

Maximize efficiency and sustainability from case to cloud



Learn more at
smartstore.danfoss.com



Journey towards a
net-zero
supermarket

Stay efficient. Stay competitive.

Scalable solutions tailored for supermarkets.

Ongoing climate change and soaring energy prices have only increased the need for food retail to become more sustainable.

Already today, supermarkets account for around 3% of the total electricity used in industrialized countries, with refrigeration systems representing by far the largest share. And with the world's population expected to reach 10 billion people by 2050, reducing these numbers is essential for a sustainable future. Climate friendly and efficient heating and cooling represent a huge potential for supermarkets to reduce their operational costs while contributing to decarbonization and reducing food loss.

Our combined Smart Store supermarket and Danfoss Application Development Center in Nordborg is one big proof point of what that looks like.

Showcasing Danfoss heating and cooling solutions, the site is a real-time demonstration of how energy saving solutions work in real life. This includes utilizing CO2 refrigeration and capturing and reusing excess heat to provide heating for the supermarket itself and for the local community through district heating.

The DGNB and LEED-certified building is futureproof and designed to positively impact its surroundings inside and out—including ground source heating, a photovoltaic system on the roof, and biodiversity-boosting initiatives.

This eBook highlights our scalable, off-the-shelf solutions for supermarkets—spanning from sensors to cloud technology. Discover how these innovations can help you cut energy costs, reduce emissions, and prepare your supermarket for a more energy-efficient future.



Explore energy efficiency in retail



Learn how to energy-optimize your store



Five ways to maximize efficiency

Maximizing efficiency in supermarkets isn't a one-time fix. As societal demands evolve, so must the solutions that drive down energy consumption while ensuring reliable refrigeration.

We have identified five key technical strategies that, when combined, help supermarkets not only keep up but turn emerging challenges into opportunities.





Case control

Case controls boost refrigeration efficiency by balancing capacity and demand. This secures food safety without wasting energy on unnecessary cooling output.

Up to

12%

energy savings compared to other EEV case control solutions

Technologies:

- ADAP-KOOL® case control solutions
- Adaptive superheat
- Commissioning and service smartphone app

Benefits:

- Save energy without compromising food safety
- Connected solutions for optimum efficiency
- Save time during commissioning and service



Sustainable refrigeration

Choosing a refrigerant is a long-term commitment. Thanks to our new technologies, efficient CO₂ solutions are available for all climates and store sizes.

Energy savings up to

25%

with Multi Ejector and ADAP-KOOL® Pack Control solutions*

Technologies:

- Multi Ejector Solution™
- Pack control solutions and plug and play condensing units for small to large plants
- CO₂ Adaptive Liquid Management

Benefits:

- Keeping up with new regulations on refrigerants
- Energy-efficient CO₂ refrigeration in all climates
- Optimum pack control

* Depending on climate conditions



HVAC integration

Harness the benefits of integrated refrigeration, heating, air conditioning, and ventilation solutions—making supermarkets the new energy hubs.

90%

reduction in your heating costs

Technologies:

- Heat recovery
- Multi-pack systems
- Alsmart® programmable controllers

Benefits:

- Reduce complexity
- Recovered heat can be used for own heating purposes or sold to other premises
- One system for all your heating, cooling, and A/C needs



Monitoring and management

Automatic and remote monitoring services deliver cost savings through performance optimization, reduced energy consumption, and fewer service calls.

Up to

30%

reduction in service calls

Technologies:

- Alsense® cloud solutions
- Case-to-cloud connectivity
- ADAP-KOOL® System Manager
- Telemetry devices

Benefits:

- Lowest total cost of ownership
- Full transparency of all relevant assets across Danfoss and non-Danfoss controlled stores
- 24/7/365 alarm management
- Enhanced data security in the cloud



Smart energy

Smart energy can turn traditional supermarkets into the supermarkets of tomorrow by taking advantage of renewable sources, energy storage, and arbitrage.

Take a step towards a

net-zero

energy store

Technologies:

- Solar energy
- Demand response
- Car charging
- Electric and thermal storage

Benefits:

- Cut your energy costs
- Offer car charging to customers
- Become an energy producer
- Strengthen your green profile

Case control

Use smart refrigeration case control to **reduce** operating costs

To optimize refrigeration efficiency, it is important to match capacity to demand. Too much cooling, and you waste energy; too little, and you risk system damage and food loss. An adaptive case controller, like the Danfoss ADAP-KOOL® series, can balance refrigeration performance to the load. And our adaptive superheat control algorithm maintains the minimal stable superheat, so there is always just enough cooling.

As refrigeration technology gets more sophisticated, you can rely on the Danfoss ADAP-KOOL® Case Controls Solution to handle the complexity - optimizing efficiency and supporting valuable decisions. With a full range of controllers, Danfoss can offer an ADAP-KOOL® Case Controls Solution for both thermostatic expansion valves (TXV) and Electric Expansion Valves (EEV).



The name

ADAP-KOOL®

is a shortened adaptation of the phrase "adaptive cooling"



ADAP-KOOL® Case Controls Solution

Case Controls Solution for display cases takes user friendliness to the next level with an app that simplifies design, installation, service, and use.

The solution includes four products: case controller platform, electric expansion valve, pressure transmitter, and temperature sensor – all designed to work seamlessly as one system providing optimized performance, reliability, and energy efficiency.

[Learn more](#)



Case control

AK-CC55

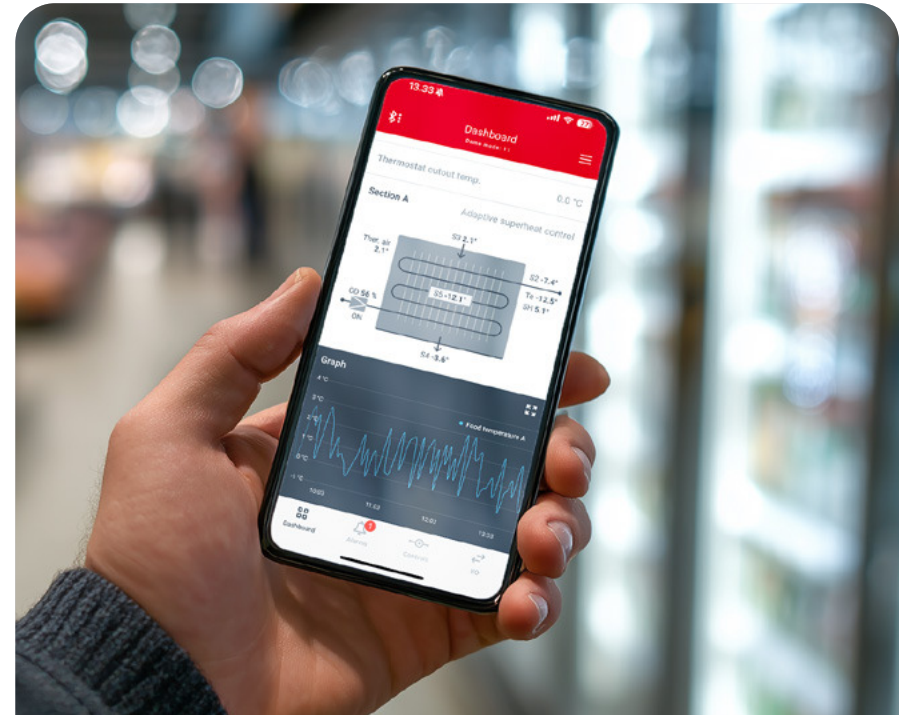
Superior as always

– stronger than ever

The AK-CC55 case controllers deliver energy savings of 6-10% compared to the next best alternative. They rely on acknowledged and advanced Danfoss adaptive superheat algorithms to control refrigerated display cases and cold rooms. For example, the large terminals on the AK-CC55 make it easy to loop the pressure transmitter cable from one controller to the next one.

Benefits:

- Significant energy savings with adaptive superheat control algorithms and adaptive defrost
- Simplified installation and service with smartphones and large terminals
- Suitable for any store size with Compact, Single Coil and Multi Coil variants

[Learn more](#)


Take user-friendliness to the next level with AK-CC Connect app

Try out the demo mode right away

[Download now](#)

The AK-CC remote display comes in a Bluetooth version, which enables wireless connection to the AK-CC Connect service app. Use it on a smart phone or tablet supported by iOS or Android operating systems.

Benefits:

- Controller setup in less than 2 minutes
- Real time overview of cabinet performance
- Alarms including checklist function
- Monitoring as well as manual operation
- Configure with no need to unload cases



Case control

AK-CC25 Pro

Unmatched versatility

– effortless control

The AK-CC25 Pro case controller sets a new standard for refrigeration control of plug-in, integral, and remote TXV display cases, offering unparalleled versatility and seamless system integration.

Supporting multiple use cases, various sensor types, and refrigerants (including A3 and A2L), high performance, and intuitive usability, the AK-CC25 Pro delivers superior energy efficiency, enhanced food safety, and comprehensive system monitoring.

[Learn more](#)


AK-CC Connect app

Use the AK-CC Connect app together with AK-CC25 for user-friendly configuration, monitoring, and manual operation. Try out the demo version.

[Download now](#)


Unmatched versatility

Reduced complexity and easy customization for specific system requirements or retrofits needs. Supports multiple use cases—including MT/LT switch mode, dual compressor, and dual circuit configurations, A3/A2L refrigerants, fully flexible I/O, and wide sensor type compatibility.



Seamless user experience

Effortless commissioning, intuitive operation, and monitoring via seamless integration with existing systems and ADAP-KOOL® tools (AK-CC Connect app, KoolProg, and KoolKey).



Efficiency and food safety

Optimizes energy use and ensures consistent cooling performance for improved food safety. Achieved through modulating temperature regulation, variable speed compressor compatibility, and performance monitoring.



Superior Reliability

Built on decades of ADAP-KOOL® expertise with advanced diagnostics and condenser monitoring for lowest downtime. Designed to meet HACCP requirements.



Extensive portfolio of cooling options for low GWP refrigerants



Complete CO₂ cooling package for smaller and medium-sized stores

Optyma™ iCO₂ condensing units

A single Optyma™ iCO₂ condensing unit can handle the cooling capacity of multiple display cabinets or cold rooms, making it the perfect solution for smaller and medium-sized stores.

The Optyma™ iCO₂ 4.6kW MT condensing unit offers reliable performance with a low noise level, convenient and easy installation, and scalable connectivity. The Optyma™ iCO₂ 20MT/10LT offers high efficiency and reliable performance for medium/low temperature applications.



Features and benefits:

- One unit can handle the cooling capacity of multiple display cabinets or cold rooms
- Noise level < 35/45 dB(A) at 10 meters, depending on condensing unit type
- Stackable and easy to start (only Optyma™ iCO₂ 4.6kW MT)
- Connectable with various remote monitoring solutions, and optimized for Danfoss ADAP-KOOL® system managers

[Read our CO₂ eBook here](#)



**Case Controller
AK-CC55**



**Electric
expansion
valve AKVP**



**Case Controller
AK-CC25**



**Thermostatic
expansion valve
TD1**



**System Manager
AK-SM 800A**



A full portfolio of CO₂ solutions

CO₂ eBook

CO₂ portfolio catalogue



CO₂ MiniPack Solution with CCMT Light

With the CCMT Light series of high pressure valves Danfoss offers a complete control solution portfolio for compact CO₂ packs.

The solution covers both AK-PC 572 Pack Controller, Danfoss BOCK® compressors, Variable Speed Drives, Valve drivers, pressure sensors and power back-up.

Features and benefits:

- Compact and light components
- Wizard setup for fast and easy programming
- Proven technologies for robust and safe installation



The Danfoss Multi Ejector Solution™ takes CO₂ to a higher level

Danfoss offers a full range of Multi Ejectors – covering the needs for all store sizes, CO₂ systems, and climates. All ejector types are available as a complete Multi Ejector Solution™ where the ejector is controlled with the AK-PC 782B pack controller to provide the robust system control necessary for efficient and reliable operation.

CO₂ Adaptive Liquid Management – CALM

The CO₂ Adaptive Liquid Management (CALM) solution allows full utilization of the evaporator surface in display cases and cold rooms, improving energy savings with CO₂ refrigeration in any store. CALM is a complete solution; in addition to intelligent pack and case controllers and a system manager, it includes two ground-breaking Danfoss innovations: The Liquid Ejector and the Adaptive Liquid Controls case controller algorithm.

Danfoss BOCK® Compressors

Danfoss BOCK® CO₂ semi-hermetic compressors offer versatile, cost-effective solutions with extensive operating limits. The compressors efficiently adjust cooling capacity for various applications and are renowned for their unrivaled reliability and durability.





Gas sensors

– ensure peace of mind 24/7

The Danfoss gas sensor series (DGS) is based on an all-new digital platform, making it easy to install and use.

The sensors can easily be integrated into Danfoss ADAP-KOOL® systems, giving you 24/7 remote service access to parameters and alarms. Furthermore, it gives you long calibration intervals for reduced maintenance costs, and sensor heads are easily replaced with a simple plug-and-play process.

[Learn more](#)

Features and benefits:

- More than 30 refrigerants covered with just five models
- Ensures peace-of-mind 24/7
- Plug-and-play commissioning and easy integration in Danfoss ADAP-KOOL® systems



Energy meters

– precision and control for energy monitoring

Danfoss EM530 and EM511 energy meters deliver accurate and reliable energy monitoring for single-phase and three-phase systems. Built for seamless integration into building management systems (BMS) and third-party control systems via Modbus RTU, they enable real-time monitoring and control.

With a backlit display, precise measurements meeting international standards, and intuitive configuration, these meters are easy to use and highly efficient. Ideal for monitoring single machines or entire installations, they help optimize energy use, identify issues early, and support preventative maintenance.

[Learn more](#)

Features and benefits:

- Accurate energy monitoring compliant with international standards
- Seamless integration into BMS and third-party systems via Modbus RTU
- Intuitive setup with a backlit display and simple navigation keys



Gateway X-Gate

– simplifying system integration for seamless communication

The Danfoss X-Gate is a flexible gateway solution that enables seamless communication between devices by translating data across protocols. It supports integrating third-party devices into the System Manager 800A, connecting the System Manager 800A to a Building Management System (BMS), and linking Danfoss devices to a general BMS.

With support for Modbus RTU/TCP, BACnet MS/TP/IP, and CAN Bus, X-Gate simplifies complex setups and ensures compatibility. Its user-friendly web interface allows easy system configuration with secure access control via accounts, passwords, and user profiles.

[Learn more](#)

Features and benefits:

- Features and benefits:
- Flexible integration across multiple protocols
- Simple configuration through an intuitive web interface
- Secure access control with user-specific profiles

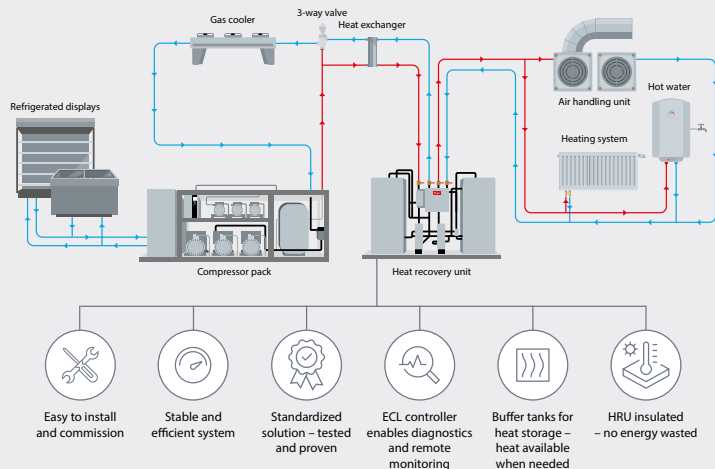


HVAC integration

Integrate each store's systems to gain economies of scale

The closer you align your heating, ventilation, air conditioning, and refrigeration systems, the easier it will be to save money, safeguard stock, and reduce your environmental impact. Integrated solutions unlock the full potential of each application and increase the efficiency of the entire system.

With a Heat Recovery Unit, you **get maximum heat recovered and reused** with no or minimum need for additional heat sources.



Heat Recovery Unit

The Danfoss Heat Recovery Unit helps to eliminate the technical challenges of managing heat recovery. The HRU is an integrated solution managing and buffering the heat from the refrigeration pack - to be reused for space heating, hot tap water, or even sold to neighbors or district heating grids.

Features and benefits:

- Maximum heat recovered and reused
- Standardized solution - tested and proven
- Easy to install and commission
- Stable and efficient solution
- Eliminates the need for a boiler



[Learn more](#)

Case story

Recycling heat to cut costs and CO₂

A busy Danish supermarket has significantly reduced its annual heating bill and carbon footprint by utilizing the excess heat from its refrigeration system.

In supermarket chain Meny's Fredericia store, a Danfoss Heat Recovery Unit (HRU) was installed to recycle heat from the CO₂ refrigeration system to warm up its 1,900 m² and provide plenty of hot tap water all year round.

Today, the store manager can see exactly how much energy, money, and CO₂ has been saved. During the first year alone, energy consumption was reduced by 135 MWh in total—and as a bonus, installation was so simple that employees didn't even notice the new unit for the first year of operation.

- 89.7% energy savings
- Carbon footprint reduced by 6.7 tons
- No operational disruptions

[Read the full case story](#)



Components that will boost the performance of your HVAC system



Compressors

Check out our compressors for rooftops, chillers, and air handling units that will really make a difference and save on applied and running costs.

Features and benefits:

- Fixed and variable speed compressors
- Wide portfolio technology for any application requirements
- High energy efficiency
- Optimized for low GWP and natural refrigerants

[Learn more](#)

MCX controller

Best-in-class connectivity, VZH compressor control logic, high system safety, and better response time with the MCX**B2 system controller.

Features and benefits:

- Easier commissioning and troubleshooting
- Integration with BMS
- Advanced applications with high execution speed and bigger memory
- Energy efficiency, comfort, and flexibility with I/O improvements

[Learn more](#)

H48T-CH brazed plate heat exchanger

The H48T-CH is specially developed for heat recovery applications, with water and CO₂ to ensure optimum system efficiency.

Features and benefits:

- Patented Micro Plate™ design
- Dedicated for 140 bar transcritical CO₂ systems

[Learn more](#)

VLT® HVAC Drive FC 102

Obtain higher reliability and lower total cost of ownership in your heating, ventilation, and air-conditioning installations, with this unique drive optimized for building automation systems.

Features and benefits:

- Energy efficiency
- Optimal motor control
- User-friendliness

[Learn more](#)

Alsmart® universal programmable controllers

Modular controller platform for powerful HVAC application management to take your thermodynamic knowledge to the next level.

Features and benefits:

- Modular hardware configuration for maximum flexibility
- Easy programmable with Alsmart® Design programming tool
- Remote monitoring and commissioning with the web-based Alsmart® Service Tool

[Learn more](#)

Full impact calls for a full solution

Real change requires more than connected components. You need the full picture to boost both store performance and enable cross-chain optimization. As the key component of the intelligent Danfoss ADAP-KOOL® refrigeration and HVAC systems, the System Manager AK-SM 800A is the link that ties everything together. Seamless connectivity from case to cloud — ensuring data-driven transparency and insights that deliver measurable impact:

- Optimized operations
- Optimum level of food quality
- Increased energy efficiency

Highlights include:

- Powerful electronics platform supporting operating system
- IT security protocols (HTTPS, SSL/TSL 1.2, and WPA2 encryption)
- Enhanced UI/UX, including familiar touch screen
- Full HTML5 web browser
- Full remote access to your system through StoreView Web
- Retro-fit ready with EOL and legacy control functions



[Learn more](#)

Alsense® Food Retail and AK-SM 800A —the perfect match

Alsense® Food Retail services is our IoT cloud solution for supermarkets and food retail applications offering a sustainable, scalable, and secure portal for optimizing operations—so you can spend less on energy and operational costs.

The System Manager AK-SM 800A is Alsense-ready—delivering full transparency from site level to chain level so you can get even more value from your data.

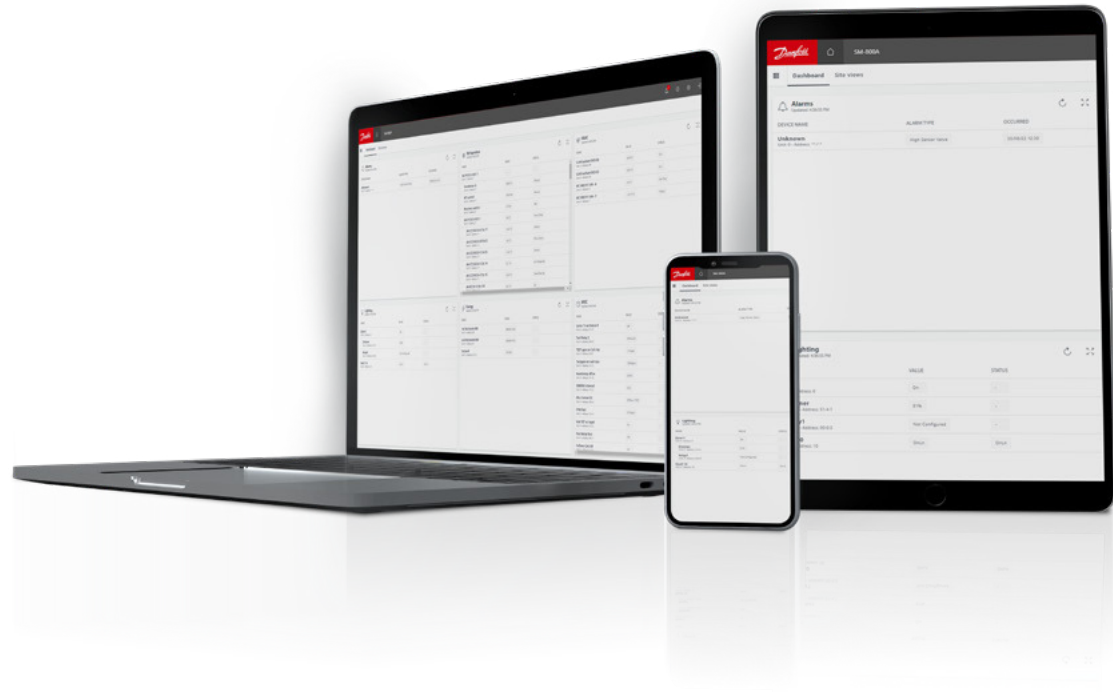


StoreView

–full web access and easy overview

StoreView Web offers a clean interface to your system manager built on modern web technologies, and is available for browser, desktop, and all major mobile platforms. It replaces a portfolio of legacy applications with improvements, including:

- Direct integration with the Alsense® platform for a seamless and connected user experience
- Using industry best practice and technologies for IT security
- Multiple deployment options – browser, desktop or mobile
- Single sign-on and role-based access for easy and secure authentication
- Constant evolution of features and enhancements, based on customer feedback and usage analytics

[Learn more](#)

Industry best practice for IT Security

The AK-SM 800A in connection with Storeview Web is implementing the industry best practice for IT security, maintained through continued security updates. In this way we want to help you in staying secure from case to cloud.

Examples of IT security features

- Encrypted web traffic (HTTPS) and communication (email)
- Password management
- User authorization
- Network isolated Wi-Fi with timeout
- Backward compatible XML interface (requires secure HTTPS connection)
- Built-in firewalls



Alsense® Food Retail

- IoT cloud application for supermarkets

Scalable, digital, and expert-managed services with a new level of sense.

Optimize performance of your food retail operations with Alsense®. The IoT software enables cloud-based monitoring and management through data and insights. Built on the tried-and-true Microsoft Azure platform, Alsense offers the security and scalability you need to stay ahead of the curve and helps you achieve:

- Reduced costs with up to **30%** food loss reduction and 15% energy savings in your refrigeration system
- Increased operational efficiency with typically, **5% - 8%** opex savings on HVAC-R
- Maintain compliance with up to **3-years** food safety audit-ready reports available on demand
- Peace-of-mind with guaranteed **99.95%** up-time availability.

[Learn more](#)

AlarmHub
Get the basics right



TempHub
Less food waste,
increased temperature
control



EcoHub
Identify energy
savings



ServiceHub
Optimize asset
management



Alsense®



Step into retail reality in the **Danfoss Smart Store ADC**

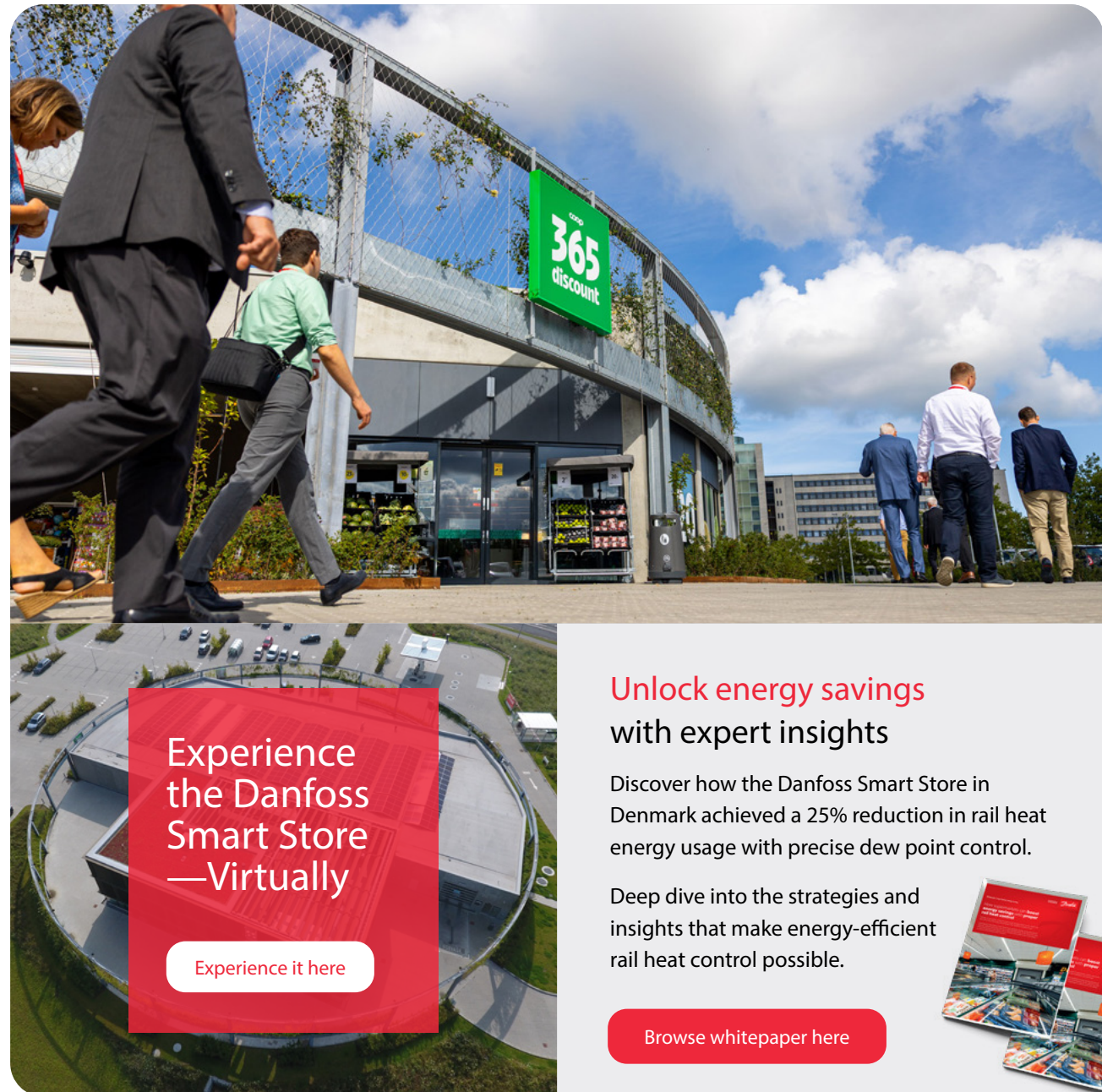
Talking about the sustainable supermarket of the future is so yesterday. So, step away from the screen and enter retail reality in our Smart Store ADC.

In the first-ever fully-functioning Smart Store supermarket in Nordborg, you can experience our complete range of solutions in action—while the adjoining state-of-the-art Danfoss Application Development Center showcases our off-the-shelf technologies.

Explore state-of-the-art solutions for reducing energy consumption, food loss, and carbon footprint today.

It's like virtual reality, only real.

[Learn more here](#)



**Experience
the Danfoss
Smart Store
—Virtually**

[Experience it here](#)

**Unlock energy savings
with expert insights**

Discover how the Danfoss Smart Store in Denmark achieved a 25% reduction in rail heat energy usage with precise dew point control.

Deep dive into the strategies and insights that make energy-efficient rail heat control possible.

[Browse whitepaper here](#)



Solutions ready for engineering tomorrow's supermarkets



One-Stop-Shop

Danfoss is your one-stop-shop offering flexible solutions for all food retail applications.



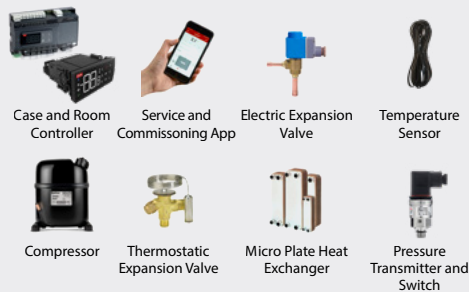
System manager



Smart Energy



Case Control



Applications:
Remote Cases/Cold Rooms,
Semi Plug-in Cases/Cold Rooms,
Plug-in Cases/Cold Rooms

Refrigerants:
CO₂, HFC, Propane



Sustainable Refrigeration



Applications:
Condensing Units,
Mini Packs, Large Packs

Refrigerants:
CO₂, Propane, HFC, HFO



HVAC Integration



Applications:
Air Handling Units, Roof Top Units,
Chillers, Heat Pumps, Multi Pack,
Heat Recovery

Refrigerants:
CO₂, HFC, HFO

Chain level

Store level

Application level



Discover the **opportunities** with Danfoss **Smart Store** solutions

Danfoss Smart Store is the supermarket of tomorrow. We have made it our business to continuously improve the 5 key areas of food retail facility operation. And by connecting these areas we can harvest the synergies and take efficiency and food safety to the next level.

Learn with Danfoss. **Anytime. Anywhere**



Learn about Danfoss CO₂ solutions for food retail

Would you like to get an opportunity to learn about CO₂ based systems?

We are offering webinar series with our experts and the broadcast from Mobile Training Unit where you can observe operational CO₂ system with all the components.

[Available On Demand here](#)

Master energy-efficient retail with our webinar series

Dive deep into cutting-edge solutions for energy efficiency through this series of webinars led by Danfoss experts.

You'll gain practical insights, discover best practices, and explore real-world applications.

[Browse Smart Store webinars](#)

Tomorrow's challenges require the best training today

With more than 49,000 registered users the Danfoss Learning platform will offer you hundreds of training courses available in up to 26 languages.

Join our webinars, e-lessons and face to face courses.

[Explore Danfoss Learning](#)

Learn more at
smartstore.danfoss.com

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