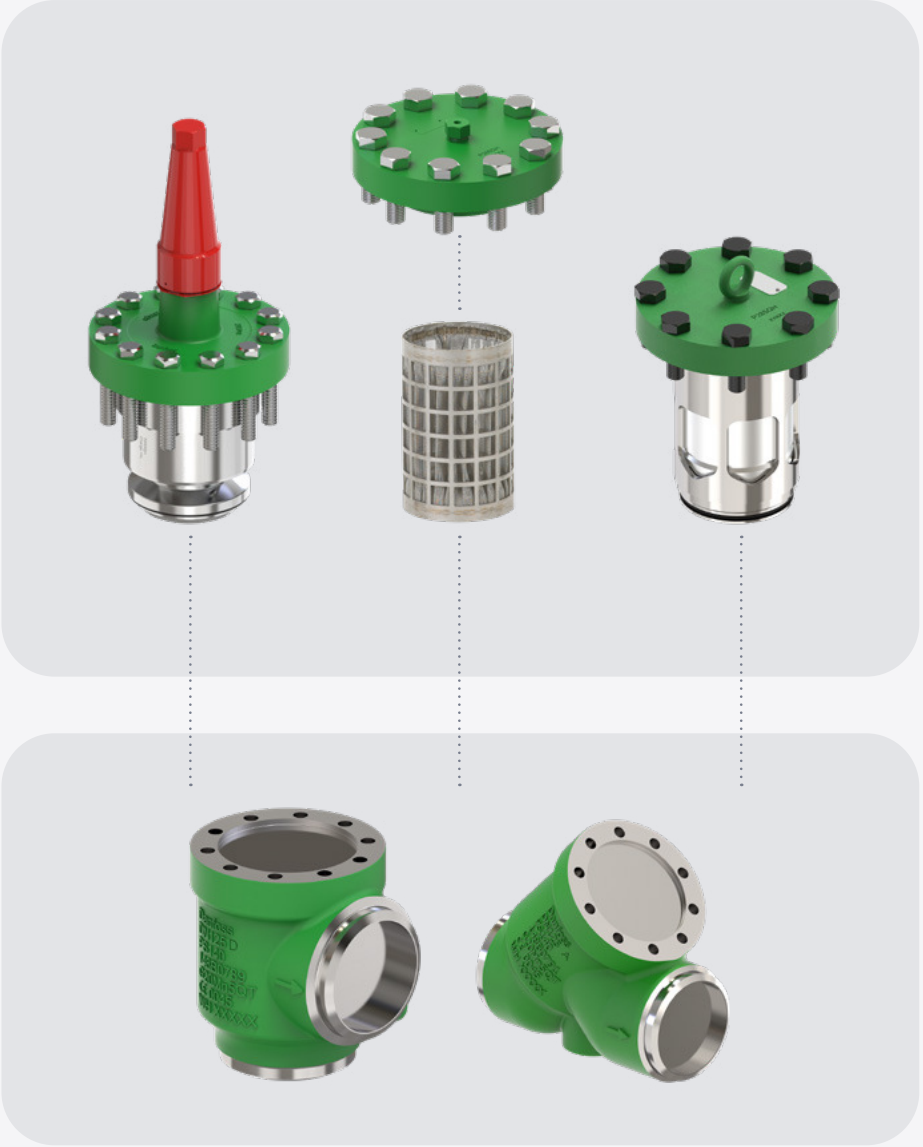
Semi hermetic filter drier

Large CO_2 ejector

Pump and level controller – EKE3470P

SVL-140B Flexline™

Simplify your large transcritical CO_2 system SVA-140B, FIA-140B and CHV-140B



Simplified design and installation

- Save additional valves, pipes, fittings, and brazing/welding
- Compact, space-saving solution
- Wide range of connection standards
- Reduced risk of leaks and rework

Balancing large differential pressures

- Smooth opening and closing of the shut-off valve
- Reduced mechanical stress on components

Operational reliability

- Designed according to industrial standards
- Serviceable platform that can extend product lifetime
- Saves time and costs when replacing valves

ICMTS 50 & ICMTS 80 >

Motor operated valve ICMTS 50/80 with ICAD 600B TS actuator

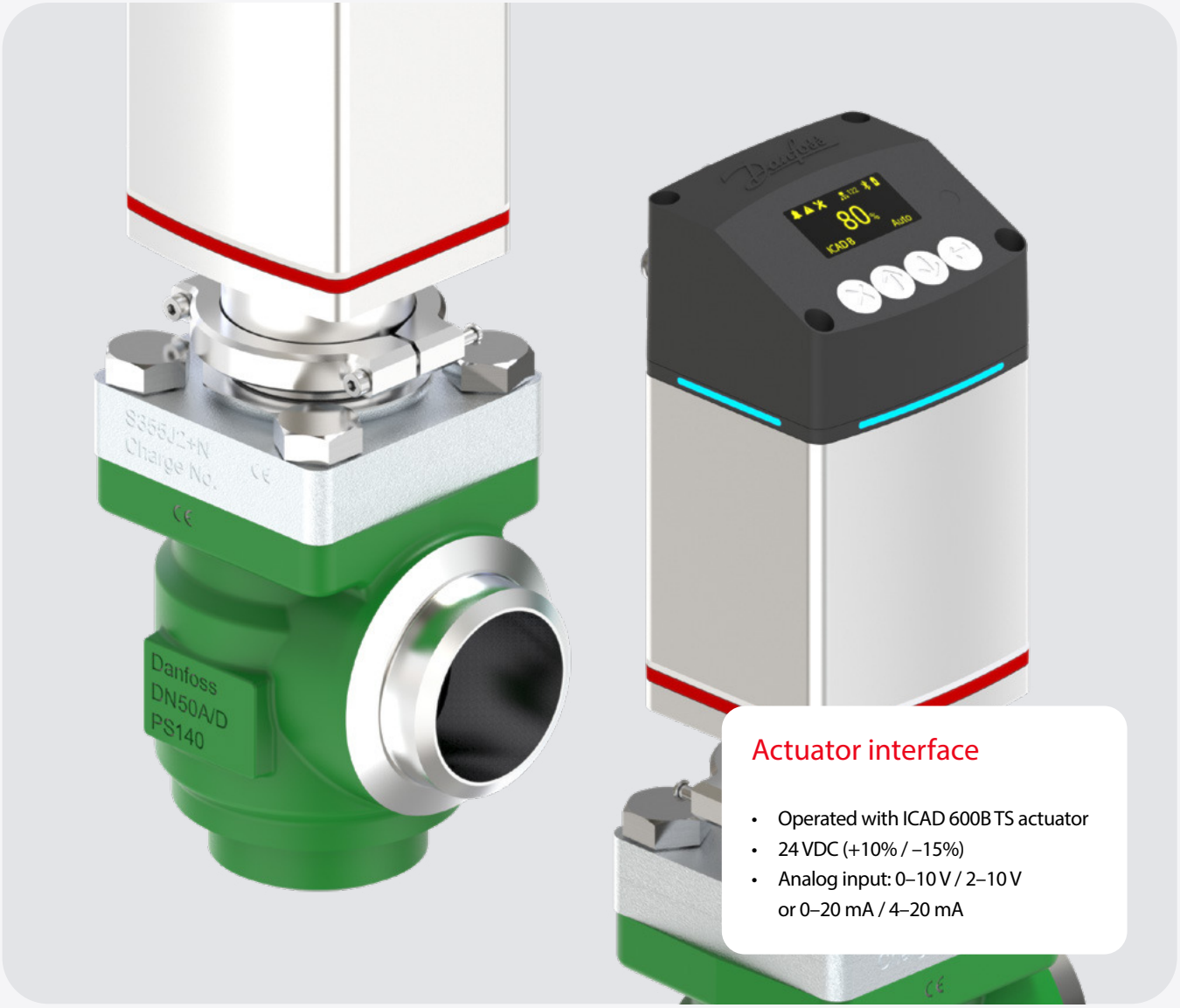
The ICMTS motor-operated valve is designed for reliable operation in high-pressure CO_2 systems, combining robust construction with precise control and service-friendly design.

Industrial specifications

- PTFE seat provides excellent valve tightness
- Balanced design for up to 90 bar opening pressure differential
- Fully serviceable design with replaceable valve seat
- Magnet coupling ensures true hermetic sealing
- No risk of trapped liquid inside the valve body when closed
- Full material traceability

General specifications

- Available in sizes DN 50 and DN 80
- Straight and angle valve body versions
- Buttweld and brazing connections
- Clear arrow marking for flow direction on valve body
- Refrigerant-neutral gasket between valve body and top part
- Pressure rating (PS) engraved in the valve body



Actuator interface

- Operated with ICAD 600B TS actuator
- 24 VDC (+10% / –15%)
- Analog input: 0–10 V / 2–10 V or 0–20 mA / 4–20 mA

Large CO_2 ejector improving system efficiency and capacity

Ejector technology enables higher capacity and improved efficiency in transcritical CO_2 refrigeration systems.

Product Highlights

- Increased efficiency for certain climates/conditions
- For large-capacity plants
- Unloads compressors and increases COP
  - HP lift 5–14 bar moves load from MT to IT
  - LP lift: MT suction pressure ~3 bar in booster systems
- Large capacity in a scalable platform
- Includes solenoid, check valve, and strainer

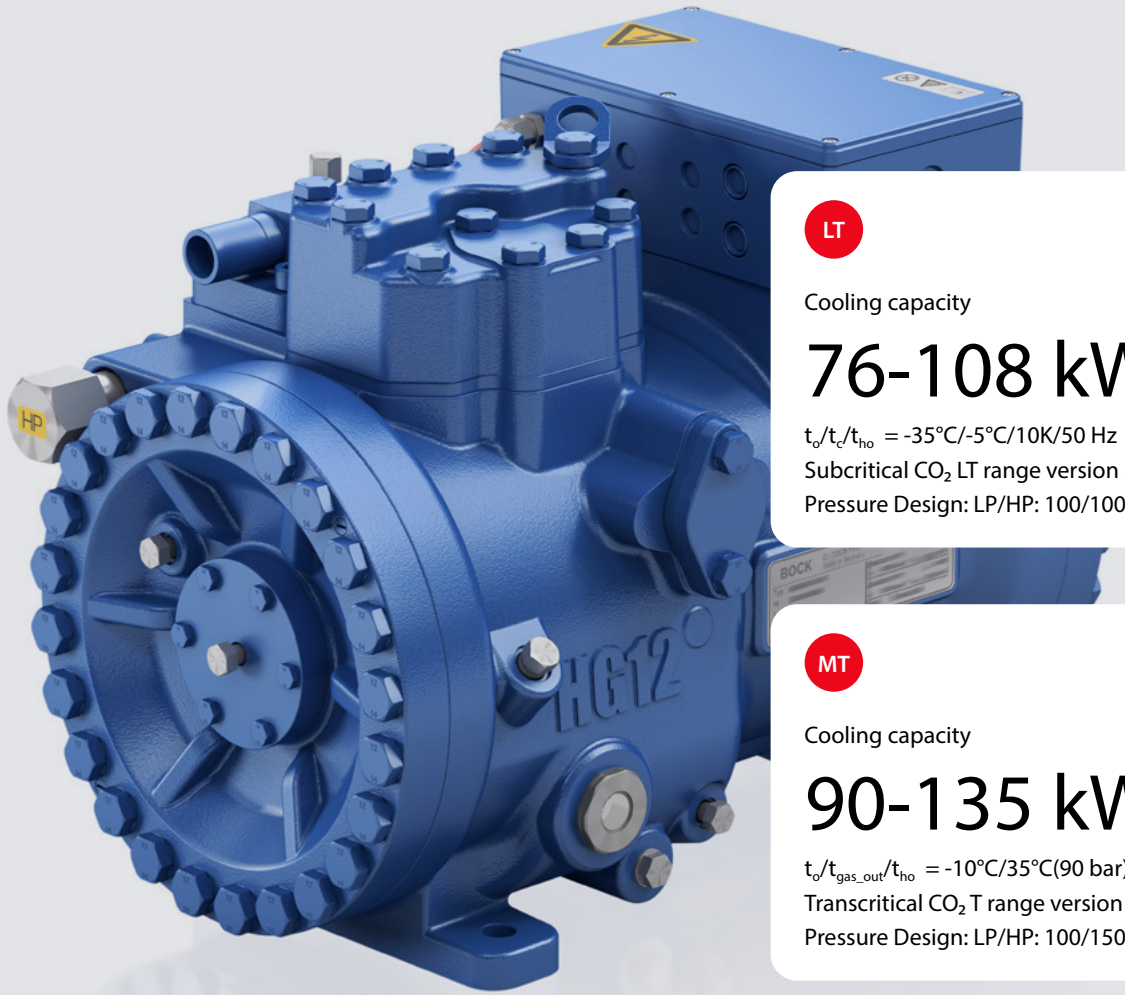
Max Working Pressure PS		140 bar
Allowable temperature TS		-40°C to +150°C
Operation Temperature		-30°C to +70°C
Capacity	LP 4000/8000 HP 8000/16000	4.400 / 8.800 kg/h 8.000 / 16.000 kg/h
MOPD		90 bar
Connection sizes		DN40, DN50 and DN65

BOCK® CO_2 Compressors >

BOCK® HGX56 CO_2 T compressor for a wide range of applications[1)]

[1)] Medium Temperature systems
Parallel Compressors
Heat Pump systems
Air Conditioning (chiller) systems
Low Temperature

Transcritical	Subcritical	m3/h (50 Hz)
HGX56/480 ML/S/SH CO_2 T	HGX56e/480 ML/S CO_2 LT	41.7
HGX56/540 ML/S/SH CO_2 T	HGX56e/540 ML/S CO_2 LT	47.1
HGX56/610 ML/S/SH CO_2 T	HGX56e/610 ML/S CO_2 LT	53.0
HGX56/680 ML/S/SH CO_2 T	HGX56e/680 ML/S CO_2 LT	59.1



LT

Cooling capacity

76-108 kW

$t_o/t_c/t_{ho}$ = -35°C/-5°C/10K/50 Hz
Subcritical CO_2 LT range version ML & S
Pressure Design: LP/HP: 100/100 bar

MT

Cooling capacity

90-135 kW

$t_o/t_{gas\_out}/t_{ho}$ = -10°C/35°C(90 bar)/10K/50 Hz
Transcritical CO_2 T range version ML, S & SH
Pressure Design: LP/HP: 100/150 bar

Gas detection

Gas detection solutions for Industrial Refrigeration

Danfoss gas detection solutions are designed specifically for Industrial Refrigeration systems to ensure early detection and safe operation.

Can detect a wide range of refrigerant gases, including:

- Ammonia (R717)
- CO_2 (R744)
- Fluorinated refrigerants: HCFCs and HFCs
- Hydrocarbons: Propane (R290), Butane (R600), and Propylene (R1270)

Available in three complete unit platforms:

Basic

Premium

Heavy Duty

Specs	Basic	Basic+	Premium	Premium+	Premium Flex	Premium Duplex	Premium Remote	Premium Uptime	Heavy Duty
Integrated relays			✓	✓	✓	✓	✓	✓	✓
Display					✓	✓	✓	✓	✓
Buzzer & light		✓		✓				✓	
Second sensor						✓			
Remote sensor (5m/16 ft.)							✓		
Integrated UPS								✓	
ATEX and IEC Ex certificated for electrical Ex protection									✓

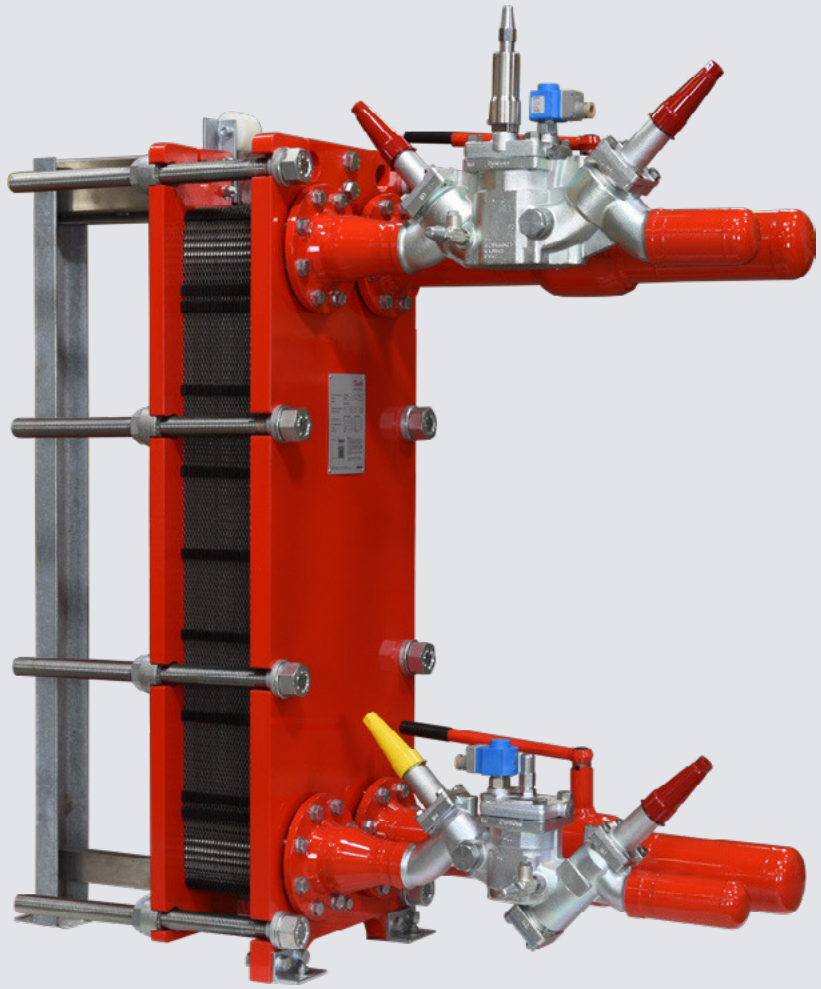
Semi-welded plate heat exchanger

Meet application needs with maximum performance

Designed for demanding Industrial Refrigeration environments, the semi-welded plate heat exchanger is optimized for ammonia applications and a wide range of natural refrigerant system functions.

Features and benefits

- Excellent heat transfer performance
- Reliable design ensuring operational safety
- Easy product configuration
- Comprehensive testing
- Part of a diversified product range for Industrial Refrigeration systems
- Comprehensive HE2 leak testing
- Optimization of overall system design



Product range

Includes sizes SW19–SW59, and supports temperatures from –40°C to 150°C (–40°F to 302°F) and pressures up to 40 bar (300 psi).

Industrial Refrigeration supporting software

Coolselector®2

Component selection and system calculation tool

Coolselector®2 helps optimize energy consumption and increase efficiency in HVACR systems. It enables unbiased calculations based on defined operating conditions—such as cooling capacity, refrigerant, evaporation temperature, and condensation temperature—and supports the selection of the most suitable components for system design. By reducing complexity, Coolselector®2 allows engineers to focus on efficient and reliable system solutions.

Features and benefits

- Comprehensive Industrial Refrigeration product selection
- ICF selection and calculation
- Complete line calculations
- Easy and flexible user interface
- Easy selection and simulation of components, including precise part-load calculations
- Advanced report generation with performance diagrams

Download here

CoolConfig

Configuration and settings management tool

CoolConfig ensures reliable copying and storage of settings. The tool allows project engineers to generate settings offline for the EKE 400/450 evaporator controller, IPS 8 Air Purger, LLS 4000, or ICAD B, and transfer the configuration file to the commissioning engineer at the appropriate stage of installation. It also enables commissioning engineers to download settings from devices already installed at a job site, modify them, and store them on a PC.

Features and benefits

- Easy setup or modification of settings for EKE 400/450 evaporator controllers, IPS 8 Air Purger, LLS 4000, or ICAD B on a PC
- Easy upload of settings to multiple EKE 400/450 evaporator controllers, IPS 8 Air Purger, LLS 4000, or ICAD B units
- Easy download of settings from devices installed at a job site, with storage on a PC

Download here

Explore our solutions
industrialrefrigeration.danfoss.com

Explore the Industrial Refrigeration knowledge hub

At Danfoss, we combine more than 80 years of Industrial Refrigeration experience with advanced technology to support reliable, energy-efficient, and environmentally responsible systems. We understand the complexity of Industrial Refrigeration and the importance of staying informed as technologies and requirements evolve.

Our Industrial Refrigeration knowledge hub provides on-demand access to technical insights, application knowledge, and practical resources—helping you stay up to date and make informed decisions throughout the lifecycle of your systems.

Visit knowledge hub here

Stay informed with Danfoss Digest

Our goal is to keep you informed and equipped with relevant knowledge to support your daily work.

By subscribing to Danfoss Digest, you gain access to selected updates on product launches, upcoming events, exhibitions, and relevant case stories within Industrial Refrigeration.

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