THERMO KING

CRYOTECH

— breakthrough technology - minimum environmental impact —

SINGLE- AND MULTI-TEMPERATURE CYOTECH
REFRIGERATION SOLUTIONS FOR TRUCK & TRAILER

TRANE TECHNOLOGIES

CONTENT

CryoTech refrigeration

Breakthrough technology - minimum environmental impact

Today's producers, retailers, consumers and legislators rightly demand the highest standards of product quality. However, they also require that their refrigerated transport operation have the lowest possible impact on the environment. We can no longer continue to depend on fossil fuels and fluorinated refrigerants. Cooling units must be extremely quiet to operate in noise sensitive areas, round the clock, and they must meet increasingly stringent emissions standards to protect the quality of the air we breathe.

Thermo King's breakthrough CryoTech refrigeration technology can now provide a no-compromise solution using a recycled natural refrigerant in a simple, robust system to eliminate both noise and emissions, while at the same time enabling the fastest pull-down on the market and the most accurate temperature control due to the all-new SR-3 CryoTech controller.

CryoTech units are available for single and multi temperature applications. Discover the range.

Available models:

- CT-10 Truck
- CT-10 Spectrum Truck
- CT-15 Trailer
- CT-15 Spectrum Trailer

Precise temperature control

Breakthrough technology

CT-10 Spectrum Truck

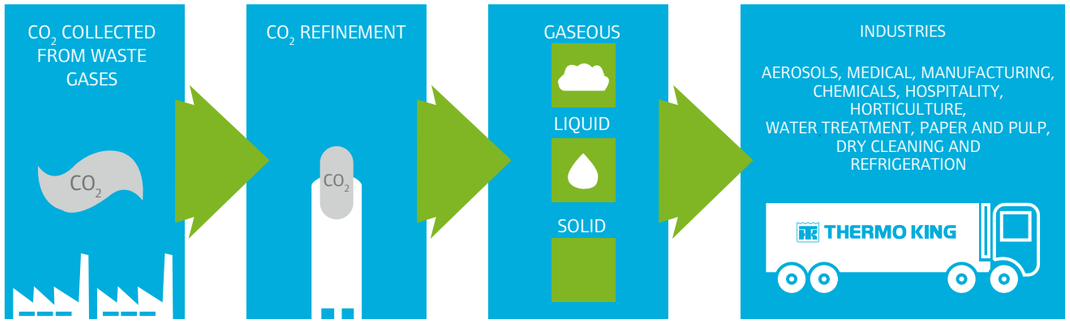
CT-15 Spectrum Trailer

The CryoTech commitment

Reduced carbon footprint

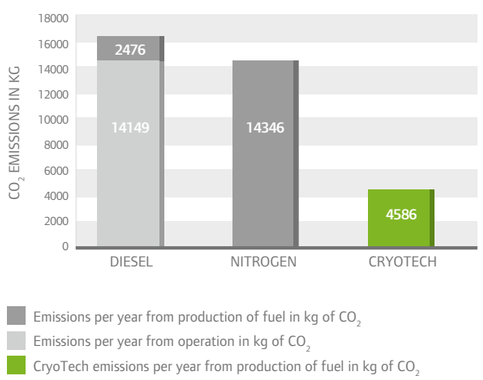
The refrigerant chosen for the CryoTech system, liquid carbon dioxide (CO_2 or R-744), is sourced from recycled waste gas captured during the production of fertiliser, bio-ethanol and other chemical compounds. It is commonly used for carbonating soft drinks, food processing and water treatment.

Because this refrigerant is a by-product that would otherwise be released into the atmosphere, there is no cumulative global warming effect caused by its use in a CryoTech system. Small amounts of greenhouse gases are created due to the consumption of electricity during the liquefaction of carbon dioxide, but this is significantly less than for similar systems running on nitrogen or indeed in the refining and use of conventional fossil fuels.



The total carbon footprint for the use of a CryoTech system is 75% less than a conventional diesel system and 68% less than a nitrogen cryogenic system.

AVERAGE ANNUAL CO_2 EMISSIONS FROM TRUCK UNIT OPERATION



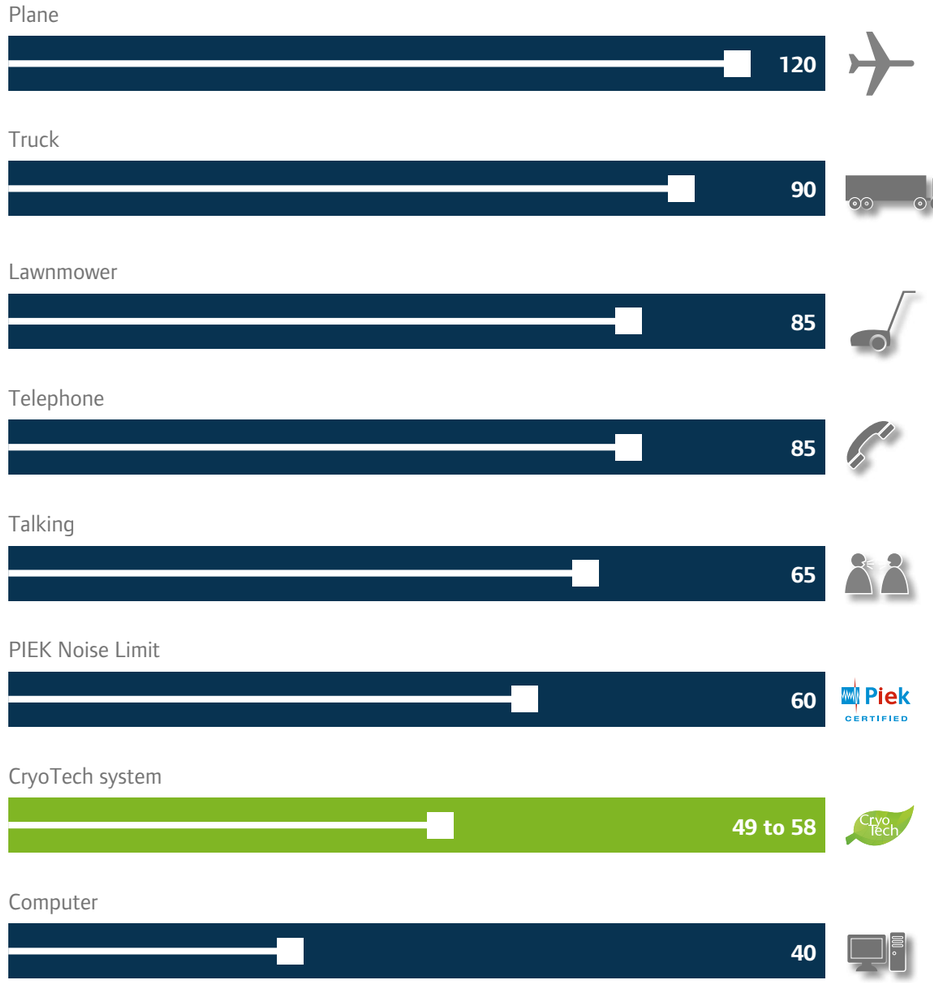
Lowest environmental impact

PIEK certified

The CryoTech system uses very few moving parts. Therefore, the extremely low operating noise ensures that both truck and trailer systems meet the demanding Piek standard. The Piek regulations were established in the Netherlands and enforce a 60dB(a) limit during nighttime deliveries in urban areas.

Not only will inner-city residents take positive notice of whisper-quiet CryoTech vehicles, but the comfort of drivers and others who work with the vehicles will be much improved.

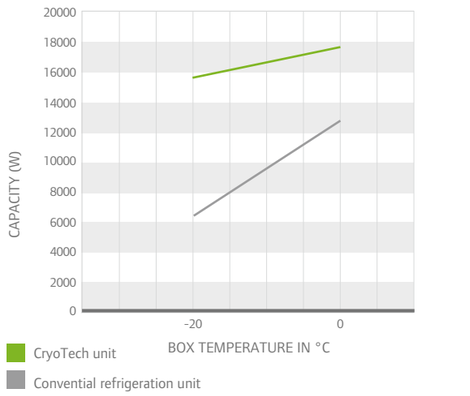
Sound pressure (dBA) - values at typical listening distances



Faster temperature pulldown and recovery

CryoTech systems have been designed for the most demanding retail and distribution operations. The unique nature of the technology delivers cooling capacity which remains unaffected by ambient temperature. Performance is substantially superior to conventional units, as demonstrated in the accompanying chart.

COOLING CAPACITY COMPARISON

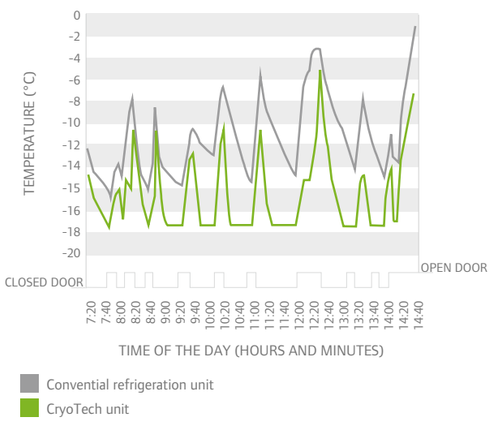


Faster temperature pull down

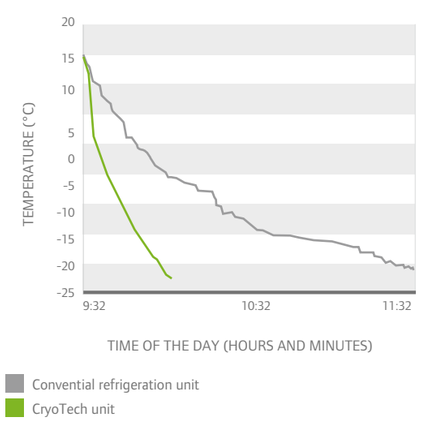
Perfect for distribution and multiple drops

Distribution runs with multiple drops and door openings place extreme demands on a refrigeration system trying to protect temperature sensitive loads. The exceptional cooling capacity of the CryoTech system means box temperature can be recovered four times faster than with any conventional system.

RETURN AIR TEMPERATURE DURING DISTRIBUTION CYCLE



PULL DOWN COMPARISON



Greater load capacity and vehicle fuel efficiency

The compact size and reduced number of components in a CryoTech system results in reduced refrigeration system weight on every vehicle. This means greater payload capacity, improved vehicle fuel efficiency and better axleweight distribution for the operator.

High quality insulation in the carbon dioxide tank is required to guarantee minimum leakage and maximum uptime. Due to its vacuum technology, high performance economizer and carbon dioxide level indicators, the CryoTech optimises carbon dioxide consumption, reducing operating costs and downtime.

The compact CryoTech electronic module is easily installed on any size of vehicle in any compartment configuration.

Ease and safety of operation

A first-time operator will need a brief introduction to optimise their use of the CryoTech system, but the same "good practice" that applies to conventional systems also applies to CryoTech. The local Thermo King dealer will provide the right tools to ensure that maximum benefit is extracted from the system.

Filling stations are fully automated and have patented quick-connect couplings with automatic cut-offs to prevent leakage even when accidentally damaged. Unlike some cryogenic systems, CryoTech units do not exhaust their coolant into the load space, thus protecting the operator and avoiding complex safety procedures.

Increased shelf-life

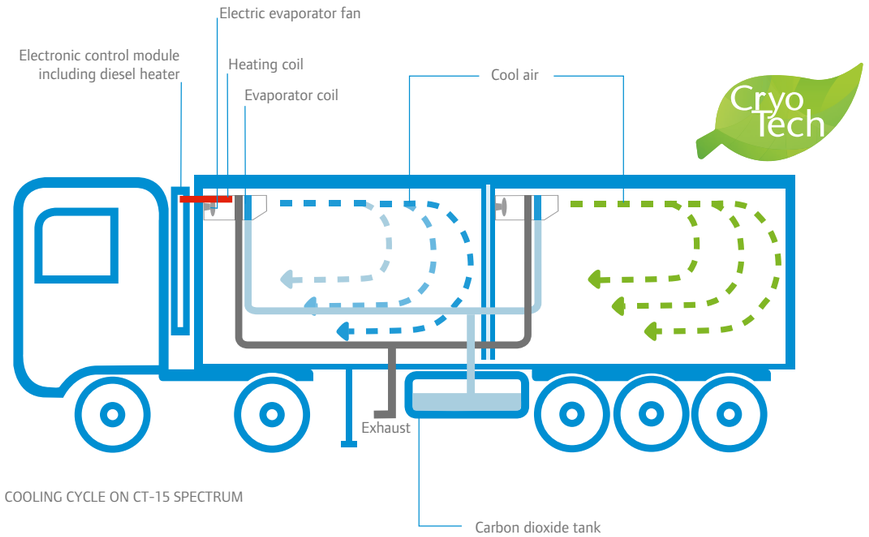
Even small variations in temperature can significantly affect the shelf-life of sensitive produce. For example, a difference of 1°C can reduce the shelf-life of lettuce by over a day. Grapes deteriorate more in ten minutes at 35°C than in 16 hours at 20°C. Hence the faster initial pull-down and temperature recovery on CryoTech also mean that shelf-life is extended and product spoilage is reduced. This results in efficiency gains and cost saving.

How does the system work?

Liquid carbon dioxide is held in a refillable tank mounted under the vehicle chassis. When cooling is demanded by the microprocessor controller, valves open to allow the liquid to flow from the tank into the evaporator coils inside the cargo space. Electric fans circulate air through the coils. As the liquid evaporates, it cools the coil and the air passing over it. Cool air is thus circulated through the cargo maintaining the temperature set point. Having cooled the coil and the air, the gas is directed outside the vehicle body into the atmosphere.

Importantly, the gas never enters the cargo space and the load temperature and humidity are controlled by airflow. Other cryogenic systems inject refrigerant gas into the load space creating potential safety hazards and failing to control humidity in fresh produce.

The new SR-3 CryoTech controller provides improved electronic features to ensure tight and accurate temperature control, thus protecting the load, maximising uptime and reducing operating costs. New telematics features support data transfer and management to provide the information needed to ensure optimum use of the CryoTech system.



COOLING CYCLE ON CT-15 SPECTRUM

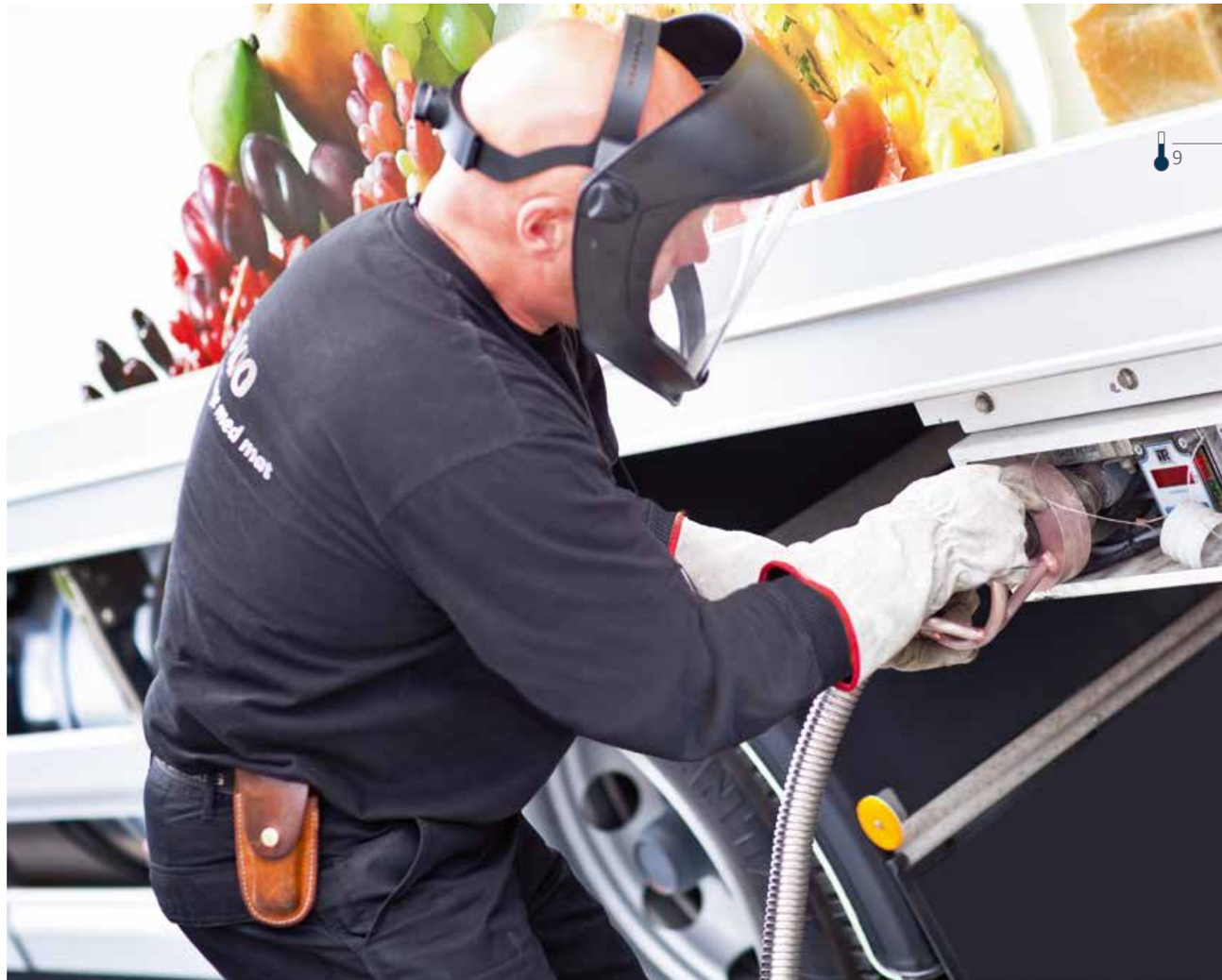
Accurate temperature management and defrost require heating as well as cooling. On trailer applications, it is provided by a small diesel heater. On truck applications, vehicle engine coolant is used to deliver heating on the road, while an electric heater coil is used on electric standby.

CryoTech filling stations

Thermo King and its partners have created and are expanding a network of dedicated filling stations where CryoTech units can be refilled. These stations consist of a storage tank refilled by the gas supplier and patented purpose built carbon dioxide dispensers.

In some countries like the Netherlands and Norway a widespread network of stations is already operational. Thermo King is in the process of building new filling stations in several other countries. Visit www.europe.thermoking.com for updates on the filling station network.

Stations are typically publically accessible, like regular petrol stations, but for large fleets a dedicated private station is also possible.



CryoAssist with every CryoTech unit

Full service support

To ensure total customer satisfaction with the ownership and operation of CryoTech equipment, as well as total peace of mind, all CryoTech units are available with a CryoAssist package.
With CryoAssist, the local Thermo King dealer takes responsibility for keeping the unit running reliably and efficiently. That means the operator can concentrate on running his business.

CryoAssist includes:

Driver training

Specific driver training is provided to ensure that operating costs are minimized and uptime is maximized. Training is carried out when units are first put into operation and then on a regular basis for new drivers.
Topics covered include:

- How to operate the unit and filling station
- Best practice in loading and unit operation
- Safety in operation and refueling, including provision of safety equipment for drivers

Maintenance and service

To maximize fuel efficiency and minimize downtime, a full preventive maintenance schedule, including interim inspections, is provided under contract by fully trained technicians at the Thermo King dealer. CO_2-tank re-vacuuming is performed as required. Only genuine Thermo King approved replacement parts are used.

Reduced operational costs*

When using your CryoTech unit, carbon dioxide consumption is influenced by many factors including the insulation of the vehicle body, the ambient temperature, cargo temperature and the Standard Operational Procedures (SOP) in effect. CryoAssist will support you in minimising operational costs by measuring carbon dioxide consumption to highlight opportunities for further economy.

The new introduced SR-3 controller allows us to capture CO_2 consumption of your CryoTech unit, which will help to determine possible high usage of CO_2. As part of CryoAssist, your TK dealer will provide you guidance and feedback on how to reduce the CO_2 consumption on your fleet or on particular units on a regular basis.

*** Available in some countries**

CO_2 consumption is a key driver in operational cost. Typical gains of 30% with CryoAssist that include CO_2 monitoring are achievable*.

*** Based on vehicles operated in the Netherlands and Norway.**

The following offerings are available:

THERMO KING CryoTech Assist

THERMO KING CryoTech AssistPlus

A complete overview of what each offering includes is shown in the table below.

CRYOASSIST PRODUCT DETAILS	CRYOASSIST	CRYOASSIST PLUS
Service & Support		
Maintenance & repairs covered	✓	✓
Scheduled services reports	✓	✓
Immediatede credit approval for breakdowns	✓	✓
Tracking: remote online asset monitoring system		
Build in fleet monitoring device (Tracking), activated	✓	✓
Online Tracking fleet monitoring system acces for the customer TracKing	✓	✓
iKare online access		
Repair and maintenance history	✓	✓
Invoice history iKare	✓	
Management report	✓	✓
Asset management		
Preventative repair & maintance history	✓	✓
Early warning system “end of contract”	✓	✓
Scheduled services requests	✓	✓
Fleet optimalisation		
Driver & fleet manager operational training (by home dealer)	✓	✓
Unit consumption report to manage operational costs on CO_2 consumption	✓	✓

SR-3 CryoTech controller, the key to total temperature management

SmartReefer3

Powerful and simple to use, the new SR-3 CryoTech controller makes it easy to accurately manage the temperature in the truck or trailer, no matter where you are or what you are hauling.

CT-15 CryoTech Trailer SR3

CT-10 CryoTech Truck SR3

Enhanced performance and temperature control

The SR-3 CryoTech controller includes features that enhance unit performance and reduce costs, such as:

- Optimisation software especially designed for CryoTech
- Superior temperature control
- EEV (Electronic Expansion Valve)
- Reduced CO_2 consumption

Improved safety and security

At the end of the day, protecting your load is what matters. The SR-3 makes that job easier and even more effective with a range of enhanced features:

- Keypad with lock-out
- Battery/Electric standby auto switching
- Set point warning
- Password protection
- Data Acquisition System (DAS) and TracKing compatibility

Intuitive interface and ease of operation

The simple and logical menus, easy to read screen and choice of 9 languages make this the interface of choice. This allows quick and easy setup and precise refrigeration adjustments, helping your drivers, your customers and ultimately your business.

Full suite of data recording, management and analysis tools

Data Acquisition System (DAS) and CargoWatch™

The high performance datalogger records up to 6 independent sensors to meet the current regulatory requirements:

- Approved to EN12830, CE mark and IP-65 standards
- Memory storage for over 1 year's data and internal Real Time Clock
- The DAS (or CargoWatch™ for CT-15 units) connects to the SR-3 CryoTech controller to provide equipment information:
  - Set point, unit sensors temperature and operating mode
  - Carbon dioxide level, battery voltage, door opening and alarms essential for CryoTech operations
- The data stored is easily accessible and exportable to different media:
  - Downloadable to PC via USB and Wintrac
  - Printable via CargoPrint
  - Transferable over the air via TracKing or i-Box

TracKing

This online platform offers the operator visibility of his vehicles and their loads. Benefits include:

- Optimum temperature management via out-of-range alarm
- Unit uptime based on reefer alarm monitoring
- Cargo integrity thanks to 2-way commands with CryoTech reefer

For more information, visit www.tktracking.com

i-Box

The SR-3 CryoTech controller is also compatible with the Thermo King protocol interpreter, i-Box. The i-Box interface allows third party systems to read the CryoTech reefer information.

CryoTech advantages

FEATURES	OPERATIONAL BENEFITS	ENVIRONMENTAL BENEFITS
EFFECTIVELY SILENT	• Access to inner-city zones for night-time deliveries - increased fleet utilisation, reduced fuel consumption • Compliance with noise and truck engine idling regulations	• Driver and residents comfort • Reduced noise pollution • Less time spent in traffic - lower vehicle emissions
RAPID PULL DOWN	• Increased vehicle usage • Increased distribution centre productivity	• Lower emissions from vehicle engine
PRECISE TEMPERATURE CONTROL	• Enhanced temperature control and increased product shelf life • Reduced load loss under extreme conditions • Suitable for sensitive loads due to anti top-freezing control	• Reduced waste from spoilage
INNOVATIVE TECHNOLOGY	• Complements an environmentally responsible corporate identity • Life costs compare favourably with conventional technology	• No cumulative global warming effect from refrigeration • Powered by recycled natural refrigerant
ZERO DIESEL EMISSIONS FROM REFRIGERATION	• Fuel cost largely independent of oil price fluctuation • Compliance with current and future regulations	• Significantly lower carbon footprint
NO FLUORINATED REFRIGERANT	• Compliance with current and future regulations	• No refrigerants to dispose of • No ozone depletion or increase in green house gas emissions
HIGHER RELIABILITY	• Lower downtime • Longer service life of unit	• Fewer used parts and no lubricants or other hazardous waste to dispose of
FLEET MANAGEMENT	• Reduces operating costs • Increases security and reduces insurance risk • Increases truck/trailer asset utilisation	• Reduces vehicle emissions

Making the switch to CryoTech

Businesses are often reluctant to make operational changes. Some delay until their competitors move first. Now, with many hundreds of installed systems and over ten years of experience, Thermo King and their dealer network are perfectly equipped to help companies make the switch.

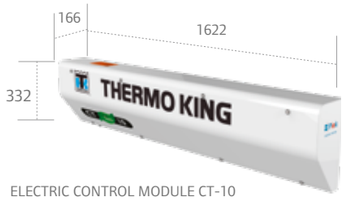
Not every transport operation is suited to CryoTech technology and the first step in any consultation is an in-depth evaluation of the business application. This will include:

- The daily delivery cycle
- Loading and unloading practices
- Driver training needs
- Fuel supply options: use of existing regional network of filling stations or installation of storage facility on site
- Cost of ownership including operation, maintenance and residual value
- Recalculation of the transport operation's carbon footprint to determine before and after measures
- Availability of subsidies
- Equipment demonstration
- Meeting existing users of the technology (where feasible)

A complete product range

The CryoTech product range covers all typical distribution vehicle configurations, with both single and multi temperature versions (lanes or compartments, up to three temperatures) for rigid trucks and trailers.

Dimensions (in millimetres)

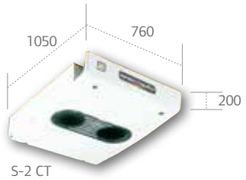


ELECTRIC CONTROL MODULE CT-10

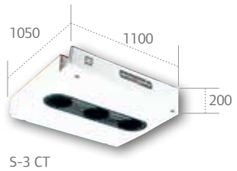
TANK

ELECTRIC CONTROL MODULE CT-15

Remote evaporators

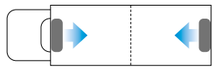
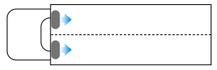
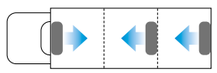


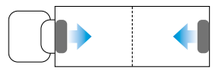
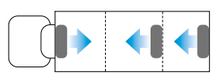
S-2 CT



S-3 CT

Zone configurations

TRUCK				
1 ZONES		**ZONE 1**	**ZONE 2**	**ZONE 3**
	Evaporator	2 x S-3 CT		
	Cooling Capacity	17600 W		
	Total Cooling Capacity	17600 W		
2 ZONES		**ZONE 1**	**ZONE 2**	**ZONE 3**
	Evaporator	S-3 CT	S-3 CT	
	Cooling Capacity	8800 W	8800 W	
	Total Cooling Capacity	17600 W		
	Evaporator	S-3 CT	S-2 CT	
	Cooling Capacity	8800 W	5800 W	
	Total Cooling Capacity	14600 W		
3 ZONES		**ZONE 1**	**ZONE 2**	**ZONE 3**
	Evaporator	S-2 CT	S-2 CT	S-2 CT
	Cooling Capacity	5800 W	5800 W	5800 W
	Total Cooling Capacity	17400 W		
	Evaporator	S-2 CT	S-2 CT	S-2 CT
	Cooling Capacity	5800 W	5800 W	5800 W
	Total Cooling Capacity	17400 W		

TRAILER				
1 ZONES		**ZONE 1**	**ZONE 2**	**ZONE 3**
	Evaporator	2 x S-3 CT + 1 x FB*		
	Cooling Capacity	17600 W		
	Total Cooling Capacity	17600 W		
2 ZONES		**ZONE 1**	**ZONE 2**	**ZONE 3**
	Evaporator	S-3 CT	S-3 CT	
	Cooling Capacity	8800 W	8800 W	
	Total Cooling Capacity	17600 W		
	Evaporator	S-3 CT + FB*	S-2 CT + FB*	
	Cooling Capacity	8800 W	5800 W	
	Total Cooling Capacity	14600 W		
3 ZONES		**ZONE 1**	**ZONE 2**	**ZONE 3**
	Evaporator	S-3 CT	S-3 CT	S-3 CT
	Cooling Capacity	8800 W	8800 W	8800 W
	Total Cooling Capacity	26400 W		
	Evaporator	S-3 CT	S-3 CT	S-3 CT
	Cooling Capacity	8800 W	8800 W	8800 W
	Total Cooling Capacity	26400 W		

(*) FB = Fan Banks

Specifications

SPECIFICATIONS		S-2 CT		S-3 CT	
REFRIGERATION CAPACITY SYSTEM NET COOLING CAPACITY (INDEPENDENT OF AMBIENT TEMPERATURE) CAPACITIES OF MULTIPLE EVAPORATORS ARE CUMULATIVE					
Return air to evaporators	°C	0°C	-20°C	0°C	-20°C
Capacity on vehicle power/electric standby	W	5800	5200	8800	7800
Airflow volume @ 0pa static pressure	m^3/hr	1360		2040	
Discharge velocity (airthrow)	m/sec	9.1		9.1	
HOST UNIT ELECTRIC STANDBY					
AC Voltage/Phase/Cycles	380/3/50				
	230/3/50				
REFRIGERANT: RECYCLED LIQUID CO_2, R-744					
Charge, 330L Tank	kg	Maximum 373			
Charge, 430L Tank	kg	Maximum 489			

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Maximum Number of fans

- CT-10 & CT-10 SPECTRUM: 6
- CT-15 & CT-15 SPECTRUM: 9

	WEIGHT	LENGTH	
ELECTRIC CONTROL MODULE		MAXIMUM LENGTH	FROZEN OR FRESH
CT-10 Spectrum Truck	49 kg	9 m	
CT-15 Spectrum Trailer	145 kg	13 m	
EVAPORATOR			
S-2 CT	35 kg		
S-3 CT	54 kg		
TANK			
330L EMPTY/FULL	171 kg/544 kg		
430L EMPTY/FULL	207 kg/696 kg		

3 year warranty

WARRANTY CONDITIONS

Thermo King warrants the new product delivered will be free of defects in material and workmanship for the period of time specified in the applicable warranties. Specific terms of the Thermo King warranty are available on request.

Find out how CryoTech can become the future of your business.

Contact your nearest Thermo King dealer.

THERMO KING

Thermo King – by Trane Technologies (NYSE: TT), a global climate innovator – is a worldwide leader in sustainable transport temperature control solutions. Thermo King has been providing transport temperature control solutions for a variety of applications, including trailers, truck bodies, buses, air, shipboard containers and railway cars since 1938.

For further information, please visit:
europe.thermoking.com

Find your nearest dealer on
dealers.thermoking.com

TRANE TECHNOLOGIES

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