

# Adapting to a changing world for over 30 years: **ADAP-KOOL® refrigeration control system**

ADAP-KOOL® is a family of state of the art adaptive refrigeration controls developed by Danfoss for all food retail applications. As the world has changed with refrigerants, regulations, and technology Danfoss has adapted to provide best in class performance for every situation.

ADAP-KOOL® automatically adapts to changes in the operating environment, delivering optimized refrigeration performance and energy efficiency. They provide advanced algorithms, supervisory control and monitoring to assure your stores operate second to none. Robust and reliable, ADAP-KOOL® ensures food safety, and user-friendly designs save time and cost during installation and operation. First introduced in 1987, Danfoss ADAP-KOOL® products have a long history of adapting to change and this experience allows us to lead the industry in controls. Despite constant evolution, today's ADAP-KOOL® generation still embodies the values of energy-efficient, robust, and adaptive control, that ensures food safety while driving down operating costs that made the original a success more than three decades ago.



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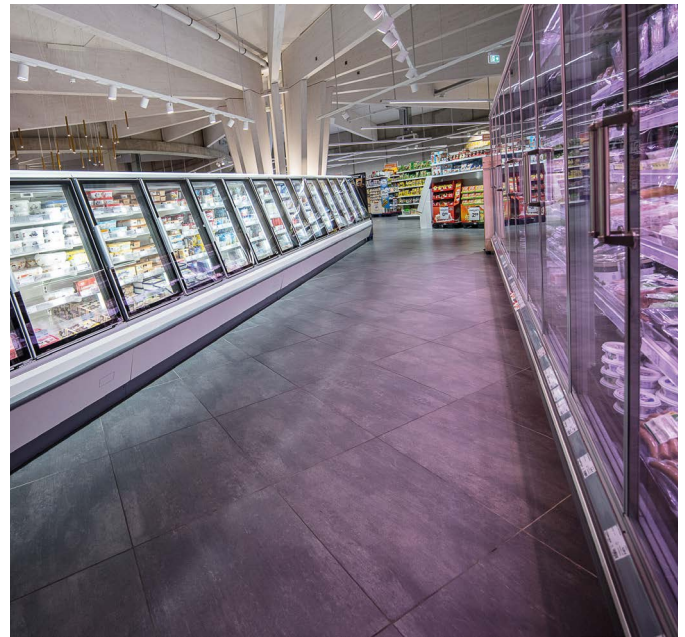
## WHAT IS ADAP-KOOL®?

ADAP-KOOL® is an adaptive refrigeration control system for all food retail applications.

### The challenge: changing operating conditions

If operating conditions in food retail refrigeration never varied, setting up a refrigeration solution for optimal operation would be a lot easier. But conditions do change: weather, shopping patterns, stocking levels, and product offerings. Load conditions change, electrical rates vary (sometimes by the hour, and lately by the minute or less in some locations), and stores are reconfigured to meet changing consumer wants and needs.

All of this means constantly fluctuating system loads, and only a truly adaptive control product can deliver optimal refrigeration and ensure food safety in all these conditions. ADAP-KOOL® avoids the “one size fits all” approach that is



not particularly well suited for any condition. With adaptive controls you don't need to manually adjust system operation for changing conditions, which is time-consuming, inefficient, and requires considerable knowledge of refrigeration system components and operation.

### The solution: adaptive refrigeration control

ADAP-KOOL®, designed by Danfoss, is the refrigeration control system for all types of food retail stores and includes pack (rack) and case controllers, system managers, sensors, valves, and much more. They are designed and built to deliver energy savings, robust and reliable refrigeration, and dependable food safety in a flexible and future-proof package that can adapt and grow as the needs of the retailer changes. The name “ADAP-KOOL®” is a shortened adaptation of the phrase “adaptive cooling” and sums up the basic idea.

The first generation of ADAP-KOOL® was introduced in 1987 and included electric expansion valves, superheat controllers, and temperature sensors. The controls were one of the first refrigeration solutions on the market to include microprocessor control; a revolutionary idea and a forward-thinking move by a leading supplier of refrigeration components. Despite all the high tech under the hood, ADAP-KOOL® used this power to focus on ease of install and use from the start: The installer only had to set the temperature and differential; everything else (including superheat control) was handled by the controller. Just two years later, Danfoss added external data communication options to the original ADAP-KOOL®, preparing the system for a world of data exchange and remote monitoring that was still only in the making. We can get a sense of the significance of

## DID YOU KNOW?

The letters “AK” in Danfoss product designations are short for ADAP-KOOL®. For example, AK-CC is the designation for ADAP-KOOL® case controllers



ADAP-KOOL® solution anno 1999.

this considering that in the late 1980s, Microsoft Windows was in version 2, and large-scale commercial use of the Internet and other networks was still years into the future.

## Constantly adapting to changes

ADAP-KOOL® now includes more products and solutions than in 1987, but the basic idea is unchanged. Case and pack controllers, evaporators, compressors, sensors, and the supervisory system are interconnected, exchanging status information over a local data communication. Intelligent control algorithms allow the system to constantly adapt to changes in the operating environment. Suction and condensing pressure are regulated as needed, and refrigerant injection is controlled accurately to fully utilize the evaporator surface and reduce superheat as much as possible.

The result: ADAP-KOOL® system controllers can control cabinet and cold room temperature with a tolerance of less than  $\pm 1$  degree Celsius ( $\pm 1.8$  degrees Fahrenheit) without additional calibration. By optimizing compressor and evaporator utilization, they can simultaneously reduce energy consumption by up to 33% compared to static systems. This is great news for retailers looking to improve margins by

driving down energy costs. ADAP-KOOL® delivers a range of additional features such as rail heat and fan eco control, adaptive defrost, and automatic night setback that make life easier for the user and helps reduce service costs. If something goes wrong, the system immediately alerts the user. And despite all these value-added options, the system is still easy to install, connect, commission, and use with for example Wizard functionality, online trainings and apps and tools.

## BENEFITS FROM USING ADAP-KOOL®

Temperature controlled to within  $\pm 1^\circ\text{C}$  ( $1.8^\circ\text{F}$ )  
Energy consumption reduced by up to 33% compared to static systems

## Benefits for all stakeholders

The adaptive ADAP-KOOL® refrigeration control system brings significant benefits for all stakeholders. For system designers and OEMs, the proven quality, reliability, and robustness of the system makes it a great choice when designing food retail refrigeration solutions that ensure food safety while driving down operating costs. For installers and contractors,

the easy installation and setup procedures reduce complexity in their daily work and make service work much easier. And for the food retail end-user who relies on the system every day, its robust and dependable operation and its low energy consumption means food safety at the lowest possible cost. The low energy consumption of ADAP-KOOL® not only drives down energy costs; it also reduces store carbon footprint.

## New possibilities, with the same core values

Today, more than 30 years after its introduction, ADAP-KOOL® is an established solution in many markets. Over the years, Danfoss continues to take advantage of technology improvements to update and upgrade ADAP-KOOL®, for example by introducing Bluetooth device communication. These upgrades have given users benefits that were not possible in 1987, such as smart grid integration, cloud data storage, and optimization through benchmarking at store chain level. They also allow users to follow current trends in food retail. To take just one example, the increasing popularity of CO<sub>2</sub> refrigeration solutions in food retail has led to the introduction of the ALC (Adaptive Liquid Control) case control algorithm that allows optimized evaporator utilization and energy savings in any climate.

In addition to these exciting opportunities, however, the basic values embodied by ADAP-KOOL® remain the same. The system still delivers energy-efficient, robust, and adaptive display case and cold room refrigeration that ensures food safety while driving down operating costs. The ADAP-KOOL® refrigeration control system embodies these values and helps our customers work towards targets such as reduced climate

footprint, maximized energy efficiency, optimized food safety, and optimized operations through data analytics. The future is knowledge driven, and whoever has the know-how to adapt to changing conditions wins. With more than 30 years at the forefront of adaptive refrigeration control in food retail, Danfoss has the experience and know-how of refrigeration and control technology to help our customers do exactly that.



*Today's ADAP-KOOL® offering is wider than the original in 1987, but the values remain the same*