

GREENING ENGINEERING

Making the difference

CFOA - CO₂ (R744)
Compressor pack
supermarket refrigeration system



General features

CFOA is a new range of compressor pack developed by BICOLD which works with ecological refrigerant CO₂ only. The design was performed considering the high technical contents of this range of products and the requirements of application covered by this innovative range.

The basic principle of CFOA compressor pack design is the respect of high standard levels of efficiency and reliability, well combined with the use of CO₂ ecological refrigerant. This fluid is not penalized by restrictions or regulations that limit its use, so it can be used for any application of food preservation sector and of refrigeration sector in general.

CFOA range was realized assembling the circuits with NT and LT compressors in a unique housing. It was designed specifically for the use in GDO sector (supermarkets) and uses CO₂ ecological refrigerant only, both for NT circuit and LT circuit.

CO₂ is neither flammable nor toxic and gives many advantages both from the point of view of environmental safety and for the distribution points, for the installation of the machines and for the following maintenance services. Moreover any possible CO₂ leak from the machine is not a problem of environmental pollution since this kind of gas is present in nature.

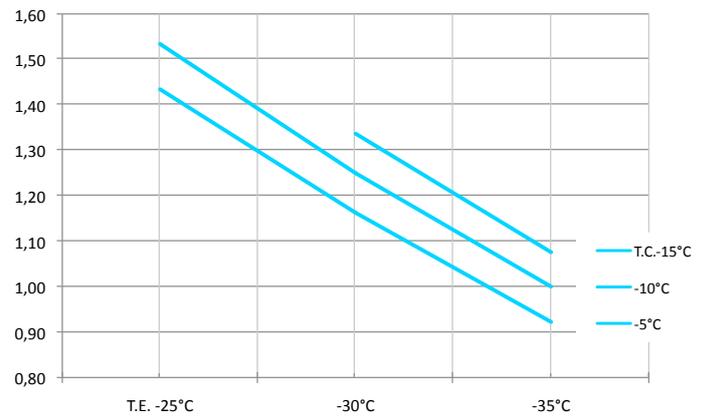
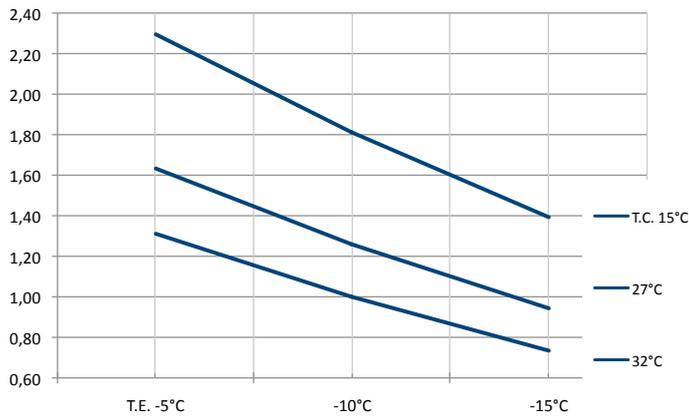
Following the main advantages of a CFOA CO₂ system:

- 100% environmental friendly
- Total security of application (neither flammable nor toxic)
- GWP=1 coefficient, therefore no effect on global warming
- No ozone impact (no CFC inside)
- Refrigerant low cost and easy availability

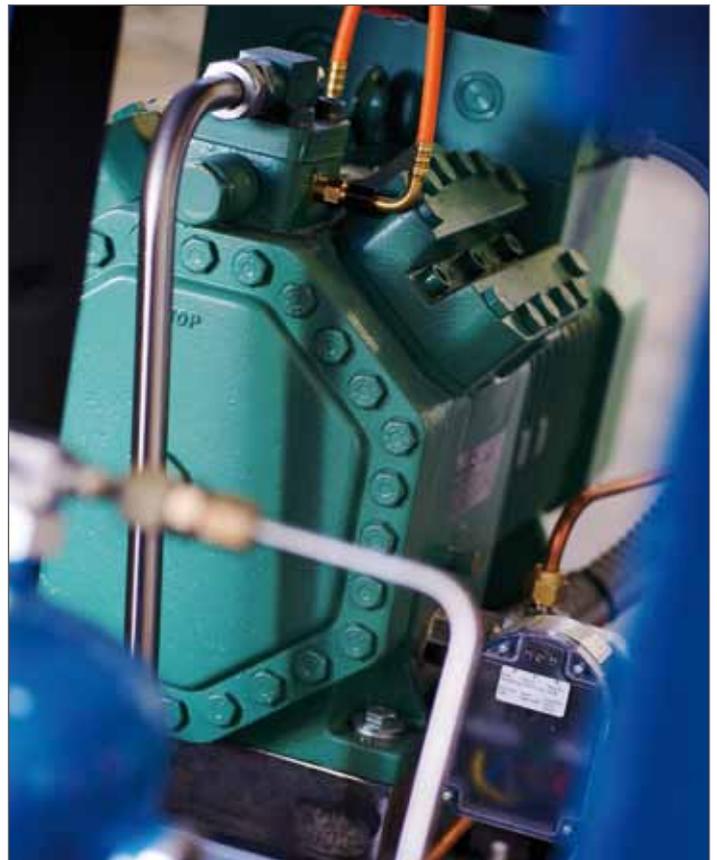


A high value of C.O.P. for std. CFOA units (between 3 and 4 at std. outdoor temperature conditions, see table on the next page) matches with an easy way of installation, possible indoor or outdoor and with easy operation for service. As option, the installation of PHE heat exchanger as de-superheater for the production of hot water at high temperature (70 – 80 °C) increases the efficiency of the whole plant. Moreover an easy installation is possible thanks to the small piping dimension necessary to connect the unit with the users. For all described reasons the annual cost of operation of a CO₂ plant is strongly reduced compared with a traditional refrigerant synthetic plant.

Below the duty coefficient for LT/NT system with the different cooling values; the cooling data for LT circuit are referred at the CO₂ temperature measured on suction line (MTC – see the refrigerant drawing) of NT circuit. The data for gas cooling are referred to $\Delta T1=3K$ in the gas cooler.



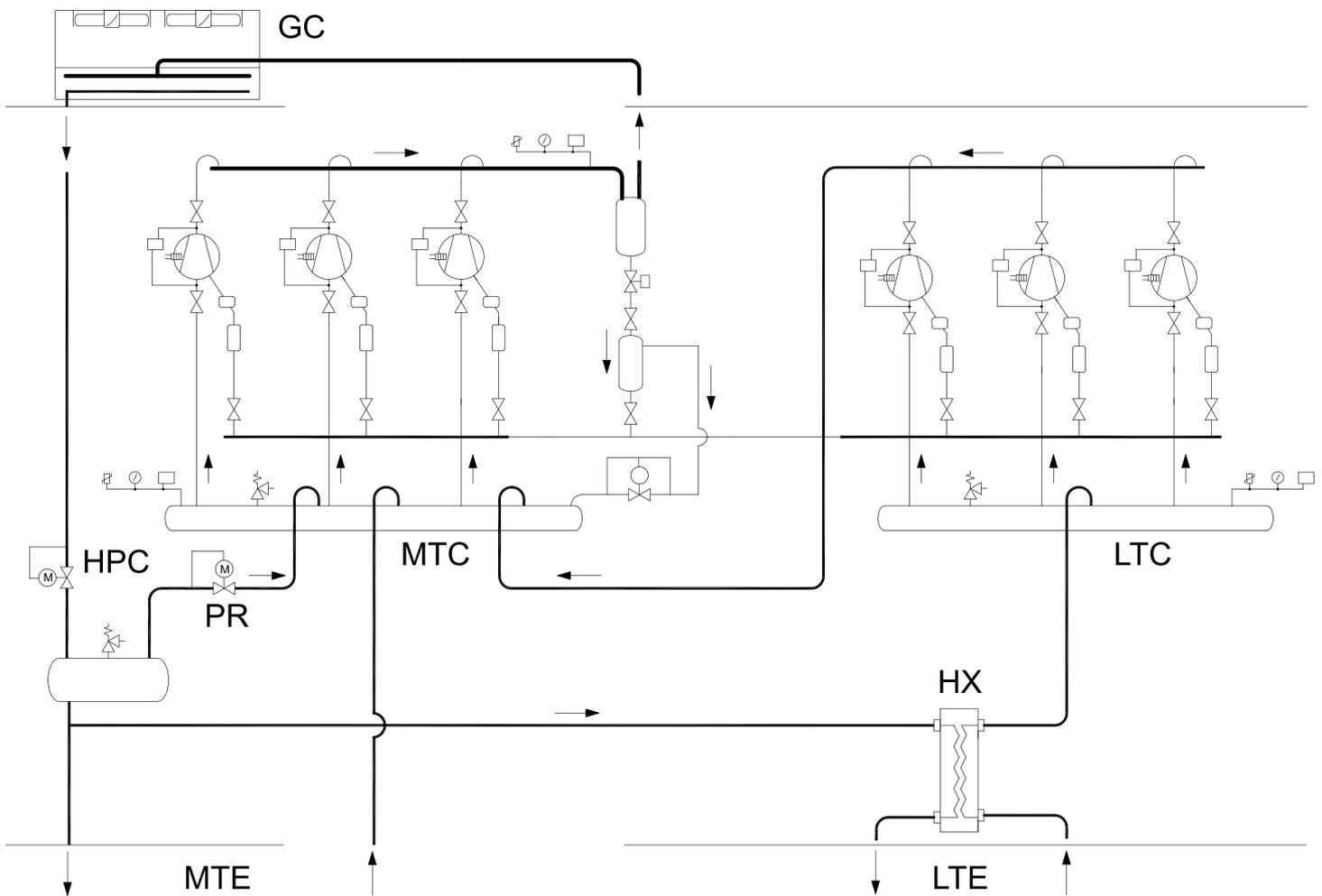
RATE OF DUTY FOR EACH CIRCUIT OF CFOA NT/LT UNIT OBTAINED BY EVAPORATION TEMPERATURE AT THE DIFFERENT SETTING AND WITH DIFFERENT COOLING TEMPERATURE OF GAS COOLER



Refrigerant circuit

The proposed range is designed for indoor installation, inside a room machines, matched to a gas cooler, installed outside, for cooling the discharge gas. Each unit is designed with a two stage circuit with LT and NT compressors which work with the same working fluid (CO₂). The refrigerant from NT discharge line is cold from the gas cooler outside, and goes, through the high pressure valve to an intermediate common liquid receiver and to the NT / LT user lines. An inverter connected to the lead compressor in the NT circuit is necessary to optimize the pressure value in suction line; low level of capacity can be managed avoiding the problems which could happen in increasing the suction pressure.

An electronic control operates all the working function of compressors pack with an advanced software which controls every working parameters ensuring a balance of the system and the management of situation of alarm. It's possible the connection to a supervising system with dedicated protocols or to open communication system (MOD-BUS) to verify from remote site the proper working of unit and sending an alarm messages through web or mobile to service.



MTC – medium temperature collector
 LTC – low temperature collector
 GC – gas cooler (outdoor installation)
 HPC – high pressure valve
 PR – by pass flash gas valve
 HX – sub cooler

MTE/LTE – user lines from NT and LT circuits

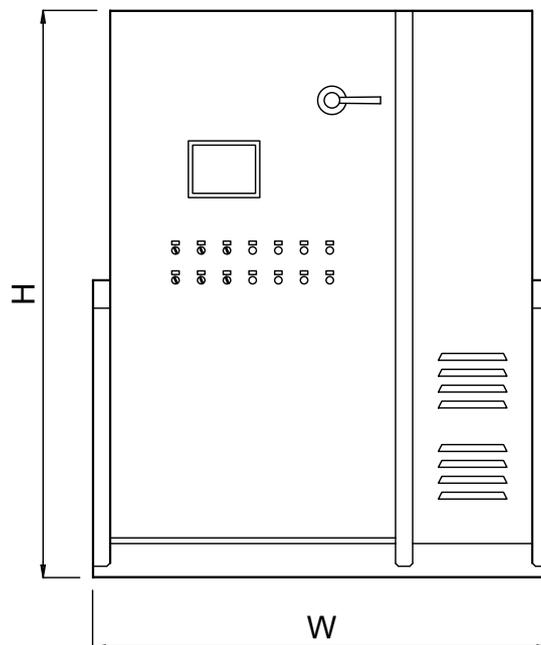
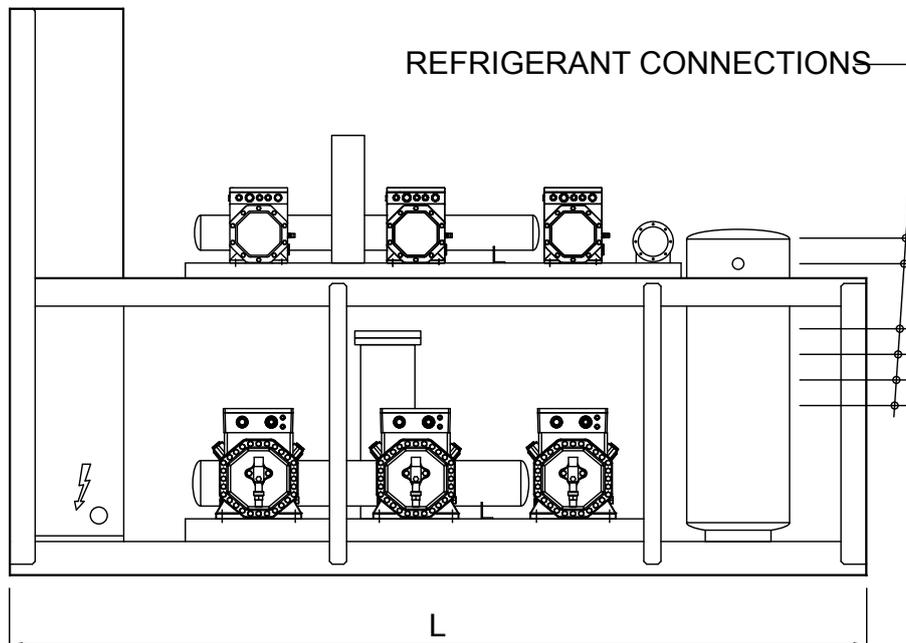
Products range

The CFOA serie is composed by 4 principal models with LT and NT circuits with booster connection. The NT field of application goes from 30 Kw to 91 Kw and from 11 Kw to 30 Kw in LT. Below the technical table with the main referring data.

Mod. CFOA - R744		CFOA BD30-1.5NLT	CFOA BD45-1.5NLT	CFOA BD60-3.0NLT	CFOA BD90-6.0NLT
Compressors NT/LT	[No]	3 - 3	3 - 3	3 - 3	3 - 3
Power each compressor	[hp]	10 - 0,5	10 - 0,5	20 - 1	30 - 2
NT nominal capacity @-10 °C and 15°C cond. temperature	[Kw]	54,6	75,7	98,0	157,6
Power input	[Kw]	16,8	24,2	30,7	46,5
Power consumption	[A]	32,5	44,9	56,1	84,7
C.O.P.		3,9	3,9	3,9	4
NT nominal capacity @-10 °C and 27°C cond. temperature	[Kw]	38,3	52,8	68,3	112,4
Power input	[Kw]	18,4	26,6	33,8	51,4
Power consumption	[A]	34,5	48,0	60,0	91,2
C.O.P.		2,7	2,7	2,7	2,8
NT nominal capacity @-10 °C and 32°C cond. temperature	[Kw]	34,4	41,9	54,3	90,9
Power input	[Kw]	20,4	29,4	37,7	57,3
Power consumption	[A]	32,1	51,8	64,8	99,4
C.O.P.		2	2	2,1	2,1
Min-max displacement NT side	[m³/h]	3,9÷19,5	5,52÷27,6	7,2÷36	10,7÷53,4
LT nominal capacity @-35 °C and -10°C cond. temperature	[Kw]	9,0	15,1	19,5	24,4
Power input	[Kw]	2,0	3,3	4,3	5,3
Power consumption	[A]	4,9	6,3	8,3	10,6
C.O.P.		4,5	4,5	4,6	4,6
LT nominal capacity @-30 °C and -10°C cond. temperature	[Kw]	11,3	18,8	24,4	30,5
Power input	[Kw]	1,9	3,2	4,1	5,0
Power consumption	[A]	4,8	6,1	8,0	10,3
C.O.P.		6,0	6,0	6,0	6,1
FLA	[A]	70,8	99,3	129	189,6
LRA	[A]	153,4	209,8	258,4	370,5
Min-max displacement LT side	[m³/h]	1,62÷4,86	2,71÷8,13	3,84÷10,44	3,84÷10,44
Volume receiver NT - LT side	[dm³]	65	90	120	120

Note: the technical table above was calculated with 32/27/15°C temperature of gas cooler and LT fixed load with -10/+35°C. The LT circuit was calculated with fixed condensing temperature at -10°C and LT load at -25/-30/-35°C evap. temp. The showed C.O.P. in NT side is referred to the capacity of NT compressors included the load of LT compressors.

Dimensions and Weight



Mod. CFOA - R744

CFOA
BD30-1.5NLT

CFOA
BD45-1.5NLT

CFOA
BD60-3.0NLT

CFOA
BD90-6.0NLT

		CFOA BD30-1.5NLT	CFOA BD45-1.5NLT	CFOA BD60-3.0NLT	CFOA BD90-6.0NLT
Dimensions (L x W x H)	[mm]	3000 x 1600 x 2000			
Weight	[Kg]	2.210	2.430	2.720	3.130
Connections suction-liquid lines (NT-LT)	[mm]	22/16 -22/10 Cu	28/16 -28/10 Cu	35/18 -35/12 Cu	42/22 -42/16 Cu



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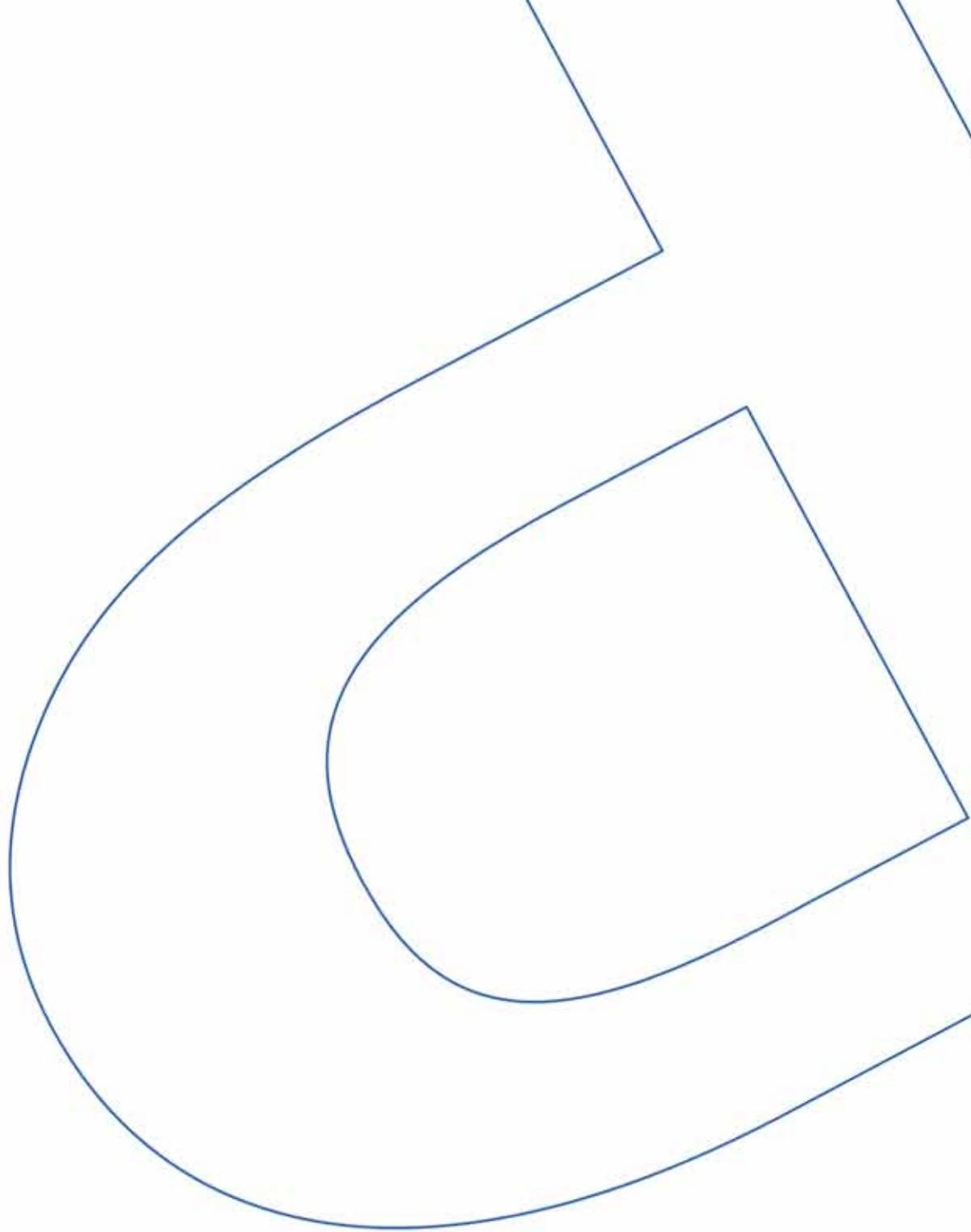
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Note / Notes

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