



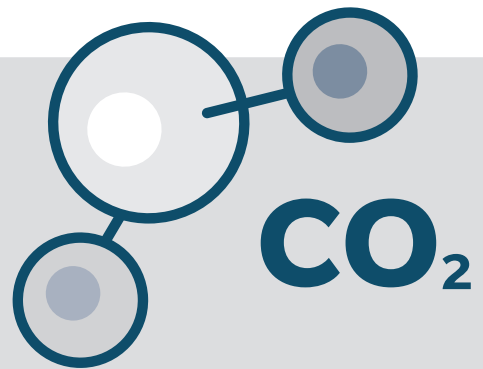
[CF] NANO₂

CO₂ systems for low-capacity refrigeration applications.

[CF] NANO₂

WHY CO₂?

The European F-gas Regulation and the potential REACH restriction on PFAS are increasingly limiting the future of synthetic refrigerants. Manufacturers and operators are increasingly required to consider lower-GWP alternatives or natural refrigerants such as CO₂, propane or ammonia.



Compared with other natural refrigerants, CO₂ has the advantage of being non-flammable. From a technical perspective, CO₂ also offers numerous benefits: high discharge temperatures and transcritical operation enable efficient heat recovery. Pressure drops have a considerably smaller impact on efficiency than with other refrigerants. In addition, the upstream pressure at the injection valves remains constant throughout the year thanks to the purpose-designed refrigeration circuit, ensuring stable and precise evaporator control.

WHY NANO₂?

THE ROBUST SYSTEM FOR LOW PART-LOAD OPERATION

PART-LOAD OPERATION IS OFTEN OVERLOOKED

When designing refrigeration systems, the focus is often on maximum refrigeration capacity – even though it is only required for a few hours each year. Most of the time, the system operates at part load. This is frequently overlooked during planning and poses particular technical challenges for lower-capacity CO₂ systems.

DESIGNING FOR MINIMUM PART-LOAD DEMAND IS CRUCIAL

The following factors should therefore be considered from the project design stage:

- ▶ Cooling points under part-load conditions: Which cold rooms may operate independently?
- ▶ Actual minimum refrigeration load: the lowest expected system load.
- ▶ Low-load periods: Times of low demand, such as at night or outside operating hours.
- ▶ Influence of ambient temperature: higher available capacity at low ambient temperatures.

SYSTEM DESIGN MAKES THE DIFFERENCE

In the lower capacity range, part-load demand often receives too little attention. Plug-and-play units with a single-compressor design are typically used here, but their design makes them less well suited to the challenges of part-load operation. By contrast, the compressor-pack design of the [CF] NANO₂ enables:

- ▶ a significantly lower minimum output at the same maximum capacity
- ▶ greater system availability through multiple compressors

ACTIVE OIL MANAGEMENT FOR MAXIMUM RELIABILITY

- ▶ If the system cannot reliably match minimum part-load demand, the compressors short-cycle. The consequences are high wear, oil carryover and oil starvation – a common cause of failure in plug-and-play units operating in systems with low part-load demand.
- ▶ The [CF] NANO₂ protects itself: active oil management detects oil starvation at an early stage and automatically shuts down the compressor. It also maintains an optimum oil charge – for lasting operational reliability.

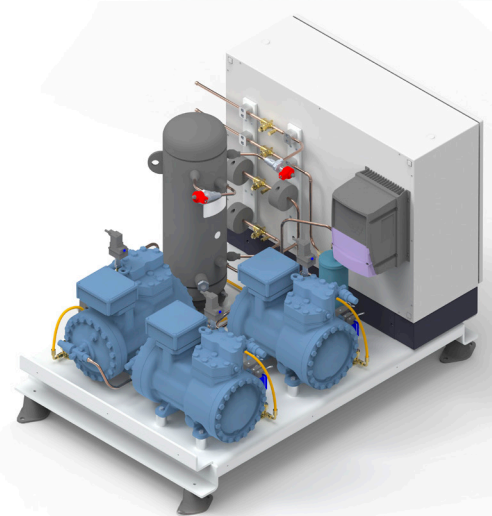
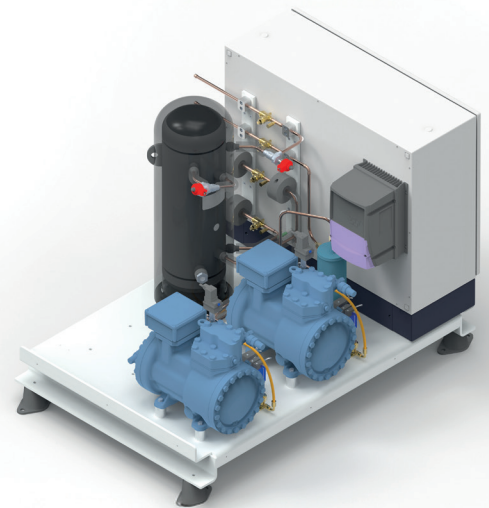
[CF] NANO₂

The compact CO₂ system

The [CF] NANO₂ range was developed specifically for applications with low part-load demand, as commonly found in hospitality, hotels and small-format retail. Depending on the configuration, it enables reliable operation of cooling points with a capacity below 1.5 kW.

Even at low capacities, the system delivers proven [CF] SYSTEMS quality and features active oil management as standard for enhanced operational reliability. Using two or three compressors instead of a single-compressor unit also significantly improves system availability.

Its compact dimensions make the system easy to position and allow it to pass through any standard doorway. An optional weatherproof enclosure also enables straightforward outdoor installation.



SCOPE OF SUPPLY

REFRIGERATION SYSTEM

- ▶ 2 or 3 MT compressors (transcritical), optional 1 LT compressor
- ▶ Lead-compressor capacity control via variable-frequency drive
- ▶ Active oil management
- ▶ Receiver (14 l)
- ▶ Service and shut-off valves on all service-relevant pipe sections
- ▶ Pressure and temperature sensors matched to the selected control system
- ▶ High-quality Armacell AF insulation
- ▶ All pipe connections (CuFe2P) routed to the rear
- ▶ Pressure-rated design (HP = PS 120; all other sections PS 90)
- ▶ Fully welded baseplate
- ▶ Control cabinet, fully assembled, wired and pre-programmed

CONTROLS & CONTROL CABINET

- ▶ Carel µRack CO₂, Danfoss AK-PC 572, Wurm (MT only DCO₂, MT/LT ANI-1F1)
- ▶ Main isolator
- ▶ Control transformer
- ▶ Backup power supply for closing the HP and MP valves in the event of a power failure

OPTIONS/ACCESSORIES

- ▶ Enclosure for indoor and outdoor installation without sound insulation
- ▶ Heat recovery with 3-way valve, supplied loose
- ▶ Filter drier, supplied loose
- ▶ Gas cooler, supplied loose



* Capacity calculations are based on the following evaporating temperatures:
-8°C MT, -30°C LT and a gas-cooler outlet temperature of 37°C

TECHNICAL DATA

Type	[CF] NANO2[2x0] 2x0[6]X[Do]1V14	[CF] NANO2[2x0] 3x0[9]X[Do]1V14	[CF] NANO2[2x0] 5x0[14]X[Do]1V14	[CF] NANO2[3x0] 4x0[10]X[Do]1V14	[CF] NANO2[3x0] 5x0[15]X[Do]1V14	[CF] NANO2[3x0] 7x0[20]X[Do]1V14	[CF] NANO2[2x1] 4x2[13]X[Do]1V14	[CF] NANO2[2x1] 7x2[16]X[Do]1V14
Order no. CAREL	182-2110	182-2111	182-2112	182-2120	182-2121	182-2122	182-2126	182-2127
Order no. Danfoss	182-2130	182-2131	182-2132	182-2140	182-2141	182-2142	182-2146	182-2147
Order no. Wurm	182-2150	182-2151	182-2152	182-2160	182-2161	182-2162	182-2166	182-2167
Control cabinet with switched neutral, halogen-free wiring and insulation ⁴⁾								
Order no. CAREL	182-2210	182-2211	182-2212	182-2220	182-2221	182-2222	182-2226	182-2227
Order no. Danfoss	182-2230	182-2231	182-2232	182-2240	182-2241	182-2242	182-2246	182-2247
Order no. Wurm	182-2250	182-2251	182-2252	182-2260	182-2261	182-2262	182-2266	182-2267
Min. MT capacity ²⁾	1.40 kW	1.84 kW	3.31 kW	1.40 kW	2.49 kW	3.31 kW	2.49 kW	3.31 kW
Max. MT capacity ¹⁾	2.94 kW	4.56 kW	6.96 kW	5.07 kW	7.73 kW	10.09 kW	3.50 kW	5.12 kW
Min. LT capacity ²⁾	---	---	---	---	---	---	0.88 kW	0.88 kW
Max. LT capacity ¹⁾ (at 55 Hz)	---	---	---	---	---	---	1.61 kW	1.61 kW
Gas-cooler capacity	5.03 kW	7.95 kW	11.96 kW	8.57 kW	13.31 kW	17.13 kW	9.37 kW	11.96 kW
Number of MT compressors	2	2	2	3	3	3	2	2
Number of LT compressors	---	---	---	---	---	---	1	1
Receiver volume	14 l	14 l	14 l	14 l	14 l	14 l	14 l	14 l
Pipe connections	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"
PS HP	120 bar	120 bar	120 bar	120 bar	120 bar	120 bar	120 bar	120 bar
PS MP PS MT-LP / PS LT-LP	90 bar	90 bar	90 bar	90 bar	90 bar	90 bar	90 bar	90 bar
Sound pressure level ³⁾ at 10 m	33.5 dB(A)	34.5 dB(A)	36 dB(A)	35.6 dB(A)	36.8 dB(A)	37.8 dB(A)	36.8 dB(A)	37.8 dB(A)
Max. operating current	11.1 A	14.6 A	19.1 A	15.7 A	20.8 A	25.3 A	18.8 A	21.7 A
Weight	354 kg	360 kg	363 kg	404 kg	412 kg	415 kg	418 kg	419 kg

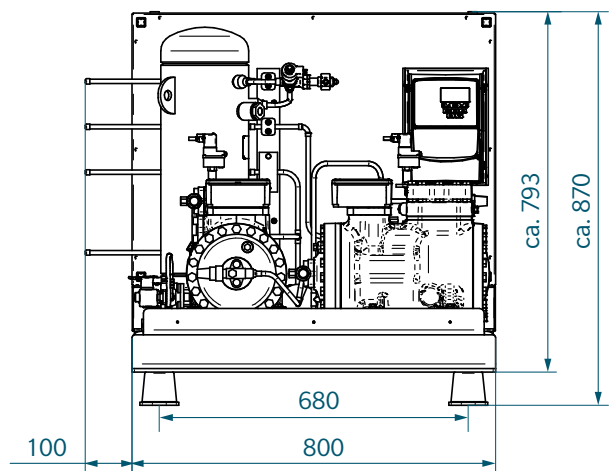
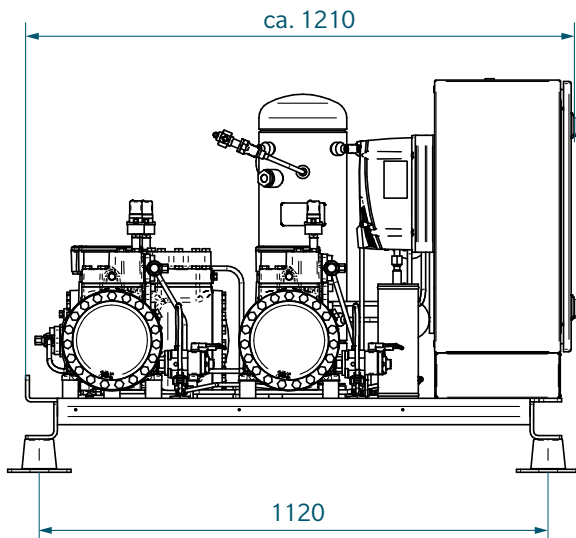
Gas-cooler type	GW30E213AF001	GW30E213AF001	GP45C114BF001	GW30E213AF001	GP45C114BF001	GP45C114BF001	GP45C114BF001	GP45C114BF001
Order no.	185-1088	185-1088	185-1089	185-1088	185-1089	185-1089	185-1088	185-1089
Air discharge direction	horizontal	horizontal	horizontal & vertical	horizontal	horizontal & vertical	horizontal & vertical	horizontal	horizontal & vertical
Sound pressure level ³⁾ at 10 m	40 dB(A)	40 dB(A)	42 dB(A)	40 dB(A)	42 dB(A)	42 dB(A)	40 dB(A)	42 dB(A)
Connections (inches)	Ø ¾ K65	Ø ¾ K65	Ø ¾ K65	Ø ¾ K65	Ø ¾ K65	Ø ¾ K65	Ø ¾ K65	Ø ¾ K65
Length×width×height	1152 × 316 × 533	1152 × 316 × 533	981 × 646 × 753	1152 × 316 × 533	981 × 646 × 753	981 × 646 × 753	1152 × 316 × 533	981 × 646 × 753
Weight	28 kg	28 kg	63 kg	28 kg	63 kg	63 kg	28 kg	63 kg

¹⁾Max. capacity and gas-cooler capacity at t_0 LT -30°C, t_0 MT -10°C, G_{cool} 38°C and 93 bar
²⁾Min. capacity at t_0 -10°C, t_c 20°C

³⁾The theoretical sound pressure level may vary depending on the operating point and installation conditions.

⁴⁾4-pole main isolator and 2-pole miniature circuit breakers upstream of the isolating transformer

DIMENSION DRAWINGS



[CF] NANO₂

Our quality promise

- + 360° service
- + robust design and high-quality manufacturing
- + active oil management
- + enhanced system availability through compressor-pack design
- + designed for low part-load operation
- + CAREL, Danfoss or Wurm controls
- + made in Germany
- + high-quality components from leading brands



MORE INFORMATION
ABOUT [CF] SYSTEMS





Germany

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www.kaeltefischer.de

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Logistics centre

Fellbach

Sales office

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Christof Fischer Kälte-Klima AG
www.kaeltefischer.ch

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Grabs SG

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