

Transcritical CO₂ DX Refrigeration Packs

CO₂ is the likely refrigerant choice of most supermarkets in the future since it has low gas cost and, because of its zero environmental impact, low taxation levies. In addition it is non toxic and has lower energy usage at subcritical temperatures.

- The CO₂ DX 2-stage Booster Pack provides both Low Temperature Freezing (LT) and Medium Temp. Refrigeration (MT) in the same refrigerant circuit.
- The CO₂ DX MT Pack only caters for Medium Temperature Refrigeration.

Both systems expect Direct Expansion modulating valves on cases and coolers in order to get the benefits of optimised energy usage.

The GC-45 and E636 controllers provide smart optimising controls which reliably ensure superb product temperatures, safe operation, low energy usage and smooth transitions from Subcritical to Transcritical CO₂ phases.



CO₂ DX Booster Pack

Transcritical or Subcritical CO₂ Pack
2-Stage Booster Pack
Evaporating Temperatures: **-10°C/-35°C**
Gas Cooler Temperature: **+35°C**
Capacity MT pack: **5 - 80 kW**
LT pack: **5 - 20 kW**
Compressors; Bitzer Octagon CO₂
MT pack : 1,2,3,2 transcritical
LT pack : 1,1,1,2 subcritical
VFDs ; ABB ACS550
Valves: Danfoss ICMTS, ETS, AKV-10
Pressure Transducer & Safeties: WIKA
Controls: Guardian GC-45 CO₂
Heat Exchanger to : Dry Cooler or Heat Reclaim

CO₂ DX MT Pack

Transcritical or Subcritical CO₂ Pack
Single Stage MT
Evaporating Temperatures: **-10°C**
Gas Cooler Temperature: **+35°C**
Capacity MT pack: **10-160 kW**
Compressors; Bitzer Octagon CO₂
MT pack : 2,3,4 transcritical
VFDs ; ABB ACS550
Valves: Danfoss ICMTS, ETS, AKV-10
Pressure Transducer & Safeties: WIKA
Controls: Guardian GC-45 CO₂
Heat Exchanger to : Dry Cooler or Heat Reclaim



- Optimised Controls
- Stable Transitions
- Low Energy Usage
- Low Cost Refrigerant
- Ozone Friendly,
- Non Toxic
- Low Carbon Footprint

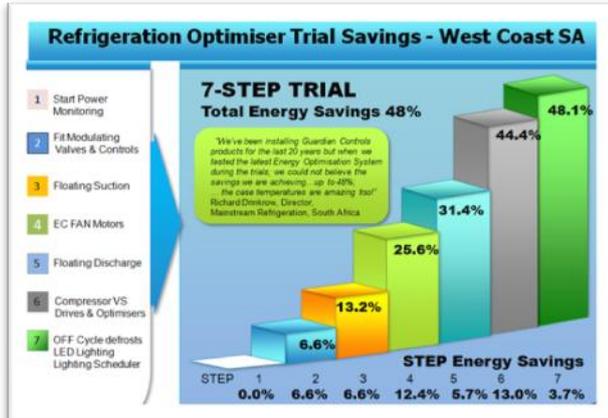
- Simple installation
- Low Service Costs
- Reduced Life Costs
- Low Noise Levels
- Integral Safety Trips
- Compact Design
- Smart Communications



Transcritical CO₂ Packs Optimisation & Control

Energy Optimisation Trials

Four years ago we did various trials with our refrigeration partner in South Africa to quantify the Energy Saving techniques applicable to his main client's supermarket controls there.



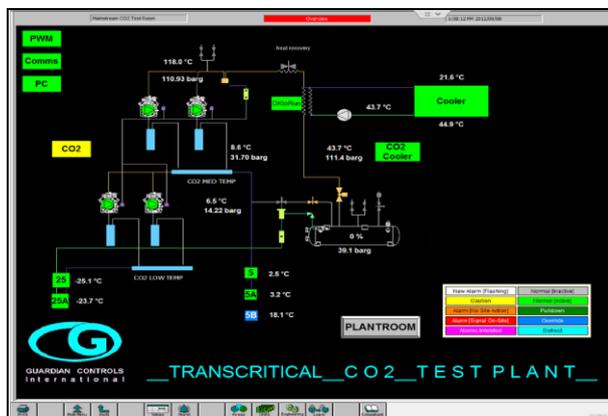
Subsequently our partner has upgraded 100+ stores in South Africa with our Energy Optimisation Controls and saved his client, dependent on the facilities already fitted, from 20% to 40% of the refrigeration energy costs per store.

Subcritical CO₂ Packs

Two years ago we jointly developed CO₂ subcritical packs and controls in our partners Capetown Test Laboratory. Within the next couple of months a total of twelve subcritical CO₂ supermarket systems will have been installed in South Africa. These subcritical CO₂ systems use a R134A pack for cooling via a heat exchanger. All Packs are based on Bitzer CO₂ compressors with our **GC-045 CO₂ Pack controller** for ABB drives, EBM fans and Danfoss valves.

Transcritical CO₂ Packs

The subcritical CO₂ pack was designed to be able to run transcritical using the same pack and gas cooler vessel design.



We have recently completed laboratory trials with the system running transcritical at 112barg via a heat exchanger to a dry cooler giving a gas cooler temperature of 44°C

All future new stores for the client will now be fitted with this elegant Transcritical CO₂ design.

Energy Optimising Controls

Accurate temperature and superheat control eliminates energy wasted in overcooling whilst still maintaining the required product temperatures.

Adaptive evaporator superheat control uses minimum refrigerant flow to maintain product temperatures, stabilize evaporator loads, raise evaporating conditions and eliminate the need for electric defrosts on medium temperature cases.

Variable Speed Drives on compressors and condensers save energy by accurately matching load requirements using minimum power. The consequent reduction in compressor ON/OFF operations prolongs plant life.

GC-45 CO₂ Pack Controls

Integrate the control of the compressor and evaporator to ensure correct product temperatures are maintained at cases and cold rooms whilst generating a stable refrigerant flow around the system and saving energy.

Compressor Motor Speed Control with ABB Inverters ensures Precise Load Matching and Efficiency. This cannot be achieved through relatively coarse step changes such as loading valves.



GC-45 CO₂ Pack

The Guardian GC-45 permits significant reductions to be made in the size of compressors and plant on new installations due to the lower duty and power loads now required throughout the system.

GC-45 CO₂ Gas Cooler Control

Innovative control of Danfoss ICMTS and ETS valves provides smooth transition between Subcritical and Transcritical operation of the gas cooler. The Guardian

GC-45 CO₂ provides appropriate interlocks between CO₂ pack, Discharge pressure, Gas cooler and Heat exchanger cooling to ensure safe operation at these high pressures.

ETS valves are PID loop controlled via a stepper motor.

ICMTS valves are PID loop controlled via a 0-10vdc output.

Pressure Transducers (4-20ma) have local displays plus built in HP and LP safety trips.

Suction Pressure Optimiser

The suction pressure setpoint of the compressor is varied to provide the optimum suction pressure for the current case or room evaporator load conditions whilst maintaining the integrity of stored product. Evaporator temperatures and superheats from all evaporators on the system are used to determine whether or not it is safe to float up (increase) the suction pressure setpoint. Floating up the suction pressure results in a reduction in pressure across the compressor which significantly reduces the load current and required energy.

Display Case & Room Control

When AKV10 Modulating Electronic Expansion Valves are coupled to highly efficient case and pack controls, set points can be varied dependent on the refrigeration load.

This ensures that the system operates at maximum cooling efficiency to provide the correct product temperature, whilst using the least amount of energy.



GC-E636 Case