R744 CO₂ SYSTEMS

NATURAL REFRIGERANT SYSTEMS

SINGLE & MULTIPLE COMPRESSOR SYSTEMS

SUB-CRITICAL / TRANS-CRITICAL
In 2004 BITZER Australia introduced the Enviro-Cold CO2 System to the Australian Refrigeration Industry. This was the first step in utilising CO2 in commercial refrigeration systems in Australia since the conception of refrigeration as we know it today. Since this time BITZER Australia has improved our systems to where we are today. This document provides an overall look at the full range of CO2 engineered equipment manufactured by BITZER Australia. The range includes:

- Generation 6 DX Hybrid
- Generation 7 Flooded Sub Critical
- Modular Cascade R134a / R744
- Cobalt Unit – R744 Sub Critical
- High Ambient R744 Booster Rack

Each product has been specifically designed to suit a particular application with efficiency and safety at the forefront of our designs.

Trans-Critical Development

BITZER Australia continues to invest in further advancements of trans-critical CO2. Realising the increase in governmental and public awareness about issues concerning global warming potential BITZER has produced a high ambient R744 Booster System design. The purpose of this development is to provide a higher Seasonal Energy Efficiency Ratio (S.E.E.R) compared to all other systems.

Further information relating to High Ambient R744 Booster Rack can be found on pgs. 13-14.

Research and Development - BITZER Australia

BITZER Australia has created two state of the art research and development laboratories across the two manufacturing facilities in Australia. Both facilities have fully operation R744 / CO2 plants specialising in testing compressor packages combined with heat exchange equipment. This enables BITZER to fully test and run all equipment before going to market. With this knowledge BITZER can also provide the technical support when commissioning your product for the first time.
**CO₂ Compressor Features**

The BITZER Semi Hermetic reciprocating SL compressors for CO2 are the heart of BITZER Australia’s R744 / CO2 natural refrigerant equipment range. The compressor range offers cooling capacity from 1.9KW to 82 KW for sub critical applications. The compressor series is characterised by improved energy efficiency, extended application limits up to a higher condensing temperature, and a permitted pressure load at the high side of 53 resp. 30 bar.

### The Special Highlights

- **Highly efficient and robust working valves**
- **Advanced centrifugal lubrication system by dynamic disc**
- **Wear-resistant drive gear with further developed multilayer bearings**
- **Special POE oil**
- **Housing with high strength pressure**
  - High pressure side **up to 53 bar**
  - Low pressure side **up to 30 bar**
- **Specially adapted motor version for condensing temperatures up to**
  \( t_c = 15°C \)
**Generation 6 DX Hybrid**

The Generation 6 (Gen 6) Low temperature R744 parallel compressor plant is the latest DX CO2 cascade system being manufactured by BITZER Australia. The “Gen 6” is a cascade plant with CO2 cascade BPHE’s condensers / R134a evaporating. This plant is connected to a dedicated BITZER R134a medium temperature plant.

The system has key features as standard to benefit the end user and enable the system to operate as efficiently as possible. As seen in the attached drawings the air cooled de-superheater is attached to the rear of the rack fully piped and factory tested (remote fitment is possible). This reduces the high temperature system load and improves system stability / operation. In addition a hot water heat reclaimed brazed plate heat exchanger can also be fitted. Utilising this heat exchanger not only assists in removing pressure and temperature for the high side of the discharge of the CO2 plant but also provides free hot water to your facility. The system is proven technology and is commonly being used throughout supermarket and commercial plants around Australia.

**Features of the “Gen 6”**

- BITZER Semi Hermetic reciprocating SL compressors
- Compact design
- Easy to Service (Component accessibility)
- Rectangular robust frame concept, 2, 3 & 4 compressor option
- Solid steel construction
- Reduced footprint & overall dimension
- Compressor sub frame c/w engineered vibration mounts
- Quiet operation under all conditions
- Improved Commissioning & service access
- Simple transport crate design
- Hot Water BPHE (optional)
- Pressure vessels manufactured to AS 1210 & AS 2971 where applicable
- BITZER dual Liquid and Suction insulated header design
- All pipework insulated with minimum 25mm foam insulation with moulded inserts
- Metal clad thermal insulated suction header / accumulator
- 6 x 40 bar relief valves c/w changeover manifold for vessel relief valve
- 1 x 25 bar relief valve
- HP & LP Bleed / Solenoids
- Air Cooled De superheater installed on the rack (Remote fitment optional)
- Compressor and system pressure controls
- Emergency Cooling BPHE & Optional BITZER Integral Emergency cooling condensing unit
- Liquid Line By Pass Circuit
Note drawing indicates optional accessories:

- Emergency Cooled Condensing Unit
- Hot water BPHE
- De-superheater fitted
Generation 7 Flooded Sub-Critical

The Generation 7 (Gen 7) R134a Flooded / R744 Rack System have been designed to reduce stress on brazed plate heat exchangers with a passive R134a fully flooded / R744 thermosiphon operation. The R744 thermosiphons vapour from the top of the liquid receiver and condenses the vapour in the primary side of the BPHE returning liquid to the vessel. The R134a separation vessels floods the secondary side of the BPHE thermo siphoning back to the top of the separation vessel. The new design reduces commissioning time and provides more stable operation under all conditions as the discharge gas is diffused into the liquid refrigerant within the liquid receiver via a BITZER designed sparge tube assembly. Adding innovation to the package is the flexibility of having the compressor package and vessel package on separate frames. They can be connected front to back for a conventional installation, installed side by side or L-shape to meet plant room dimensions. This also eases onsite installation.

Features

- BITZER Semi Hermetic reciprocating SL compressors
- 2 Frame Concept with multiple mounting positions
- Compressor sub frame c/w engineered vibration mounts
- Metal clad thermal insulated suction header / accumulator
- 5 x 40 bar relief valves c/w changeover manifold for vessel relief valve
- 1 x 25 bar relief valve
- Easy to Service (Component accessibility)
- Rectangular frame concept , 2 , 3 & 4 compressor option
- Solid steel construction
- Reduced footprint & overall dimension
- Pressure vessels manufactured to AS 1210 & AS2971 where applicable
- Liquid Line by pass circuit
- BITZER dual Liquid and Suction insulated header design
- Liquid separation vessel R134a c/w level probe and level switch
- Liquid receiver c/w low level indicator
Note drawing indicates optional accessories:

- BITZER Emergency Cooled Condensing Unit
- Hot water BPHE
Modular Cascade R134a / R744

The newly developed Cascade solution by BITZER Australia provides the combination of low side R744 /CO2 and R134a high side systems into the one compact unit. This provides contractors and end users a robust construction with compact dimensions. Utilising the new SL series R744 compressors for the low temperature cascade and optimised Ecoline series for the R134a high stage and medium temperature application, this compact package delivers efficiency and energy savings with a reduced Global Warming Potential.

- BITZER Semi Hermetic reciprocating SL compressors
- BITZER Ecoline Semi Hermetic reciprocating compressors
- Metal clad thermal insulated suction drier / accumulator
- 6 x 40 bar relief valves c/w changeover manifold for vessel relief valve
- 1 x 25 bar relief valve
- Easy to Service (Component accessibility)
- Rectangular frame concept, 2, 3 & 4 compressor option
- Solid steel construction
- Reduced footprint & overall dimension
- Pressure vessels manufactured to AS 1210 *AS 2971 where applicable
Dimensional Drawings
Cobalt Unit - R744 Sub-Critical

The BITZER Australia Cobalt Unit is a self-contained small capacity DX CO2 Cascade low temperature system. It is designed to be close coupled to the evaporator and connected to a high side medium ring main. It has been designed to be low height so it can be installed above freezer rooms or close to cabinets. There is also the opportunity to have a dual unit which provides 2 individual circuits which can operate at differing suction temperatures. The unit has also been built around a small footprint making it perfect to fit into tight spaces.

Features:
- Electrical Board option with control of EX valve
- R744 high pressure vent solenoid
- Off cycle solenoid
- R744 access valves
- 7 Litre liquid receiver
- Suction to liquid plate heat exchanger
- Single relief valve
- High pressure vent control
- Reduced footprint & overall dimension
- Pressure vessels manufactured to AS 1210 *AS 2971 where applicable

### Single Cobalt Units

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Nominal Capacity</th>
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<tbody>
<tr>
<td>2MSL-07K // V10T</td>
<td>3.62 kW</td>
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<tr>
<td>2KSL-1K // V10T</td>
<td>6.00 kW</td>
</tr>
<tr>
<td>2HSL-3K // V25T</td>
<td>9.88 kW</td>
</tr>
<tr>
<td>2FSL-4K // V200T</td>
<td>14.91 kW</td>
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<tr>
<td>2DSL-5K // V200T</td>
<td>22.00 kW</td>
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<tr>
<td>2CSL-6K // V200T</td>
<td>26.7 kW</td>
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Nominal Capacity given at -27°C SST, -2°C SCT

### Dual Cobalt Units

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Nominal Capacity</th>
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<tbody>
<tr>
<td>2 x 2MSL-07K // V10T</td>
<td>7.24 kW</td>
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<tr>
<td>2 x 2KSL-1K // V10T</td>
<td>12.00 kW</td>
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<tr>
<td>2 x 2HSL-3K // V25T</td>
<td>19.76 kW</td>
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<tr>
<td>2 x 2FSL-4K // V200T</td>
<td>29.82 kW</td>
</tr>
<tr>
<td>2 x 2DSL-5K // V200T</td>
<td>44.00 kW</td>
</tr>
<tr>
<td>2 x 2CSL-6K // V200T</td>
<td>55.20 kW</td>
</tr>
</tbody>
</table>

Nominal Capacity given at -27°C SST, -2°C SCT
BITZER CO2 BOOSTER RACK is a new generation of 2-stage CO2 trans-critical system in Australia. It comprises of a LT system, a MT system and a Parallel Compression system. Comparing to a standard Flash Gas Bypass CO2 trans-critical booster/cascade system currently on the market, BITZER CO2 BOOSTER RACK will produce a better Seasonal Energy Efficiency Ratio (SEER) thanks to the principle of thermodynamics for parallel compression. In other words, end users of Bitzer Australia products will benefit from consuming less energy while helping environment preservation.

BITZER CO2 BOOSTER RACK is able to offer popular options such as hot gas defrost on LT evaporators, and heat reclaim from high/low side systems, etc. With two on-aboard pressure vessels, a numerous of potential opportunities could be created, for example, A/C load via a flooded BPHE.

The standard features are:

- High stage compressor capable of handling high stage load including flash gas should the parallel compressor fail
- An external parallel compressor for optimising flash gas vapour duty
- High side heat reclaim capability
- Gas cooler with on-board hydro-spray system
- R134a emergency cooling system on MT receiver
- LT discharge gas for hot gas defrost on LT evaporators
- CAREL HP valves, receiver pressure valves, and CAREL valve drivers
- CAREL rack controllers and cool room controllers
Dimensional Drawings
Dual Cobalt - R744 Sub-Critical Unit
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Please note: The ISO Certification applies to New South Wales and Victoria branches only.