GREEN COLD CHAIN·PROTECTS FOOD SAFETY

Haier Carrier

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Haier Carrier

Integrated Commercial Refrigeration Solution

HybridCO_2OL COMPRESSOR RACK CONFIGURATION

Qingdao Haier-Carrier Refrigeration Equipment Co., Ltd.

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Qingdao Haier Carrier Refrigeration Equipment Co., Ltd. was established by Haier Group and Carrier in 2001. After more than ten years of development, it has become a world-class facility. Its products include supermarket display cabinets (more than 1,000 models), compressor rack and condensing units(scroll, reciprocating and screw), and heat exchangers (condenser and air cooler). It can provide customers with integrated refrigeration turnkey solutions. With the support of Carrier's R&D centers in Mainz, Germany and Shanghai China, the company now has many government certified labs, leading products and technologies in the world. The company is committed to provide advanced energy-saving solutions, e.g CO_2 systems, for customer.

In the past ten years, with abundant resources of two parent companies, Haier Carrier has become a world-class facility that owns the ISO9001, ISO14001certification and the ACE certification of United Technologies (Carrier's parent company). With strong R&D strength, we are able to provide world-class system solutions like D2D hot gas defrosting (Refrigerating defrosting system - China patent), Supermarket cold chain and HVAC system, SPI (Semi Plug-in Integrated system), HybridCO_2OL (carbon dioxide cascade refrigeration technology), and CO_2OLtec (carbon dioxide trans-critical refrigeration technology).

Green Energy Saving and Lower-carbon Environmental Friendly

Carrier/UTC

The world's leader in heating, air-conditioning and refrigeration solutions. Carrier is a part of UTC Climate, Controls & Security, a unit of United Technologies Corp., a leading provider to the aerospace and building systems industries worldwide.

In 2015, UTC global revenue volume is $56.1 billion.

When Dr. Willis Carrier invented the first modern air conditioning, he was on the list of 100 most influential people in the 20th century.

Haier Group

Since its establishment in 1984, Haier Group has expanded its business from the single production of refrigerators to areas such as household appliance, communication, IT digital products, home furnishing, logistics, finance, real estate and bio-pharmaceutical, becoming a world leading life solution provider.

Committed to building a local brand popular among global consumers, Haier has long been practicing an overseas market strategy of localized research and development, production and marketing, and great results have been achieved. Up to now, Haier has 5 research and development centers, 21 industrial parks, 66 trading companies and users across 100 countries and regions.

In 2015, Haier achieved a global turnover of RMB188.7 billion.

In 1877, Mr. Carl von Linde patented the technology of cold storage, creating its application in scientific research, industry and commerce, and domestic use.

Certification: GCCA (General Product Certification of Credit Alliance),EEL (Energy Efficiency Label),SAA (Standards Association of Australian) /MEPS (Minimum Energy Performance Standards), UL (Underwriter Laboratories) / NSF (National Sanitation Foundation)

Innovation Roadmap

1877

Mr Carl von Linde patented the first refrigerating machine, which was the first step toward modern refrigeration

The first Linde refrigerating machine improved from the prototype in 1873was assembled and put into practice at a brewery in Trieste (Italy) in 1877

1883

The refrigerating machine from Linde for Wiesbaden abattoir

1902

Mr Willis Carrier invented modern air conditioning

1915

Seven young engineers established Carrier company with investment of 32,600 dollars, which was the first independent company focusing on new arts and technology of air conditioning

1920

The Machinery Factory purchased by Linde in Cologne in 1920

1922

The unveiling ceremony of Rivoli Theatre equipped with the world's first Carrier units of 133 ton of refrigeration became the envy of others.

1945

The first trolley bus with Carrier's air conditioning in Atlanta

1950

The refrigerating showcase was assembled in Mainz factory

1950

Linde launched E1 deluxe refrigerating showcase

1952

Carrier company also helped cultivating new retail model-shopping mall, a sheltered courtyard centered building with energy saving and low operating cost

1994

In America, Carrier company stopped producing CFC chilling unit in this year which was 2 years earlier than the requirement stated by Clean Air Act

2002

E5 series was launched and new standard of frozen food display case and its temperature was established

2007

Carrier set up the global research center in Germany

2009

The 100th CO_2OLtec transcritical system was installed in a Aldi Sud store in Germany

2012

The first CO_2OLheat heating supply system was installed in a Edeka store in Germany.

2014

E6,the new generation of Remote cabinet product was launched.

2015

The first CO_2 rack offline in China factory

Haier Carrier

Integrated Commercial Refrigeration Solution

Haier-Carrier-Integrated Commercial Refrigeration Solution

HybridCO_2OL COMPRESSOR RACK CONFIGURATION

WHY DO WE CHOOSE CO_2?

- GWP = 1
- ODP = 0
- Non-flammable，non-toxic
- Natural material (a by-product of industrial production process)
- Low cost, global widespread supply
- The F - Gas regulations
- Suitable for heat recovery refrigerant
- CO_2 has high volumetric capacity, 6 times higher than R404A
- Smaller pipe work, leads to reduced refrigerant charge, reduced cooper cost and installation time
- CO_2 (R744) has very good heat transfer properties thus increase the evaporation temperature and improve COP of system

Wide Applications

- Large and medium-sized supermarkets

Product Features/options

- Independent framework
- Indoor installation
- Compact size can be through a standard door
- Standardized electronic control panel (unit and condenser)
- 2 to 4 compressor optional at low temperature
- Ability to service from four sides，saving machinery room space
- Compared with R404A system, operating cost saving 3% ~ 5%

*All data comparison vs. last generation product

CO_2/HFC Cascade Compressor Rack

V C M 4 1 0 0 O E - 24

- Parallel Rack
- Refrigerant: C:CO_2
- Application Temperature: M:Low Temp
- Compressor Quantity
- Control Panel: 0:No Control Panel; 1:with Control Panel using Danfoss controller; 2:with Control Panel using Carel controller
- Compressor Type: 0:Bitzer Semi-hermetic compressors
- Options: 0:No desuperheater/ heat reclaim, subcooler, MT suction HX; 1:Only desuperheater/heat reclaim; 2:Only subcooler; 3:Only MT suction HX; 4:With desuperheater/ heat reclaim and subcooler; 5:With desuperheater/ heat reclaim and MT suction HX; 6:With subcooler and MT suction HX; 7:with desuperheater/ heat reclaim, subcooler, MT suction HX
- Active Oil System
- Emergency CDU: E: Emergency CDU; N: No Emergency CDU
- Total Horse Power

Note: the heat exchanger not included in the desuperheater or heat reclaim

HybridCO₂OL Compressor Rack Configuration

- HybridCO₂OL Compressor Rack Models:

Item	Refrigerant	Lubricant	Standard Model	HP	Compressor Configuration
1	R744(R134a*)	BSE60K	VCM4100ON-24	24	4x2CSL-6K
2			VCM3100ON-36	36	3x4CSL-12K
3			VCM4100ON-48	48	4x4CSL-12K

*HybridCO₂OL compressor rack is LT rack which is working together with the MT rack as a cascade system. The standard MT refrigerant is R134a.

- Rating Condition: Saturated Suction Temprature -32°C, Saturated Discharge Temprature -8°C.

- Standard Configuration

- Bitzer semi-hermetical compressor subcritical R744 application
- 3 phase motor 380/3/50Hz
- Each compressor is equipped with suction/subcritical R744 application, low/high pressure protection and suction filter on main suction line
- Each compressor is equipped with electronic oil regulator
- Oil separator with safety valve
- Oil receiver with safety valve, sight glass, shut-off valves, differential valve
- Oil return loop includes ball valve, oil filter, solenoid valve and sight glass
- Liquid line includes liquid receiver, low liquid level switch, filter, sight glass and shut-off valves. Double safety valves are to be installed on site
- Cascade brazed plate heat exchanger
- 1 or 2 electronic expansion valve
- Controller and pressure/ temperature sensors of cascade brazed plate heat exchanger
- Angle valve with safety valve for service
- Suction accumulator with safety valve
- Suction manifold, discharge manifold and oil manifold
- Suction/discharge pressure gauges and switch
- Welded chassis and frame
- Electrical control system includes control box, controllers, other electrical components and pressure/ temperature sensors

Note: without refrigerant and oil ex-factory

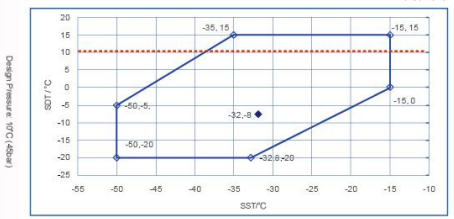
- Main Components List

Item #	Component	Item #	Component
1	Compressor Assy	5.5	Pressure/ temperature sensors
1.1	Semi-hermetic Compressor	5.6	Controller
1.2	Suction/discharge Valve	5.7	Safety Valve
1.3	HP/LP Pressure Switch	6	Liquid Line Assy
1.4	Oil Regulator	6.1	Liquid Filter
2	Oil Seperator	6.2	Safety Valve
2.1	Oil Separator	7	Suction Line Assy
2.2	Relief Valve	7.1	Suction Accumulator
3	Oil Receiver	7.2	Relief Valve
3.1	Oil Receiver	7.3	Suction Filter
3.2	Differential Valve	8	Other Parts
3.3	Relief Valve	8.1	Valves
4	Liquid Receriver	8.2	Pressure Switch
4.1	Liquid Receriver	8.3	Pressure Indicator
4.2	Low Level Switch	8.4	Sight glass
4.3	Dual Safety valve	8.5	Flexible tube
5	Cascade BPHE	9	Electronic Control Part
5.1	Cascade Brazed Plate Heat Exchanger	9.1	Controller
5.2	Solenoid Valve	9.2	Displayer
5.3	Electronic Expansion Valve	9.3	Pressure Sensor
5.4	Liquid Filter	9.4	Temperature Sensor

- Options: ·Desuperheater connection kit ·Emergency CDU ·MT suction line heat exchanger ·Subcooler

HybridCO₂OL Compressor Rack Operating Envelop

R744



HybridCO_2OL Compressor Rack Performance Data(superheat 10K)

Refrigerant: R744，SDT: -10℃，SH: 10K, SC: 0K, 50Hz, unit of capacity and power: kW

Item	HybridCO_2OL Rack Model	HP	Compressor Configuration	SST:-40ºC			SST:-35ºC			SST:-32ºC			SST:-25ºC		
				Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP
1	VCM4100ON-24	24	4x2CSL-6K	68.56	17.08	4.01	86.26	16.88	5.11	98.22	16.40	5.99	130.38	14.12	9.23
2	VCM3100ON-36	36	3x4CSL-12K	101.71	25.08	4.06	128.18	24.78	5.17	146.28	24.09	6.07	195.41	20.94	9.33
3	VCM4100ON-48	48	4x4CSL-12K	135.62	33.44	4.06	170.91	33.04	5.17	195.04	32.12	6.07	260.54	27.92	9.33

Refrigerant: R744，SDT: -8℃，SH: 10K, SC: 0K, 50Hz, unit of capacity and power: kW

Item	HybridCO_2OL Rack Model	HP	Compressor Configuration	SST:-40ºC			SST:-35ºC			SST:-32ºC			SST:-25ºC		
				Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP
1	VCM4100ON-24	24	4x2CSL-6K	66.28	17.92	3.70	83.60	17.88	4.68	95.20	17.56	5.42	126.80	15.60	8.13
2	VCM3100ON-36	36	3x4CSL-12K	98.40	26.31	3.74	124.20	26.28	4.73	141.90	25.80	5.50	189.90	23.07	8.23
3	VCM4100ON-48	48	4x4CSL-12K	131.20	35.08	3.74	165.60	35.04	4.73	189.20	34.40	5.50	253.20	30.76	8.23

Refrigerant: R744，SDT: -5℃，SH: 10K, SC: 0K, 50Hz, unit of capacity and power: kW

Item	HybridCO_2OL Rack Model	HP	Compressor Configuration	SST:-40ºC			SST:-35ºC			SST:-32ºC			SST:-25ºC		
				Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP
1	VCM4100ON-24	24	4x2CSL-6K	62.84	19.12	3.29	79.50	19.40	4.10	90.78	19.24	4.72	121.18	17.76	6.82
2	VCM3100ON-36	36	3x4CSL-12K	93.18	28.20	3.30	117.99	28.53	4.14	135.00	28.29	4.77	181.31	26.22	6.91
3	VCM4100ON-48	48	4x4CSL-12K	124.24	37.60	3.30	157.32	38.04	4.14	180.00	37.72	4.77	241.74	34.96	6.91

Refrigerant: R744，SDT: 0℃，SH: 10K, SC: 0K, 50Hz, unit of capacity and power: kW

Item	HybridCO_2OL Rack Model	HP	Compressor Configuration	SST:-40ºC			SST:-35ºC			SST:-32ºC			SST:-25ºC		
				Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP
1	VCM4100ON-24	24	4x2CSL-6K	57.16	21.12	2.71	72.73	21.84	3.33	83.31	22.00	3.79	111.86	21.28	5.26
2	VCM3100ON-36	36	3x4CSL-12K	84.61	31.26	2.71	107.66	32.28	3.34	123.53	32.46	3.81	166.84	31.44	5.31
3	VCM4100ON-48	48	4x4CSL-12K	112.82	41.68	2.71	143.55	43.04	3.34	164.70	43.28	3.81	222.46	41.92	5.31

HybridCO_2OL Compressor Rack Performance Data(superheat 20K)

Refrigerant: R744，SDT: −10℃，SH: 20K, SC: 0K, 50Hz, unit of capacity and power: kW

Item	HybridCO_2OL Rack Model	HP	Compressor Configuration	SST:-40ºC			SST:-35ºC			SST:-32ºC			SST:-25ºC		
				Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP
1	VCM4100ON-24	24	4x2CSL-6K	67.10	17.08	3.93	84.36	16.88	5.00	96.01	16.40	5.85	127.27	14.12	9.01
2	VCM3100ON-36	36	3x4CSL-12K	99.54	25.08	3.97	125.36	24.78	5.06	142.99	24.09	5.94	190.75	20.94	9.11
3	VCM4100ON-48	48	4x4CSL-12K	132.72	33.44	3.97	167.15	33.04	5.06	190.66	32.12	5.94	254.33	27.92	9.11

Refrigerant: R744，SDT: −8℃，SH: 20K, SC: 0K, 50Hz, unit of capacity and power: kW

Item	HybridCO_2OL Rack Model	HP	Compressor Configuration	SST:-40ºC			SST:-35ºC			SST:-32ºC			SST:-25ºC		
				Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP
1	VCM4100ON-24	24	4x2CSL-6K	64.88	17.92	3.62	81.60	17.88	4.56	93.20	17.56	5.31	123.60	15.60	7.92
2	VCM3100ON-36	36	3x4CSL-12K	96.30	26.31	3.66	121.50	26.28	4.62	138.60	25.80	5.37	185.40	23.07	8.04
3	VCM4100ON-48	48	4x4CSL-12K	128.40	35.08	3.66	162.00	35.04	4.62	184.80	34.40	5.37	247.20	30.76	8.04

Refrigerant: R744，SDT: −5℃，SH: 20K, SC: 0K, 50Hz, unit of capacity and power: kW

Item	HybridCO_2OL Rack Model	HP	Compressor Configuration	SST:-40ºC			SST:-35ºC			SST:-32ºC			SST:-25ºC		
				Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP
1	VCM4100ON-24	24	4x2CSL-6K	61.59	19.12	3.22	77.88	19.40	4.01	88.89	19.24	4.62	118.50	17.76	6.67
2	VCM3100ON-36	36	3x4CSL-12K	91.33	28.20	3.24	115.58	28.53	4.05	132.18	28.29	4.67	177.29	26.22	6.76
3	VCM4100ON-48	48	4x4CSL-12K	121.77	37.60	3.24	154.10	38.04	4.05	176.24	37.72	4.67	236.38	34.96	6.76

Refrigerant: R744，SDT: 0℃，SH: 20K, SC: 0K, 50Hz, unit of capacity and power: kW

Item	HybridCO_2OL Rack Model	HP	Compressor Configuration	SST:-40ºC			SST:-35ºC			SST:-32ºC			SST:-25ºC		
				Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP	Q0	Pe	COP
1	VCM4100ON-24	24	4x2CSL-6K	56.13	21.12	2.66	71.38	21.84	3.27	81.72	22.00	3.71	109.59	21.28	5.15
2	VCM3100ON-36	36	3x4CSL-12K	83.08	31.26	2.66	105.65	32.28	3.27	121.17	32.46	3.73	163.46	31.44	5.20
3	VCM4100ON-48	48	4x4CSL-12K	110.78	41.68	2.66	140.87	43.04	3.27	161.56	43.28	3.73	217.94	41.92	5.20