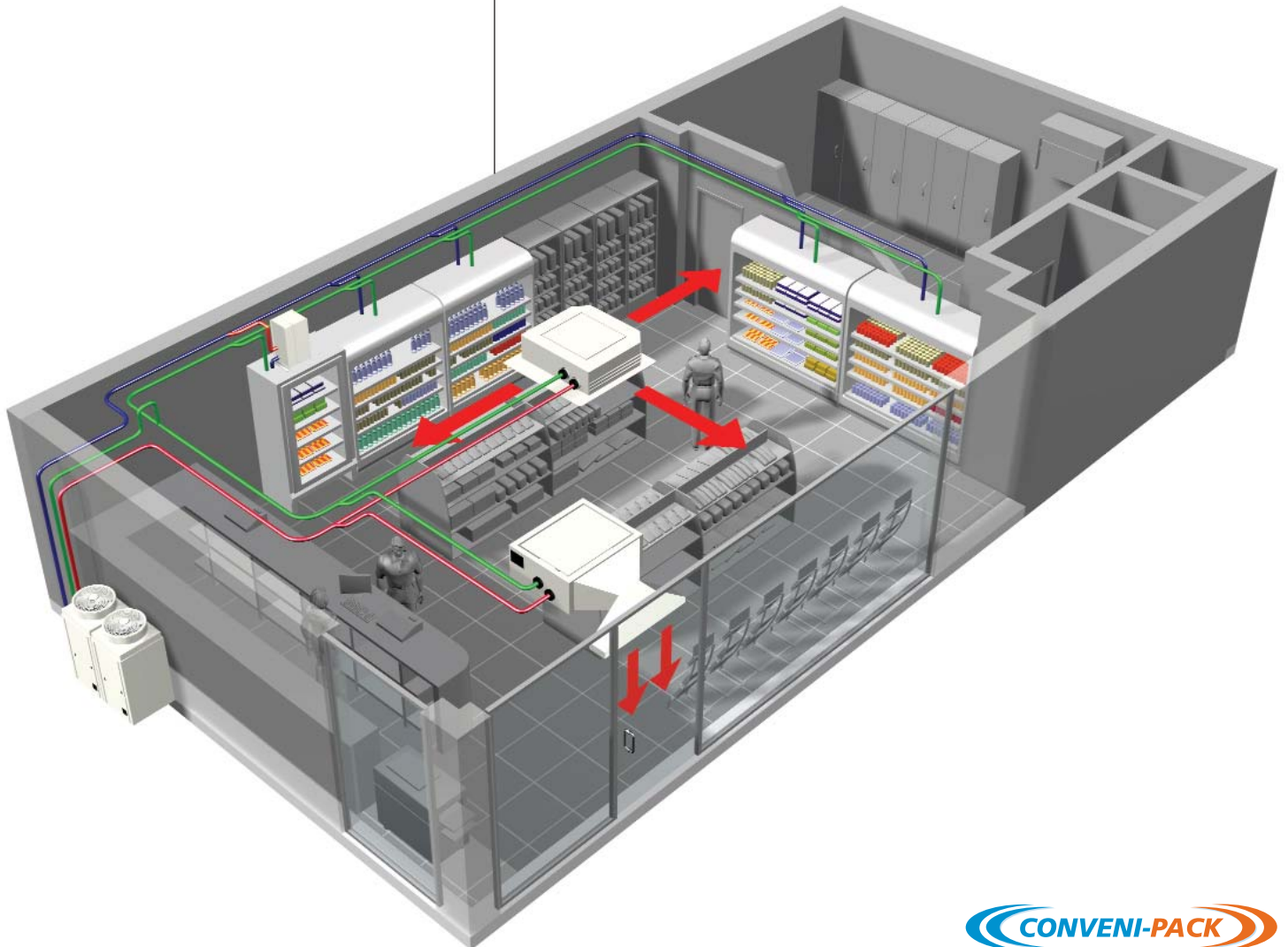


Conveni-pack

Integrated refrigeration and air conditioning system



Conveni-pack

Conveni-pack is a compact low noise system which integrates high and low temperature refrigeration and air conditioning, including heating, into one system.

The main benefits of using Conveni-pack :

- Reduced energy consumption
- Stable and comfortable room temperatures
- A modular and scalable system
- Compatible with R-404A refrigeration

Since the launch in 2003, Daikin has installed over 2000 systems for major retailers in Japan. Conveni-pack is the first system of its kind on the European market.

Conveni-pack meets the requirements of a challenging retailing environment:

The need for low energy systems

New demands are placed on refrigeration and air conditioning systems by the growing demand for fresh goods, prepared meals and chilled drinks in an environment where energy consumptions and CO₂ emissions are closely monitored. The Conveni-pack system ensures that the total energy usage for air conditioning / refrigeration is minimized, thus limiting associated CO₂ emissions and freeing power for alternative uses (e.g. ovens or coffee machines etc.).

Cold and uncomfortable stores

Higher refrigeration loads have consequences for the indoor comfort. Ambient shop temperatures are often too hot or too cold and are usually unstable. The cold store phenomenon arises when large amounts of heat is extracted by the refrigeration

system and rejected outside. The opposite situation occurs when integral refrigeration systems release heat into the store in an uncontrolled way. Conventional solutions to these problems, such as fitting additional heating or cooling, are neither cost effective or energy efficient. Conveni-pack has been developed to meet these needs.

Building restrictions

There is a growing demand for fresh goods from convenient stores, consequently the number of outlets in residential areas is increasing in an environment where the building regulations are more severe. Restricted space and proximity to dwellings mean that conventional systems are often not suitable. Conveni-pack is an ideal response to these more stringent requirements, being a compact and modular low noise system.

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Revolution based on a great tradition

Daikin has more than 80 years' experience in the refrigeration and air conditioning industry, manufacturing over a million residential and commercial refrigeration systems per year. The company produces all critical components itself, including the compressors at the heart of the system.

In 1985, Daikin transformed the industry's approach to cooling and heating large buildings with the introduction of its Variable Refrigerant Volume (VRV) technology where multiple indoor heating and cooling units are connected to a single outdoor unit. The volume of the refrigerant is varied to respond to changing needs, leading to energy savings and more accurate temperature control. VRV can also be configured to supply heating and cooling simultaneously to various parts of the building, resulting in substantial energy savings when

compared to separate heating and cooling systems. As result, VRV has become an industry standard with Daikin leading the way. It is currently recognized as one of the most efficient and reliable means to heat and cool all types of buildings.

To address the challenges the retail industry is facing, Daikin has developed Conveni-pack, a unique integrated system based on its revolutionary VRV technology.



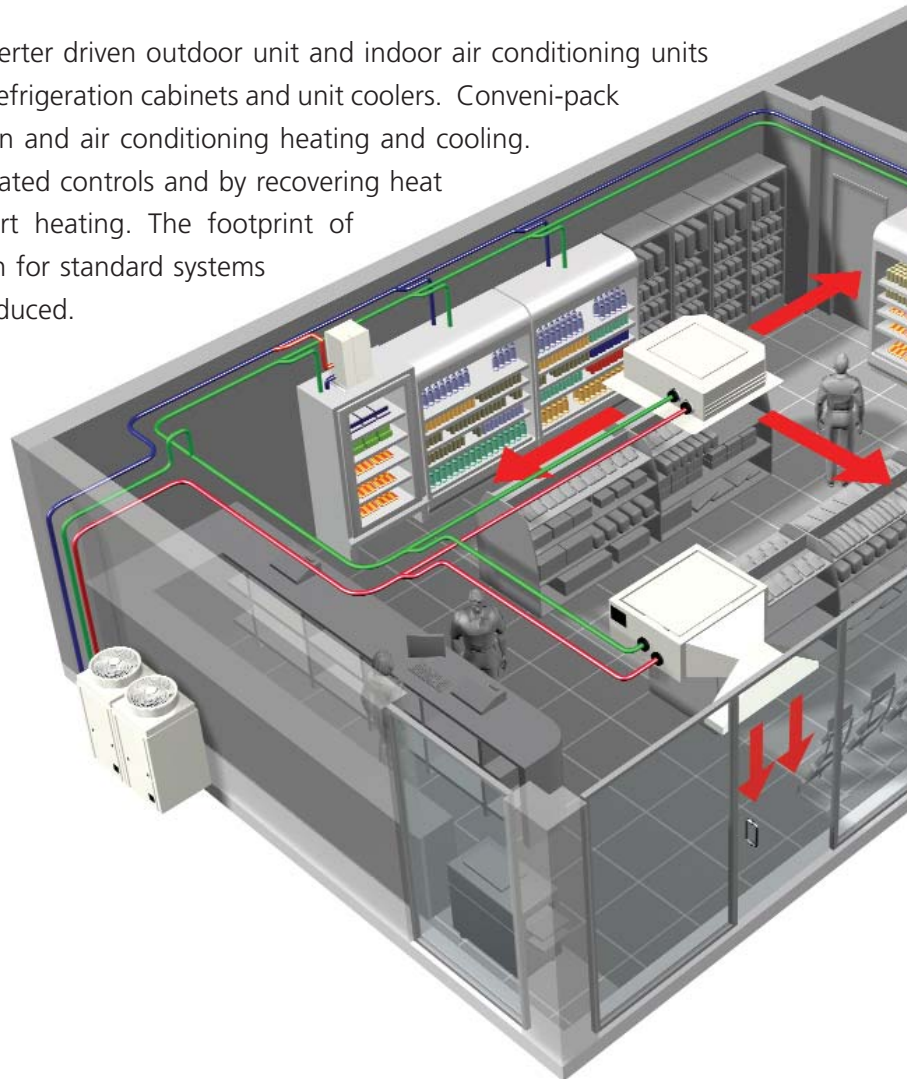
Daikin Europe N.V.

Conveni-pack

A total solution for small applications

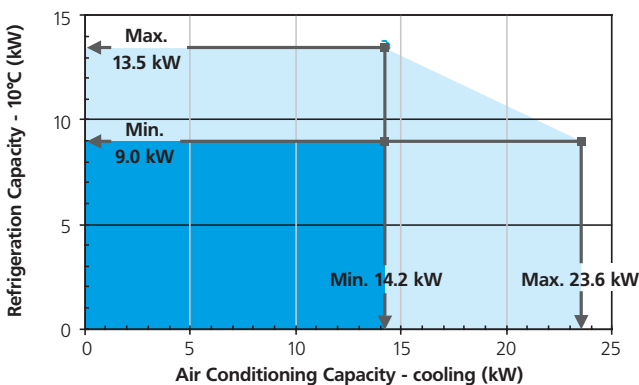
The Conveni-pack system consists of an inverter driven outdoor unit and indoor air conditioning units that can be connected to high temperature refrigeration cabinets and unit coolers. Conveni-pack can fully meet the demands for refrigeration and air conditioning heating and cooling. Energy consumption is reduced by sophisticated controls and by recovering heat from the refrigeration cabinets for comfort heating. The footprint of the outdoor unit is significantly smaller than for standard systems and the amount of pipe work to install is reduced.

A single pack system is suitable for small convenience stores and petrol stations.



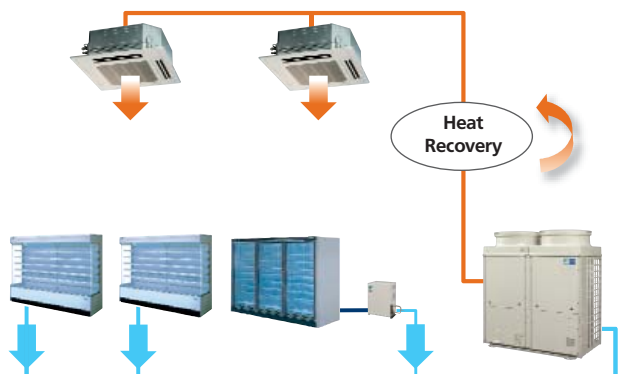
Capacity Range

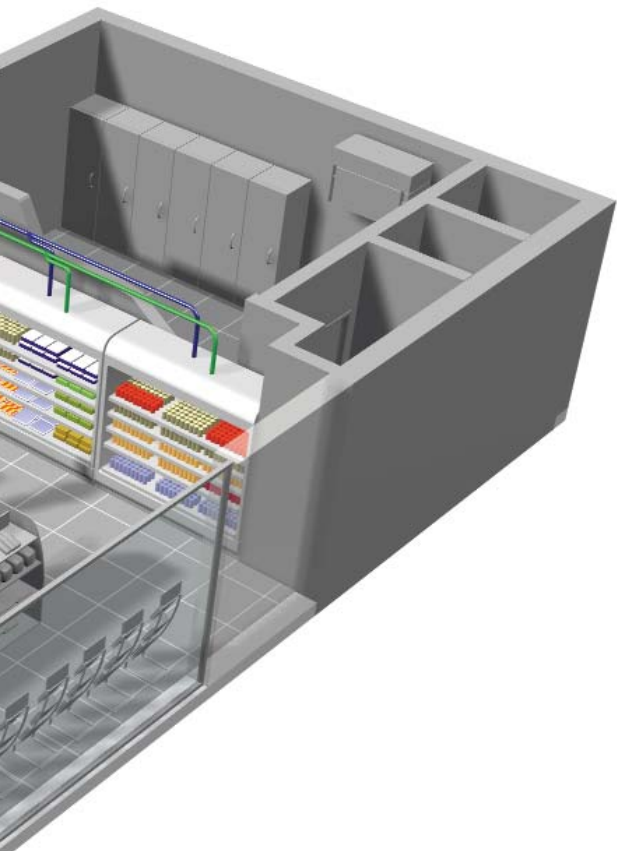
The selection of the system takes into consideration both refrigeration and air conditioning requirements. The connectable range using one outdoor unit is sufficiently broad to cover small store applications.



Heat Recovery

Conveni-pack can take heat from the refrigeration cabinets and provide it to the indoor air conditioning for comfort heating for free. Use of this waste heat stabilizes ambient temperatures at no extra cost.



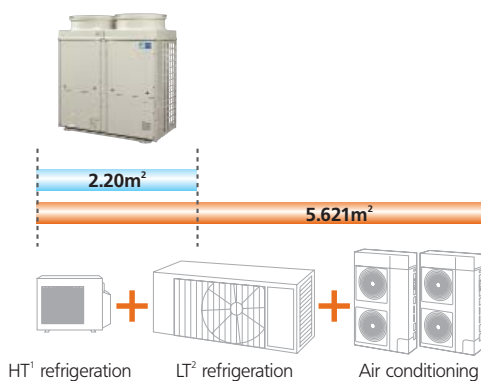


Conveni-pack is unique in combining the latest controls and inverter technology with a single refrigerant circuit, for both the refrigeration and air conditioning, to maximize energy efficiency. R-407C is used to provide high performance and compatibility with R-404A refrigeration cabinets and unit coolers.

The system can be specified for all refrigeration applications and is supplied with a wide range of air conditioning indoor units to closely fit the requirements for shop applications. A system controller with user interface is provided as standard and an optional freezer booster pack is available for low temperature refrigeration.

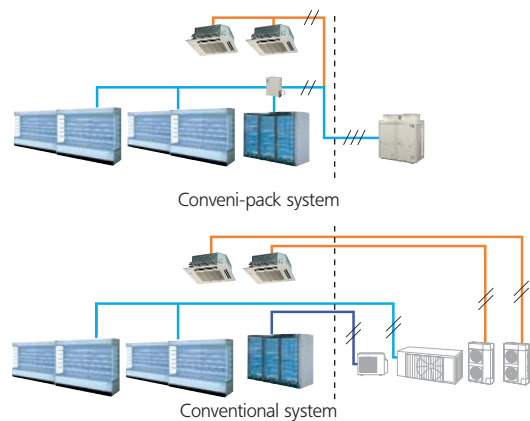
Reduced footprint

The Conveni-pack outdoor unit is compact when compared to conventional systems. Its footprint is 60% smaller, allowing it to be used in applications where space is restricted.



Simplified piping

The amount of piping used to connect the Conveni-pack outdoor unit to the indoor services is reduced from eight pipes to three when compared with a standard configuration.



¹ High Temperature.

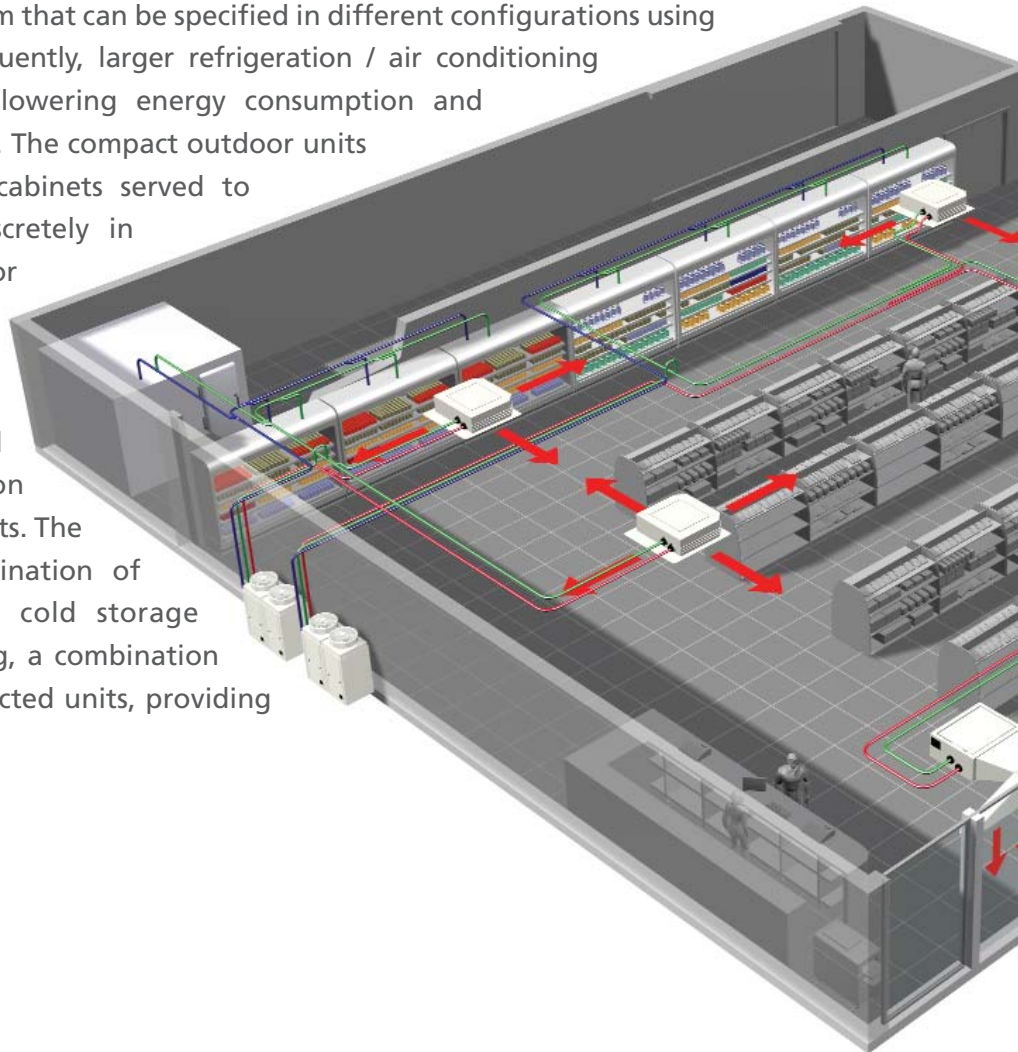
² Low Temperature.

Conveni-pack

A flexible system for larger applications

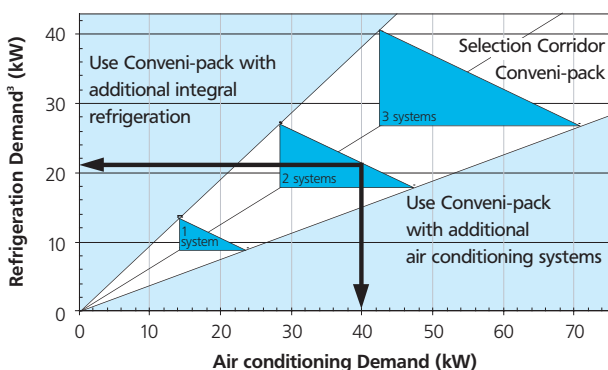
Conveni-pack is a modular system that can be specified in different configurations using multiple outdoor units. Consequently, larger refrigeration / air conditioning requirements are met whilst lowering energy consumption and stabilizing indoor temperatures. The compact outdoor units can be located close to the cabinets served to optimize the piping runs, discretely in groups or individually, inside or outside the building.

In larger applications the Conveni-pack system is connected to a variety of refrigeration systems and air conditioning units. The refrigeration may be a combination of cabinets and unit coolers in cold storage rooms, and the air conditioning, a combination of 4 way blow cassettes and ducted units, providing overdoor heating for example.



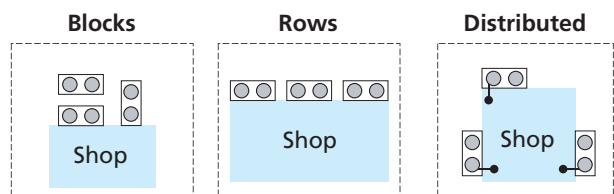
Capacity range

The combined refrigeration and air conditioning loads are used to select multiple systems and conventional air conditioning or integral refrigeration systems are added where required. This process maximizes the benefits of using Conveni-pack.



Placement Flexibility

The modularity of the Conveni-pack system maximises installation flexibility. Outdoor units can be grouped into blocks or rows, or distributed around the building, to meet individual installation constraints. Additionally, the outdoor units can be located above or below the refrigeration cabinets, inside the building⁴ and with long piping runs if required.

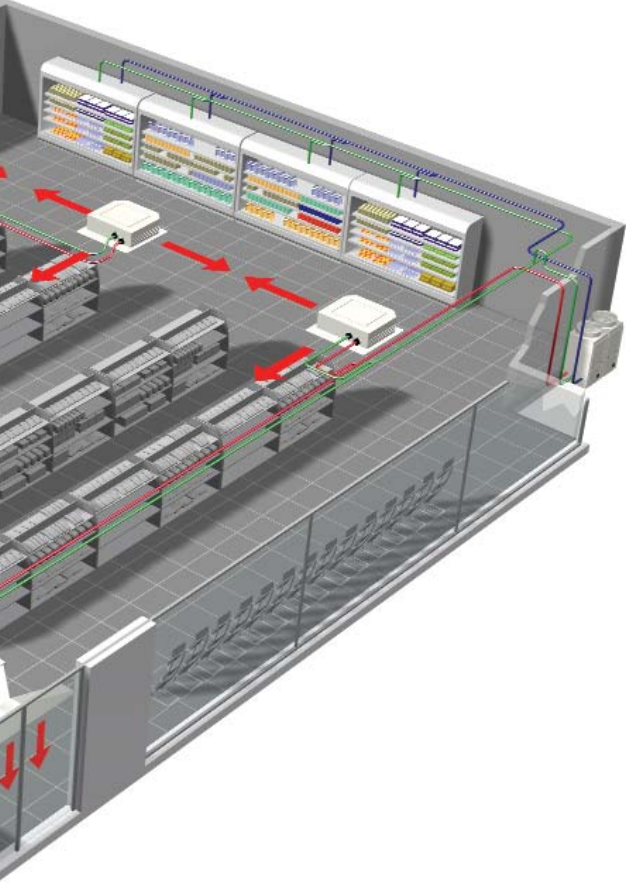


³ Excluding low temperature refrigeration.

⁴ Sufficient air flow around the unit must be provided.

The key benefits of installing Conveni-pack:

- Scalable from small to medium applications
- Reduced energy consumption
- Lower associated CO₂ emissions
- Power can be available for other uses
- Space saving and installation flexibility
- Improved in-store comfort
- Low noise



Case study

A number of theoretical simulations have been made using the Conveni-pack system for shops operated by a large UK retailer. Their average surface area was approximately 200m² with 50-70% of the refrigeration units connected to the Conveni-pack system. The remaining systems were a combination of conventional air conditioning and integral refrigeration cabinets. The results of the simulation were impressive:

- Electricity consumption reduced by 105,000 kWh/year on average
- Energy cost saving of € 8,000/year⁵ on average
- CO₂ reduction of 47,000 kg/year⁶

The investment in the Conveni-pack system would pay back within 1.5 to 3 years when compared to a conventional solution. Daikin is now installing a number of demonstration sites with major retailers in order to measure actual system performance.

⁵ at 0.076 €/kWh

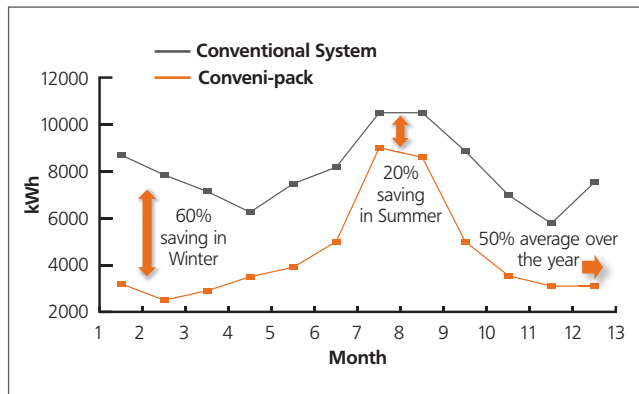
⁶ based on UK electricity production figures

Conveni-pack

System Features

Energy saving

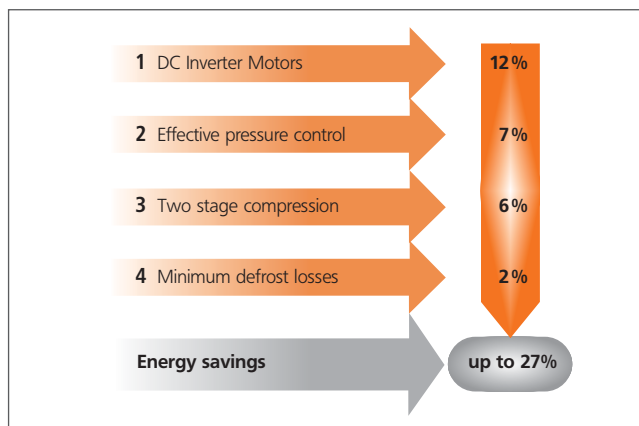
Using Conveni-pack can reduce annual energy consumption by as much as 50%⁷, when compared to conventional systems, by using optimised controls, inverter technology and heat recovery. The controls and inverter provide a baseline efficiency gain of 27% and heat recovery can provide up to 23% further energy saving depending on the outdoor temperature.



Inverter Technology and Controls

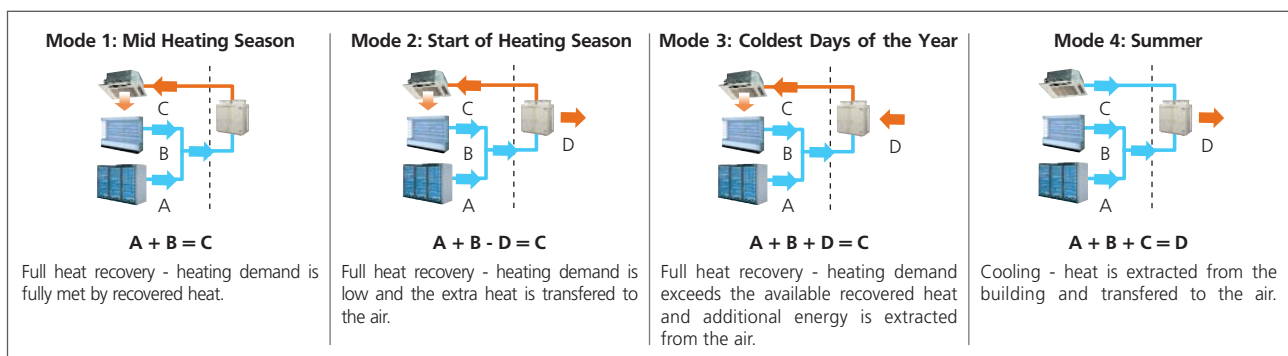
The 27% efficiency gain results from:

- 1 DC Inverter Motors** – on the inverter compressor and fan motors reduces energy consumption.
- 2 Effective pressure control** - minimizes the gap between evaporation and condensing temperature.
- 3 Two stage compression** - for the low temperature refrigeration using the optional inverter freezer booster pack.
- 4 Minimum defrost losses** – in heat recovery mode the need for a defrost cycle is removed.



Heat recovery – Improved comfort

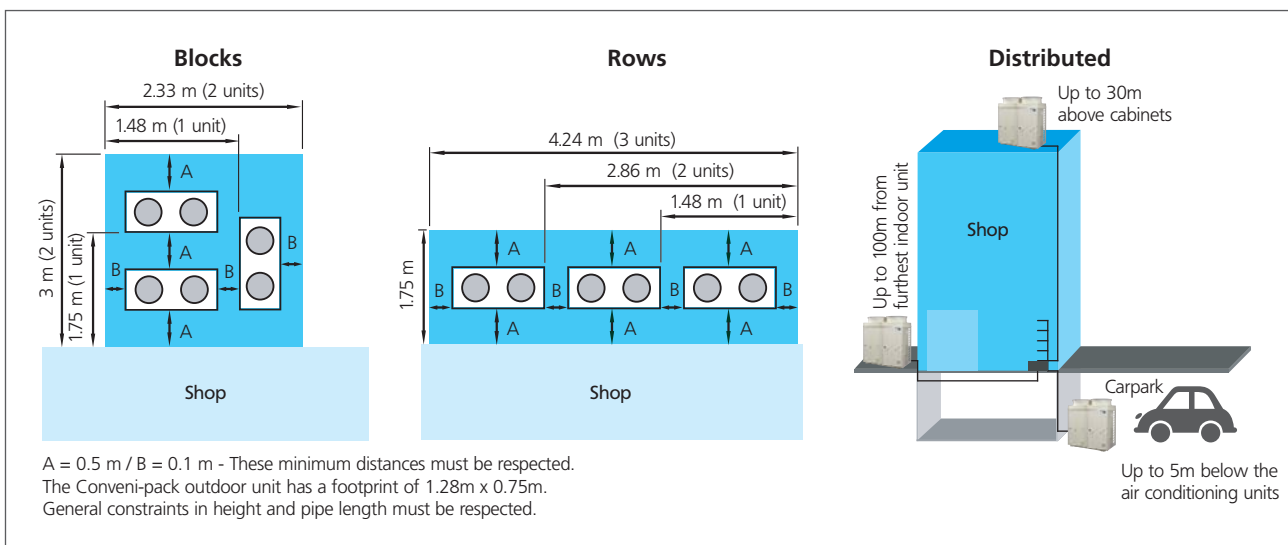
Heat recovery provides an additional 23% energy saving on average over the year by taking waste heat from the refrigeration system and providing stable comfort heating for free. 100% of the recovered heat can be used and is the most energy efficient means of heating the building. In combination with cooling, Conveni-pack is able to provide comfort all year round. Depending on the outdoor temperature, the system can operate in 4 different modes:



Configuration and Installation Flexibility

The modular Conveni-pack concept allows a wide and flexible range of installation practice to suit the variety of conditions met on-site:

- **Configurations:** multiple outdoor units can be positioned to make the best use of the space available, in blocks, rows or distributed around the building to minimize pipe runs.
- **Distance:** the length of piping between the outdoor unit and the furthest refrigeration cabinet or air conditioning unit on the circuit can be up to 100m.
- **Height:** the outdoor unit can be placed up to 30m above the lowest or up to 5m below the highest refrigeration cabinet or air conditioning unit.
- **Inside the building:** sufficient air flow around the unit must be provided.



Low Noise

The technology of Conveni-pack closely resembles VRV which has been installed in residential and noise sensitive areas over many years. Noise is minimized by:

- The continuous gas flow of the scroll compressors which is significantly quieter than the pulsating flows of a reciprocating compressor, and the inverter driven compressor allows partial load operation, which is quieter than conventional on-off systems.
- Compressors with specially designed sound suppressing jackets.
- Aero-spiral fan blades combined with aerodynamic grilles that reduce turbulence and noise. All fans have inverter driven motors that provide the right air volumes without sudden noise changes.

Conveni-pack features a programmable night setback mode that reduces noise by limiting the fan speed at sensitive times of the day.



Conveni-pack

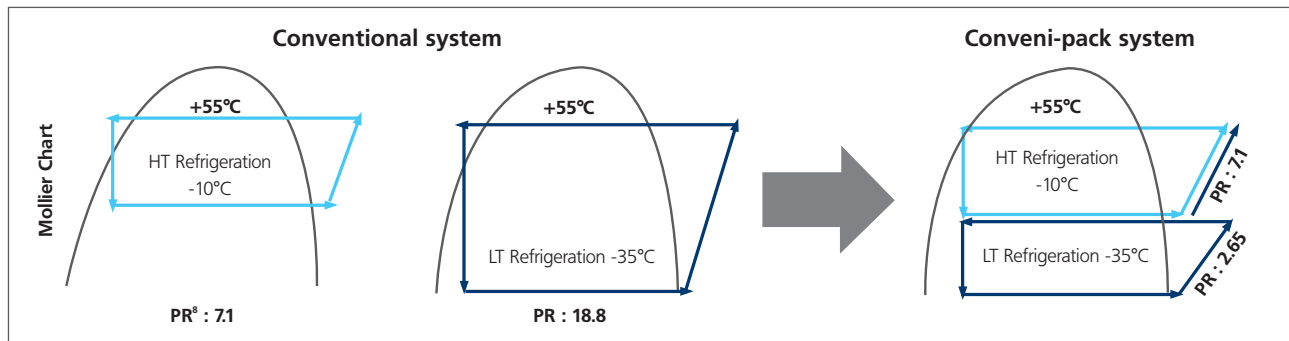
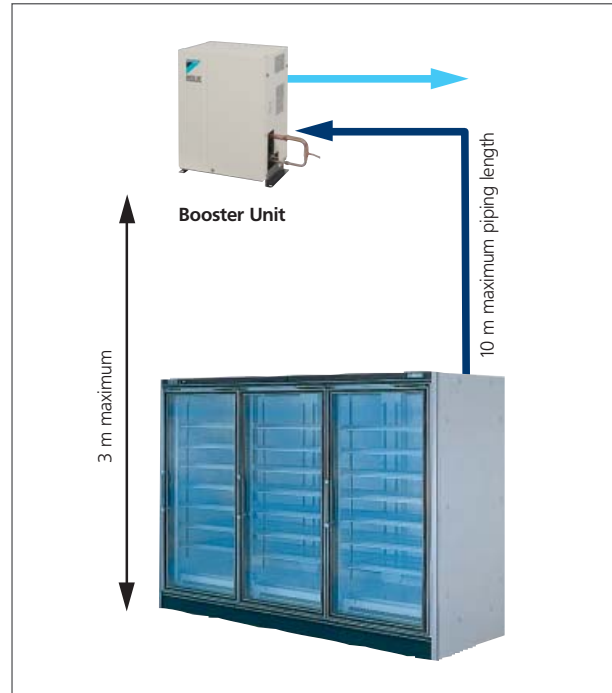
Options

Freezer Booster Pack

Conveni-pack can be provided with a freezer booster pack for use with low temperature refrigeration. This option brings additional energy savings and simplifies installation by limiting the length of heavily insulated pipe required.

The freezer booster pack contains a satellite compressor which provides the first compression stage from -35°C into the suction line of the high temperature refrigeration. The second stage compression is performed in the outdoor unit. This allows significantly lower compression ratios, reduced energy consumption and end temperatures.

The length of heavily insulated piping can be limited by placing the Booster unit within 10m of the low temperature cabinet or unit coolers, reducing the material and installation costs compared to conventional systems. The freezer booster pack should be installed indoors.



Air Conditioning Indoor units

The Conveni-pack system is available with a number of indoor unit options:

- **4 way blow cassettes** - for the majority of applications. The number of outlets can be adjusted between four and two, optimizing the distribution and avoiding air currents that would disturb the operation of the refrigeration cabinets.
- **Ceiling suspended units** - can be used where no ceiling cavity is available.
- **Ducted units** - available in high or low ESP⁹ versions for installations where control over the distribution is required, between aisles of refrigeration cabinets for example, or as an energy efficient alternative to direct electric air curtains.

⁸ Pressure ratio.

⁹ External Static Pressure.

Conveni-pack

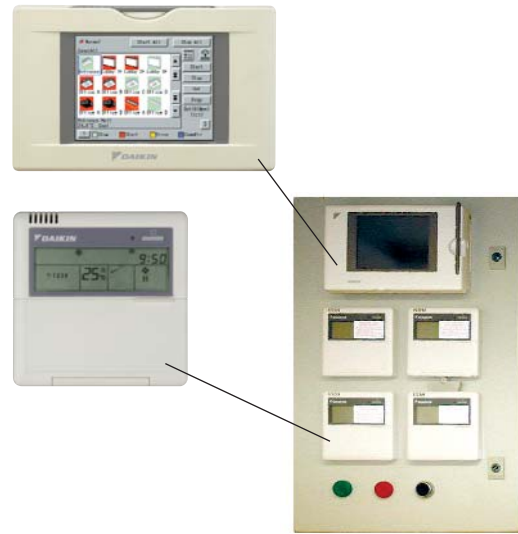
R-407C

Product Range

Outdoor unit



System controller



Air Conditioning Indoor units



4 way blow cassette



Ceiling suspended unit



Low ESP ducted unit



High ESP ducted unit

Freezer Booster Pack





Daikin Europe N.V. is approved by LRQA for its Quality Management System in accordance with the ISO9001 standard. ISO9001 pertains to quality assurance regarding design, development, manufacturing as well as to services related to the product.



ISO14001 assures an effective environmental management system in order to help protect human health and the environment from the potential impact of our activities, products and services and to assist in maintaining and improving the quality of the environment.



Daikin units comply with the European regulations that guarantee the safety of the product.

Daikin cares for our environment



Daikin's unique position as a manufacturer of air conditioning equipment, compressors and ozone-friendly refrigerants has led to its close involvement in environmental issues. For several years Daikin has had the intention to become a leader in the provision of environmental friendly products. This challenge demands the eco design and development of a wide range of products and an energy management system, which involves energy conservation and reduction of waste.



To encourage firms to make energy saving investments, the UK Government introduced an incentives scheme called the Enhanced Capital Allowance (ECA). Under this scheme, expenditure on technologies and products on the Energy Technology List can qualify for 100% first year tax allowances. The Energy Technology List of equipment and criteria is on www.eca.gov.uk. Conveni-pack qualifies for ECA.



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