

## Sabroe CAFP CO<sub>2</sub>/NH<sub>3</sub> low-temperature chiller

Compact packaged freezer systems using reciprocating compressors, with a 100–800 kW capacity range

The highly customised Sabroe CAFP freezer systems are based on a cascade system that combines the advantages of CO<sub>2</sub> on the low-temperature side and ammonia on the high-temperature side.

These packaged systems are built around Sabroe reciprocating compressors that use CO<sub>2</sub> as refrigerant, which gives them a significantly greater cooling capacity than corresponding compressors using ammonia. This in turn makes the low-temperature compressor much smaller, and the whole package significantly more compact than traditional two-stage ammonia-based freezer systems.

As a result, each standard CAFP package can be fitted inside a standard 20-foot shipping container, if required. This does away with the need for a special machinery space, and the freezer installation can easily be moved if required.

Compared with conventional ammonia-based two-stage or single-stage systems with economisers, a CAFP unit uses significantly less power in the temperature range down to –55°C.

This results in energy savings of as much as 15% compared with traditional two-stage ammonia systems, and up to 45% compared with single-stage set-ups.



CAFP unit controlled and monitored by UniSAB systems controller

Advantages	Benefits
Compact design that fits inside a standard 20-foot container	Big savings on installation costs
High COP and extremely low power consumption, even at part load	Low operating costs
Use of CO <sub>2</sub> as low-temperature refrigerant reduces piping complexity and costs	Reduces installation costs
Very small ammonia charge, located on the unit itself	No risk of ammonia leaks in production areas, cold stores and working areas
CO <sub>2</sub> is a simple, inexpensive natural refrigerant	Low operating costs

### Range

There are six standard models in this range of freezer systems, with capacities ranging from 100 kW to 800 kW.

All CAFP units are operationally tested with refrigerant before dispatch. Factory acceptance test (FAT) available.



### Standard equipment

- Double control panel including UniSAB systems controller
- CO<sub>2</sub> pump separator including two pumps (one standby)
- Shell-and-tube cascade cooler with double-tube sheet to minimise any risk of CO<sub>2</sub> and ammonia mixing
- Standstill cooling unit, with separate control panel and power supply, to limit CO<sub>2</sub> pressure
- Automatic oil recovery system in both circuits
- Water-cooled condenser (plate heat exchanger type) on ammonia side
- Insulation of all cold parts.

### Options

- Variable-speed drive
- Titanium plates in condenser
- Oversized CO<sub>2</sub> pump separator for high CO<sub>2</sub> evaporator volume
- Oversized CO<sub>2</sub> pumps for higher circulation rate
- Oversized ammonia condenser for higher cooling water temperature
- Fully welded shell-and-tube cascade cooler
- External interstage load, including a brine cooler on the R717 side of the cascade cooler
- Special version for use with remote condenser
- Configurations for use with HFC refrigerants instead of ammonia on high-pressure side.

### Compliance

All Sabroe chiller units are fully compliant with appropriate major international design codes and the specifications laid down by the most common classification societies. Approval in accordance with other technical requirements, specific national legislation or other classification societies' requirements is available on request.

Model	Evaporation temperature °C	Cooling capacity kW	Power consumption kW	Compressors R744/R717	Minimum NH <sub>3</sub> charge kg (approx.)	Minimum CO <sub>2</sub> charge l (approx.)	Unit dimensions in mm (approx.) L x W x H	Weight (approx.) kg	Sound pressure level dB(A)	COP shaft cooling
CAFP 80	-50	84	64	HPO 24 / SMC 104 S	120	300	5500 x 2400 x 3000	7000	78	1.3
CAFP 80	-45	108	74	HPO 24 / SMC 104 L					80	1.5
CAFP 80	-40	138	84	HPO 24 / SMC 104 E					79	1.7
CAFP 80	-35	159	87	HPO 24 / SMC 106 S					79	1.8
CAFP 120	-50	125	95	HPO 26 / SMC 106 S	120	350	5700 x 3200 x 3300	10000	80	1.3
CAFP 120	-45	162	110	HPO 26 / SMC 106 L					80	1.5
CAFP 120	-40	203	126	HPO 26 / SMC 106 E					80	1.6
CAFP 120	-35	246	134	HPO 26 / SMC 108 L					82	1.8
CAFP 160	-50	166	127	HPO 28 / SMC 108 S	120	350	5900 x 2900 x 3300	11000	80	1.3
CAFP 160	-45	214	147	HPO 28 / SMC 108 L					82	1.5
CAFP 160	-40	271	167	HPO 28 / SMC 108 E					82	1.6
CAFP 160	-35	337	183	HPO 28 / SMC 112 L					83	1.9
CAFP 200	-50	196	150	HPC 104 / SMC 106 E	180	350	5900 x 3100 x 3800	14000	80	1.3
CAFP 200	-45	255	174	HPC 104 / SMC 108 E					82	1.5
CAFP 200	-40	321	193	HPC 104 / SMC 112 L					82	1.7
CAFP 200	-35	379	206	HPC 104 / SMC 112 L					83	1.8
CAFP 300	-50	300	222	HPC 106 / SMC 112 L	300	800	6300 x 3200 x 3900	16000	82	1.4
CAFP 300	-45	381	258	HPC 106 / SMC 112 E					82	1.5
CAFP 300	-40	468	279	HPC 106 / SMC 116 L					83	1.7
CAFP 300	-35	553	299	HPC 106 / SMC 116 L					83	1.9
CAFP 400	-50	392	293	HPC 108 / SMC 112 E	400	800	6500 x 3700 x 4000	19000	82	1.3
CAFP 400	-45	484	324	HPC 108 / SMC 116 L					83	1.5
CAFP 400	-40	616	370	HPC 108 / SMC 116 E					83	1.7
CAFP 400	-35	729	395	HPC 108 / SMC 116 E					83	1.9

Condenser: water inlet 25°C,  
outlet 30°C.  
Capacities are nominal,  
1500 rpm at 50 Hz.

Power consumption applies to compressors only.  
Refrigerant charge depends on application.  
Dry weight (approx.).

Sound pressure levels measured  
in free field, over reflecting  
plane and one metre distance  
from the unit.

All information is  
subject to change  
without notice.

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