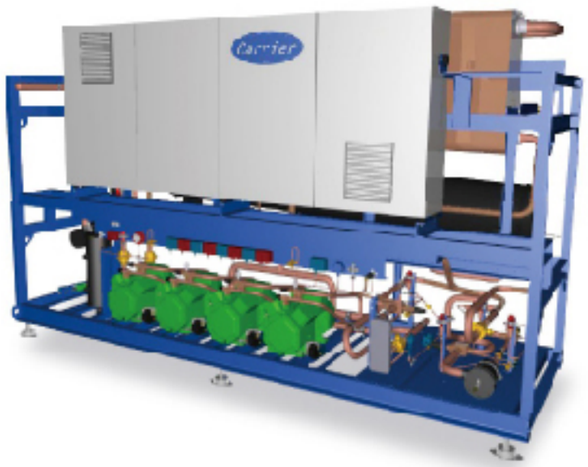
Cascade CO_2 Parallel Racks



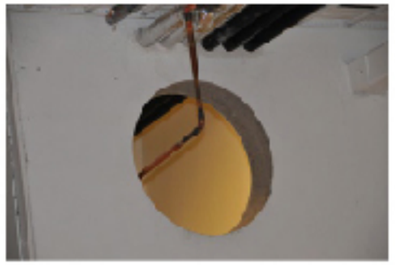
Customer Value

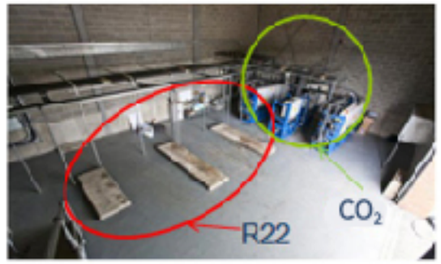
- Natural refrigerant, environmentally friendly and non-toxic, sustainable
- Small main pipeline, saving installation costs
- Cheap refrigerant and small charge volume with low charge costs
- Small-sized main and auxiliary parts, compact and saving machine room space
- Stable operation, with independent racks, safe & reliable
- High energy efficiency, in comparison with traditional HFC racks, saving 5%-10% energy annually
- Waste heat can be recovered to provide domestic hot water or room heating
- 2~4 optional compressors and optional cooling capacity

Product Features

- GWP=1, ODP=0, non-toxic, non-flammable, a natural working fluid
- Promoted by EU F-Gas Regulation
- CO_2 is cheap and is widely applied across the world
- Volumetric efficiency CO_2 is 6 times volumetric efficiency higher than the value for R404A, causing small pipeline
- CO_2 has better heat transfer performance and improves evaporating temperature by 2K, with high energy efficiency
- 2~4 optional compressors, standardized electrical control panels
- Independent framework, indoor installation, and easy maintenance
- High discharge temperature, easy to recover waste heat

*GWP: Global Warming Potential. ODP: Ozone Depletion Potential





The images above show the differences in pipeline and machine room area after R22 system is changed into CO_2 system

* All comparisons are based on the product performances of last generation.

Naming Rule of HybridCO2OL Parallel Racks

V C M 4 1 0 0 O E - 24

- Total Horsepower of Racks
- Emergency CDU
  - E: with emergency CDU
  - N: No emergency CDU
- Oil Return System
- Compressor Type
  - O: Reciprocating Compressor
- Accessories
  - 0: No precooler or heat recoverer, subcooler, MT suction line heat exchanger
  - 1: Only with precooler or heat recoverer
  - 2: Only with subcooler
  - 3: Only with MT suction line heat exchanger
  - 4: Both precooler and subcooler
  - 5: Precooler, MT suction line heat exchanger
  - 6: Subcooler, MT suction line heat exchanger
  - 7: Precooler, subcooler, MT suction line heat exchanger Note: Precooler or heat recoverer. Exchangers are not included in the accessories and need to be purchased
- Control System
  - 0: No electrical control system
  - 1: Racks with Danfoss electrical control system 2: Racks with Carel control system
- Number of Compressors
- Applicable Temperature
  - M: Low temperature
- Refrigerant
  - C:CO_2
- Parallel Racks

Rated conditions: SST -32°C , SDT -8°C .

Standard racks configuration instruction

- Each compressor is equipped with Electronic oil level regulator
- Oil separator with safety relief valve
- Oil accumulator with safety relief valve, sight glass, stop valve and differential valve . Oil return system includes ball valves, oil filter, solenoid valve, sight glass
- Refrigerant sight glass includes liquid accumulators, low liquid level switches, filters, sight glass and stop valves. System safety valves are provided and installed at site.
- Cascade brazing plate heat exchanger
- Cascade plate heat exchangers' electronic expansion valves
- Cascade plate exchangers' controllers and pressure/temperature sensors
- Angle valves are equipped with safe valves (enabled during maintenance)
- Accumulator is equipped with safety relief valve
- Suction headers and discharge headers and oil return headers
- Suction/Discharge pressure gage and pressure switch
- Welded frame
- Control system consists of electric cabinets, controllers, pressure/temperature sensors and other electric components

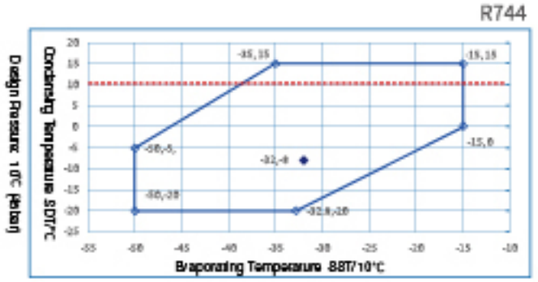
Refrigerant/refrigerant oil not included

HybridCO2OL Parallel Racks Configuration Table

No.	Refrigerant	Refrigerant Oil	Standard Racks Model	HP	Compressor Configuration
1	R744 (R134a*)	BSE 60K	VCM4100ON-24	24	4x2CSL-6K
2			VCM3100ON-36	36	3x4CSL-12K
3			VCM4100ON-48	48	4x4CSL-12K

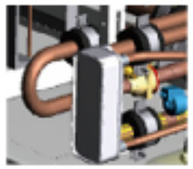
*HybridCO2OL Parallel racks are low temperature racks, and must use with medium temperature racks. Standard racks are designed as R134a medium temperature racks.

Operation Range of HybridCO2OL Parallel Racks



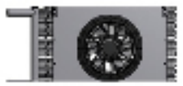
Description of Optional Kit

Emergency compressor unit
Independent UPS to prevent emergency stop



Liquid supply subcooler
Higher energy efficiency, higher degree of subcooling to prevent flash gas before the expansion valves

Medium temperature gas return superheater
Higher degree of superheat for medium temperature gas return to prevent flood back



Desuperheat
Higher heat exchange efficiency for condensers

Cascade CO_2 Parallel Racks Performance Table (Degree of Superheat 10K)

Refrigerant: R744. Condensing temperature: -10°C . Degree of superheat: 10K, Degree of subcooling: 0K, 50Hz, Cooling capacity unit: kW

	HybridCO2OL racks	HP	Compressor Configuration	Evaporating Temperature:-40°C			Evaporating Temperature:-35°C			Evaporating Temperature:-32°C			Evaporating Temperature:-25°C		
				Q	P	COP	Q	P	COP	Q	P	COP	Q	P	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. Condensing temperature: -8°C . Degree of superheat: 10K, Degree of subcooling: 0K, 50Hz, Cooling capacity unit: kW

	HybridCO2OL racks	HP	Compressor Configuration	Evaporating Temperature:-40°C			Evaporating Temperature:-35°C			Evaporating Temperature:-32°C			Evaporating Temperature:-25°C		
				Q	P	COP	Q	P	COP	Q	P	COP	Q	P	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	101.71	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. Condensing temperature: -5°C . Degree of superheat: 10K, Degree of subcooling: 0K, 50Hz, Cooling capacity unit: kW

	HybridCO2OL racks	HP	Compressor Configuration	Evaporating Temperature:-40°C			Evaporating Temperature:-35°C			Evaporating Temperature:-32°C			Evaporating Temperature:-25°C		
				Q	P	COP	Q	P	COP	Q	P	COP	Q	P	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. Condensing temperature: 0°C . Degree of superheat: 10K, Degree of subcooling: 0K, 50Hz, Cooling capacity unit: kW

	HybridCO2OL racks	HP	Compressor Configuration	Evaporating Temperature:-40°C			Evaporating Temperature:-35°C			Evaporating Temperature:-32°C			Evaporating Temperature:-25°C		
				Q	P	COP	Q	P	COP	Q	P	COP	Q	P	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

Cascade CO_2 Parallel Racks Performance Table (Degree of Superheat 20K)

Refrigerant: R744. Condensing temperature: -10°C . Degree of superheat: 10K, Degree of subcooling: 0K, 50Hz, Cooling capacity unit: kW

	HybridCO2OL racks	HP	Compressor Configuration	Evaporating Temperature:-40°C			Evaporating Temperature:-35°C			Evaporating Temperature:-32°C			Evaporating Temperature:-25°C		
				Q	P	COP	Q	P	COP	Q	P	COP	Q	P	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. Condensing temperature: -8°C . Degree of superheat: 10K, Degree of subcooling: 0K, 50Hz, Cooling capacity unit: kW

	HybridCO2OL racks	HP	Compressor Configuration	Evaporating Temperature:-40°C			Evaporating Temperature:-35°C			Evaporating Temperature:-32°C			Evaporating Temperature:-25°C		
				Q	P	COP	Q	P	COP	Q	P	COP	Q	P	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. Condensing temperature: -5°C . Degree of superheat: 10K, Degree of subcooling: 0K, 50Hz, Cooling capacity unit: kW

	HybridCO2OL racks	HP	Compressor Configuration	Evaporating Temperature:-40°C			Evaporating Temperature:-35°C			Evaporating Temperature:-32°C			Evaporating Temperature:-25°C		
				Q	P	COP	Q	P	COP	Q	P	COP	Q	P	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. Condensing temperature: 0°C . Degree of superheat: 10K, Degree of subcooling: 0K, 50Hz, Cooling capacity unit: kW

	HybridCO2OL racks	HP	Compressor Configuration	Evaporating Temperature:-40°C			Evaporating Temperature:-35°C			Evaporating Temperature:-32°C			Evaporating Temperature:-25°C		
				Q	P	COP	Q	P	COP	Q	P	COP	Q	P	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