

Benefit from **robust** and **efficient** pack controllers built on **superior** **know-how**

20.000

Danfoss CO₂
solutions installed

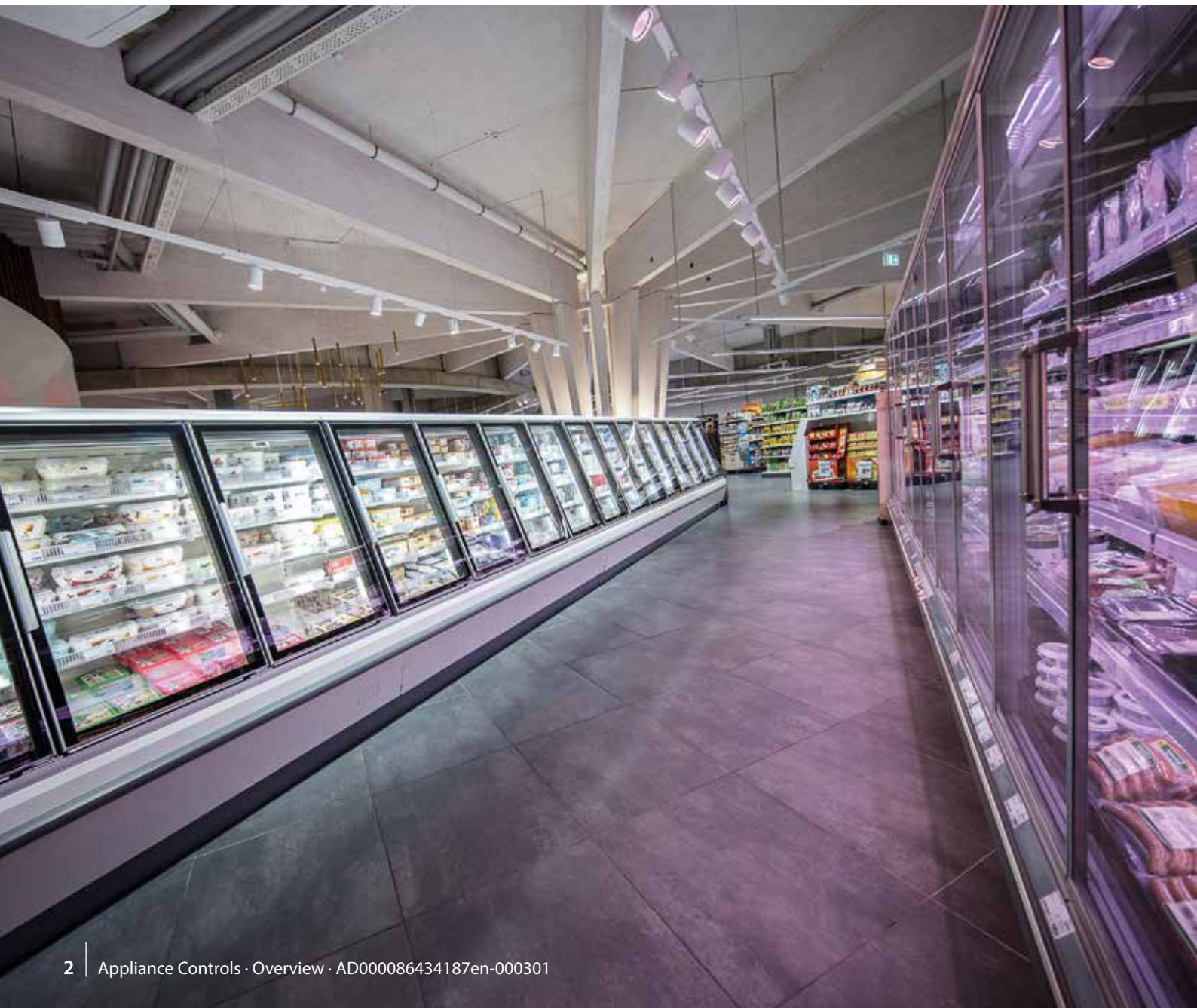


ADAP-KOOL® pack controllers ensure accurate control and operational reliability for advanced solutions








Danfoss offers a range of pack controllers for use in compact systems, as well as in large power packs. The ADAP-KOOL® pack controllers ensure efficient control and operational reliability for advanced solutions for controlling up to twelve compressors. The intelligent controllers optimize the suction and condensing pressure according to load and outdoor temperatures. Additional energy savings and low maintenance costs can be achieved by using variable speed control of condenser fans and compressors and other advanced features such as suction pressure optimization, self-diagnosis and automatic fault detection. The capacity controls provide a good diagnostic tool for remote management.

Features and benefits:

- Full range of compressor and condenser controllers for small and large food retail applications
- Accurate control and great reliability for high energy efficiency and low maintenance costs
- Leading control technology for the Multi Ejector Solution™
- Heat recovery for tap water and space heating
- Remote management



Pack Controller **product portfolio**

| |  |  |  |  |  |  |  |  |
|--|---|---|---|---|---|---|---|---|
| | AK-PC 351 Small Pack Controller | AK-PC 551 Medium Pack Controller | AK-PC 572 MiniPack Controller | AK-PC651 Large Pack Controller | AK-PC 772A Trans-critical CO ₂ Mini-Booster Controller | AK-PC 781A Multi purpose HFC or CO ₂ Pack Controller | AK-PC 782A Transcritical CO ₂ Booster Pack controller | AK-PC 783A HFC/CO ₂ Cascade Controller |
| Application | Single Suction Condenser | Dual Suction Condenser | CO ₂ MiniPack Controller | Single Suction Condenser | Mini Booster Trans-critical | Universal Pack ¹⁾ | Booster Trans-critical | Cascade Condenser |
| HFC | ✓ | ✓ | - | ✓ | - | ✓ | - | ✓ |
| CO ₂ | - | - | ✓ | - | ✓ | ✓ | ✓ | ✓ |
| Suction Groups | | | | | | | | |
| No. of suction groups | 1 | 2 | 2 | 1 | 3 | 1 | 3 | 2 |
| No. of compressors | 4 | 8 / 4+4 | 3+2 | 10 | 3 (MT+IT) + 2 | 10 | 8 (MT+IT) + 4 | 4+4/ 5+3 |
| Compressor control | Variable + step | Variable + step | Variable + step | Variable + step | Variable + step | Variable + step | Variable + step | Variable + step |
| Control sensor | P/T | P/T | P | P/T | P | P/T | P | P/T |
| Cascade injection control | - | - | - | - | - | - | - | ✓ |
| Condenser | | | | | | | | |
| Fan control | Step or Speed | Step or Speed | Speed | Step or Speed | Step and/or Speed | Step and/or Speed | Step and/or Speed | Step and/or Speed |
| No. of steps | 4 | 8 | - | 8 | 4 | 8 | 8 | 8 |
| Control sensor | P/T | P/T | P/T | P/T | P/T | P/T | P/T | P/T |
| CO ₂ high pressure valve and receiver control | - | - | ✓ | - | ✓ | ✓ | ✓ | - |
| Heat recovery | - | Standard | Standard | Standard | Standard | Advanced | Advanced | Standard |
| Data Communication | | | | | | | | |
| Protocol | Modbus | Modbus | Modbus | Modbus | Lon | Lon | Lon | Lon |
| Front-end support | AK-SM 800 ²⁾ | AK-SM 800 ²⁾ | AK-SM 800 | AK-SM 800 ²⁾ | AK-SM 800 AK-SM 350/720 ³⁾ | AK-SM 800 AK-SM 350/720 ³⁾ | AK-SM 800 AK-SM 350/720 | AK-SM 800 AK-SM 350/720 ³⁾ |
| No. of digital outputs | 6 | 8 | 10 | 15 | Flexible via I/O | Flexible via I/O | Flexible via I/O | Flexible via I/O |
| Total number of IO | 20 | 26 | 35 | 47 | 120 | 120 | 220 | 160 |
| Graphical display | Built in | Built in/ External | Built in/ External | Built in/ External | External | External | External | External |

¹⁾ AK-PC 781A can be used in a hybrid CO₂ cascade solution by using 2x AK-PC 781A and EKC 313 CO₂ cascade injection controller

AK-PC 781A can be used in a transcritical CO₂ booster application by using 2x AK-PC 781A or 3x AK-PC 781A

²⁾ Limited support for selected legacy front ends (AK-SC 355)

³⁾ Limited support for selected legacy front ends (AKA245, AK-SC 255, AK-SC 355)

Dedicated Pack Controllers

AK-PC 351 • AK-PC 551 • AK-PC 572 • AK-PC 651

The dedicated pack controller range is very compact and available in different sizes optimized for small, medium and large pack. Despite the small form factor, the product range offers advanced features:

- 4, 5, 8 or 10 compressor outputs
- Optimized factory settings and control algorithms for HFC and CO₂ packs
- Energy saving features
- Graphical user interface with Wizard Setup
- Further optimization through
- ADAP-KOOL® system integration



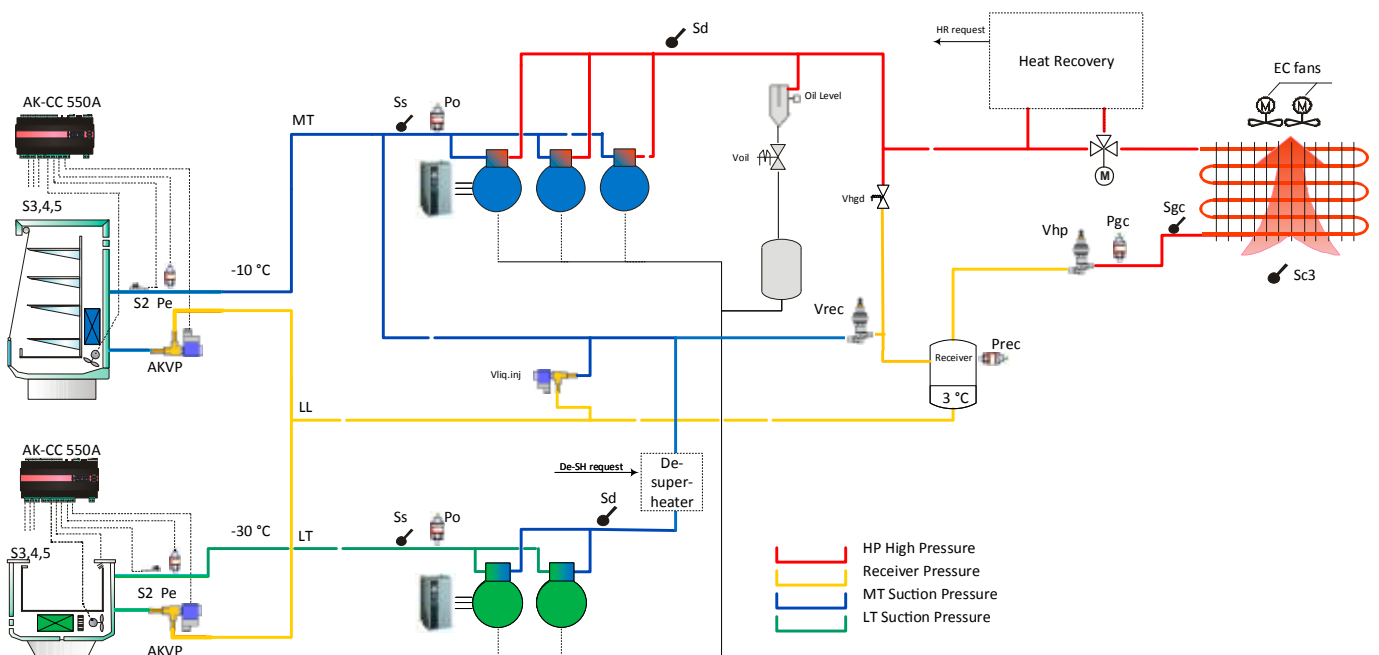
AK-PC 572 MiniPack – CO₂ made easy

The new AK-PC 572 MiniPack controller provides a complete pack solution for small store retailers looking to benefit from using CO₂ as a refrigerant. While compact and cost-effective, it includes much of the technology contained with the AK-PC 781 pack controller – a product known for over a decade of proven reliability in CO₂ applications. The AK-PC 572 MiniPack also makes using CO₂ much more approachable, even for those who have little-to-no experience with CO₂. It contains all the essential functionality of a dedicated CO₂ controller, but with unique ease of use and minimal complexity.

Features og benefits:

- Full CO₂ booster solution with up to 5 compressors
- Reduced operational costs with proven technology from Flexible Pack Controllers
- CO₂ made easy, requiring little CO₂ knowhow and offering efficient interfaces for OEM's as well as installers
- Cost effective hardware solution based on a compact design requiring limited space in the electrical panel
- Ease of use with few parameter settings, wizard based set-up and graphical daily use screens
- Integrated pack design supporting multiple compressor technologies and simple interfaces to external systems like heating
- Flexible solution with optional features like heat recovery, oil management, liquid injection, de-superheater, hot gas dump etc.

CO₂ Transcritical Booster
AK-PC 572 Minipack controller



Flexible Pack Controllers

AK-PC 772A • AK-PC 781A • AK-PC 782A • AK-PC 783A

The flexible pack controller range is scalable and offers high customization both in terms of the pack design as well as control algorithms. The flexible Pack controllers offer highest safety and efficiency with:

- 5 to 12 compressor outputs
- Controls HFC systems, HFC/CO₂ cascades or CO₂ transcritical systems
- Parallel compressor support
- Leading Multi Ejector technology
- Advanced Heat Reclaim
- High pressure CO₂ and receiver valve control

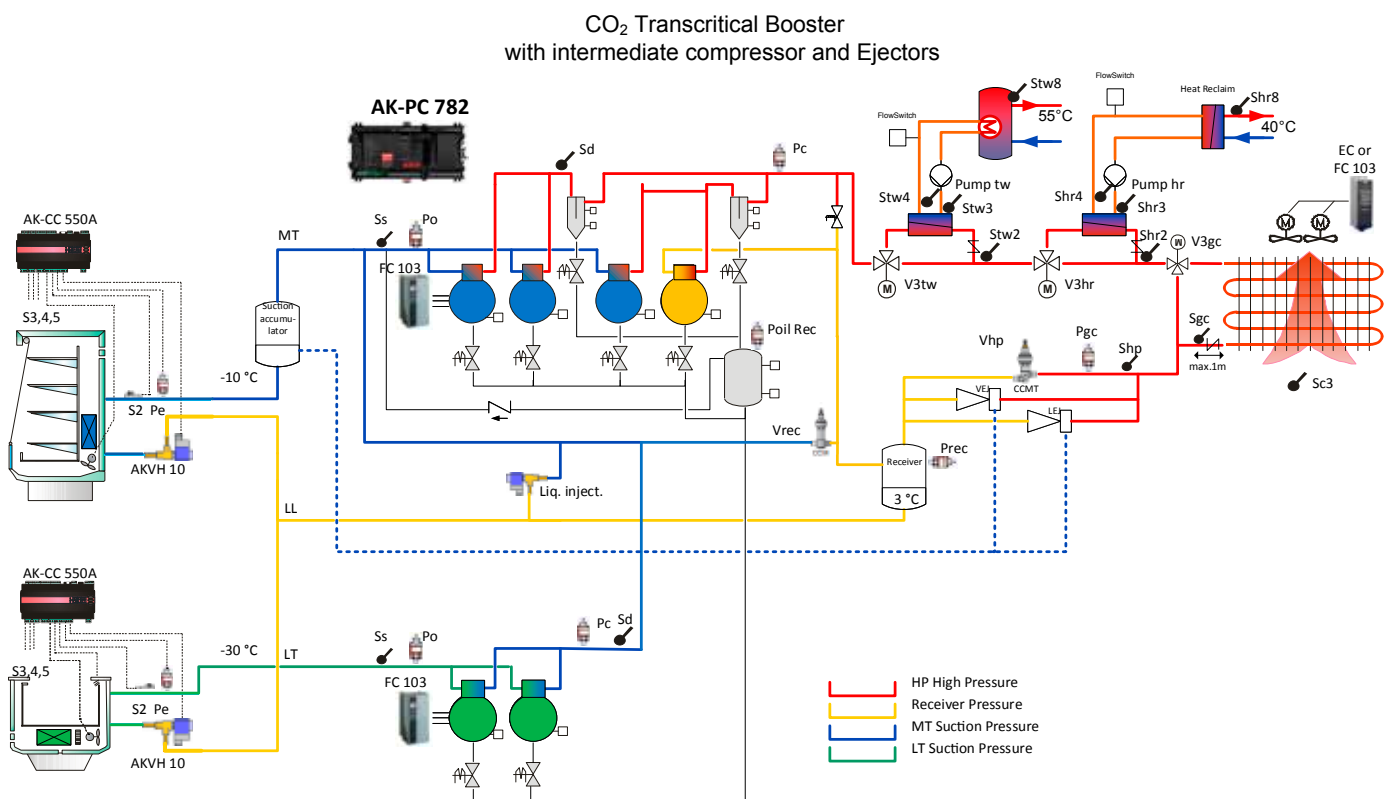


AK-PC 782A for integrated and optimized pack control

The AK-PC 782A is designed for integrated pack control in transcritical CO₂ booster packs and offers precise regulation, improved efficiency and enhanced user-friendliness. Handling up to 3 suction groups, AK-PC 782A performs all necessary control functions as one, integrated solution. The integrated control leads to precise regulation and high efficiency even in challenging operational conditions. The highest possible flexibility matching the specific application needs is achieved by adding IO-modules to the pack controller.

Features and benefits:

- Scalable to control large booster packs with up to 12 compressors
- Handles mixed compressor sizes and speed control of 2 compressors per suction group
- Robust algorithms ensure safe initial start-up and reliable operation
- World class refrigeration system efficiency with Danfoss Multi Ejector
- Receiver pressure and suction pressure optimization for maximum utilization of all compressor groups
- Gas Cooler control for maximum efficiency at all times (summer, winter, heat recovery etc.)
- General functions like thermostats and PI controllers are available for auxiliary application control



Efficient and user-friendly interfaces



Graphical control panel for ease of service and maintenance:

Both the Dedicated and the Flexible pack controllers benefit from an optional graphical display, available for both panel and wall mounting. Used for both service and commissioning purposes, it offers the following features:

- Full graphic LCD display for intuitive navigation
- Easy connection to pack controller through plug connection
- Panel (IP64) or wall mount
- Status information and parameter access in local language
 - Daily use screens with graphical representation of the application
 - 3 password protected user levels

PC based tools for fast pack set-up and configuration

Separate tools are available for the Dedicated and the Flexible pack controllers, offering safe and efficient programming and analysis of the pack controller. The tools include the following features:

- Multi language support
- Access to all parameters relevant to the particular controller configuration
- Offline preparation of backup files and on-line operation
- Full transparency of system performance in real-time
- Manual control, test and calibration of inputs and outputs
- Back-up and download of settings

AK-PT 50 for **Dedicated** Pack Controllers



AK-ST 500 for **Flexible** Pack Controllers



Intelligent and adaptive control in transcritical CO₂ refrigeration

Intelligent control solutions are important for achieving reliable, optimized operation and realizing financial savings and environmental benefits in your transcritical CO₂ refrigeration solution. Using controllers that constantly monitor system status and respond intelligently to condition changes is crucial. Danfoss has long been the industry standard for CO₂ pack and case controllers, and we are continuously updating our offering with new software that allows them to control and optimize CO₂ refrigeration solutions.



Read the full article here



Learn more about the Multi Ejector Solution™

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

Danfoss offers a complete portfolio of gas and liquid ejectors that provide significant benefits in CO₂ refrigeration applications.

The portfolio include:

- the Multi Ejector Low Pressure (LP)
- the Multi Ejector High Pressure (HP),
- the Liquid Ejector (LE).

All three ejector products are available as a complete Multi Ejector Solution™ where the ejector is controlled with the AK-PC 782A pack controller to provide the robust system controls necessary for efficient and reliable operation. The Multi ejector solution has moved CO₂ technology into warm climates as well as improving efficiency in cold climates. In summary the Multi Ejector portfolio increases system performance for all store sizes, CO₂ systems and climates



Read more about CO₂ Adaptive Liquid Management

CO₂ Adaptive Liquid Management (CALM)

The new 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.

Discover the opportunities with Danfoss Smart Store

As a market leader with more than 50,000 food retail installations worldwide, Danfoss leads the development of integrated control solutions. Our Smart Store solution has been developed based on 30 years of close cooperation with the global community of food retailers. The solution is currently running in more than 9,000 stores worldwide, returning savings of up to 50 %.

Danfoss continues to develop the portfolio of components, controllers and advanced algorithms with the long-term ambition to create net-zero stores or even stores that give more energy than they take. Together with forward-thinking retailers around the world we take sustainable solutions to the next level through constant development of innovative technologies and service concepts.

Visit Danfoss Smart Store at:
smartstore.danfoss.com