

## REFRIGERATION UNITS

# SENNA Series

Nominal cooling capacity from 70 to 380 kW in Medium Temperature  
Nominal cooling capacity from 4 to 110 kW in Low Temperature



Enex presents SENNA, the new range of transcritical CO<sub>2</sub> refrigeration units, designed to combine simplicity, compactness and high reliability. It is available in 8 sizes, each with a wide choice of compressor models: MINI, SMALL, TOP MAXI, PLUS, LARGE-200, LARGE-300 & LARGE-400. Sizes MINI to PLUS are only 850 mm wide, making them ideal for installation in plant rooms with restricted footprint and/or where access is through narrow doors.

Enex was the first ever company to develop CO<sub>2</sub> only solutions since 2004. CO<sub>2</sub> is a natural fluid with zero OPD, GWP = 1. Neutral refrigerant of excellence, CO<sub>2</sub> is neither toxic nor flammable: it is in fact the one of the natural gases with fewer contraindications and for this reason it is a candidate as the refrigerant of the future, not subject to the F-gas regulation on fluorinated gases.

# LEADING SOLUTION IN RETAIL, FOOD STORAGE & PROCESS APPLICATIONS

SENNA range is ideal for medium sized commercial refrigeration systems in food retail, food storage, process cooling and other similar applications. It is available in single temperature (MT only) or dual temperature (MT and LT) configurations. It can be provided with a cladding for sound insulation and/or as protection against atmospheric agents for outdoor use. It can also be supplied as a plug&play monoblock version, mounted on a skid with an integral gas cooler, complete with refrigerant piping and electrical connections.



The image is for illustrative purpose  
and represent the SENNA PLUS, unit type 4+3

SENNA is the new range of transcritical CO<sub>2</sub> refrigeration units of Enex designed to combine:  
simplicity, compactness  
and high reliability.

# GENERAL TECHNICAL DATA

## SIZES: MINI, SMALL AND MAXI

Cooling capacity from 17 to 46kW in Low Temperature

Cooling capacity from 52 to 130kW in Medium Temperature

The SENNA range includes 8 sizes, each of them with many pre-defined compressor configurations. In the tables below only the sizes Mini, Small and Maxi are shown. The biggest compressor models for each size are shown. The technical data may vary according to the specifications provided and / or agreed with the customer.

Size Model	Mini		Small			Maxi				
	2.0 70 kW	2.1 70 kW	3.0 100 kW	3.1 100 kW	3.2 100 kW	4.0 130 kW	4.1 130 kW	4.2 130 kW	4.3 130 kW	
<b>Power Input</b>	[kW]	42	46	60	65	68	78	82	85	90

Low temperature section										
Compressor number	[-]	0	1	0	1	2	0	1	2	3
Cooling Capacity	[kW]	-	17	-	17	32	-	17	32	46

Medium temperature section										
Compressor number	[-]	2	2	3	3	3	4	4	4	4
Cooling Capacity	[kW]	70	52	100	84	68	130	113	98	80

<b>Gas cooler capacity</b>	[kW]	116	116	169	169	169	222	222	222	222
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Connection piping diameters										
Low temperature suction	[mm]	-	22	-	22	28	-	22	28	35
Medium temperature suction	[mm]	28	22	42	35	35	42	35	35	35
Gas cooler line	[inch]	1/2"	1/2"	3/4"	3/4"	3/4"	1"	1"	1"	1"
Liquid line	[mm]	28	28	35	35	35	35	35	35	35

Tanks capacity										
Liquid Receiver	[liters]	100/150	100/150	150	150	150	150/300*	150/300*	150/300*	150/300*
Oil Receiver	[liters]	26	26	26	26	26	20	20	20	20

Dimensions											
L x W x H *, **	[mm]	2800 x 850 x 1900			3500 x 850 x 2000			5500 x 850 x 2150			
Weight	[kg]	2500			3100			4200			

### NOTES:

1 - Evaporation temperatures

Low temperature evap. -31°C

Medium temperature evap. -8°C

2 - Ambient temperature 34°C

3 - Discharge compressor pressure 92 bar

4 - Outlet gas cooler temperature 36°C

\*without housing for indoor/outdoor

\*\* Bitzer compressors

# GENERAL TECHNICAL DATA

## SIZES: TOP AND PLUS

Cooling capacity from 17 to 46kW in Low Temperature

Cooling capacity from 118 to 190kW in Medium Temperature

The SENNA range includes 8 sizes, each of them with many pre-defined compressor configurations. In the tables below only the sizes Top and Plus are showed. The biggest compressor models for each size are shown. The technical data may vary according to the specifications provided and / or agreed with the customer.

Size Model	Top			Plus				
	3.0 150 kW	3.1 150 kW	3.2 150 kW	4.0 190 kW	4.1 190 kW	4.2 190 kW	4.3 190 kW	
Power Input	[kW]	89	93	99	121	125	128	131

Low temperature section								
Compressor number	[-]	0	1	2	0	1	2	3
Cooling Capacity	[kW]	-	17	32	-	17	32	46

Medium temperature section								
Compressor number	[-]	3	3	3	4	4	4	4
Cooling Capacity	[kW]	150	133	118	190	173	158	144

Gas cooler capacity	[kW]	252	252	252	331	331	331	331
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Connection piping diameters								
Low temperature suction	[mm]	-	22	28	-	22	28	35
Medium temperature suction	[mm]	42	42	42	42	42	42	42
Gas cooler line	[inch]	1"	1"	1"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
Liquid line	[mm]	42	42	42	42	42	42	42

Tanks capacity								
Liquid Receiver	[liters]	300	300	300	300	300	300	300
Oil Receiver	[liters]	20	20	20	20	30	30	30

Dimensions								
L x W x H *, **	[mm]	5000 x 850 x 2150				5700 x 850 x 2150		
Weight	[kg]	3500				4300		

### NOTES:

1 - Evaporation temperatures

Low temperature evap. -31°C

Medium temperature evap. -8°C

2 - Ambient temperature 34°C

3 - Discharge compressor pressure 92 bar

4 - Outlet gas cooler temperature 36°C

\*without housing for indoor/outdoor

\*\* Bitzer compressors

# GENERAL TECHNICAL DATA

## SIZES: LARGE 200-300

Cooling capacity from 33 to 88kW in Low Temperature

Cooling capacity from 130 to 300kW in Medium Temperature

The SENNA range includes 8 sizes, each of them with many pre-defined compressor configurations. In the tables below only the sizes Large 200-300 are showed. The biggest compressor models for each size are shown. The technical data may vary according to the specifications provided and / or agreed with the customer.

Size	Large 200				Large 300				
	4.0 225 kW	4.1 225 kW	4.2 225 kW	4.3 225 kW	4.0 300 kW	4.1 300 kW	4.2 300 kW	4.3 300 kW	
Power Input	[kW]	137	145	151	157	185	193	199	205

Low temperature section									
Compressor number	[-]	0	1	2	3	0	1	2	3
Cooling Capacity	[kW]	-	33	60	88	-	33	60	88

Medium temperature section									
Compressor number	[-]	4	4	4	4	4	4	4	4
Cooling Capacity	[kW]	225	192	161	130	300	280	249	218

Gas cooler capacity	[kW]	376	376	376	376	515	515	515	515
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Connection piping diameters									
Low temperature suction	[mm]	-	28	35	42	-	28	35	42
Medium temperature suction	[mm]	42	42	42	42	48	48	48	48
Gas cooler line	[inch]	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
Liquid line	[mm]	42	42	42	42	48	48	48	48

Tanks capacity									
Liquid Receiver	[liters]	350	350	350	350	450	450	450	450
Oil Receiver	[liters]	45	45	45	45	45	45	45	45

Dimensions									
L x W x H *, **	[mm]	6000 x 1300 x 2350				6300 x 1300 x 2350			
Weight	[kg]	4800				5300			

### NOTES:

1 - Evaporation temperatures

Low temperature evap. -31°C

Medium temperature evap. -8°C

2 - Ambient temperature 34°C

3 - Discharge compressor pressure 92 bar

4 - Outlet gas cooler temperature 36°C

\*without housing for indoor/outdoor

\*\* Bitzer compressors

# GENERAL TECHNICAL DATA

## SIZE: LARGE 400

Cooling capacity from 33 to 115kW in Low Temperature

Cooling capacity from 262 to 380kW in Medium Temperature

The SENNA range includes 8 sizes, each of them with many pre-defined compressor configurations. In the tables below only the size Large 400 is showed. The biggest compressor models for each size are shown. The technical data may vary according to the specifications provided and / or agreed with the customer.

Size Model	Large 400					
	5.0 380 kW	5.1 380 kW	5.2 380 kW	5.3 380 kW	5.4 380 kW	
Power Input	[kW]	229	236	243	249	255

Low temperature section						
Compressor number	[-]	0	1	2	3	4
Cooling Capacity	[kW]	-	33	60	88	115

Medium temperature section						
Compressor number	[-]	5	5	5	5	5
Cooling Capacity	[kW]	380	355	324	293	262

Gas cooler capacity	[kW]	637	637	637	637	637
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Connection piping diameters						
Low temperature suction	[mm]	-	28	42	48	60
Medium temperature suction	[mm]	60	60	60	60	60
Gas cooler line	[inch]	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"
Liquid line	[mm]	60	60	60	60	60

Tanks capacity						
Liquid Receiver	[liters]	600	600	600	600	600
Oil Receiver	[liters]	45	45	45	45	45

Dimensions						
L x W x H *, **	[mm]	7350 x 1300 x 2350			7900 x 1300 x 2350	
Weight	[kg]	6300			6800	

#### NOTES:

1 - Evaporation temperatures

Low temperature evap. -31°C

Medium temperature evap. -8°C

2 - Ambient temperature 34°C

3 - Discharge compressor pressure 92 bar

4 - Outlet gas cooler temperature 36°C

\*without housing for indoor/outdoor

\*\* Bitzer compressors

# SPECIFICATIONS DESCRIPTION OF STANDARD UNITS

SENNA is available in 8 sizes: MINI, SMALL, TOP, MAXI, PLUS, LARGE-200, LARGE-300 & LARGE-400. Below the list of main technical specifications:

Oil recovery system:

- ✓ SENNA Mini/Small: Enex proven gravity system with oil accumulator on MT suction;
- ✓ SENNA Top/Maxi/Plus/Large: oil separator on MT discharge line and oil reservoir.

Frame: SENNA Mini/Small/Top/Maxi/Plus/Senna Large: welded frame.

Piping: in AISI304L TIG welded stainless steel. Forged stainless steel fittings. The pipes are clamped with industrial type fixings. Cold pipes are thermally insulated with Armaflex insulation or equivalent with closed cells and low vapor permeability.

Control valves: stainless steel step motor valves, mounted with shut-off valves to use the back-up ones (available as option) in case of fault of the main ones.

Exchangers: optional one (up to Senna Plus) or two (Large 200-300-400) brazed plate heat recovery exchangers for Space Heating or DHW applications.

Regenerative suction/liquid stainless steel plate exchanger on LT return line for anti-liquid protection (only on Senna TOP to LARGE)

Regenerative stainless steel plate exchanger between flash gas and high temperature line to guarantee superheating of the vapour from the liquid receiver (all sizes).

Tanks: in painted carbon steel. Cold storage tanks are insulated as described below. Liquid line design pressure 60 bar with back-up cooling unit for control of the pressure increase available as option (factory mounted on MINI to PLUS only if cladding option is selected, otherwise supplied as a separate item; always factory mounted on Senna LARGE).

Insulation: Armaflex or equivalent with closed cells, combined with protection, for cold parts, with fat bandage and vapor barrier.

Liquid Level:

- ✓ Visual indicator of the liquid level through sight glasses and low alarm level installed directly on the liquid receiver as standard
- ✓ Low and high level sensors & sight glasses installed in the external pipe connected to the liquid receiver (available as option only on Senna LARGE 200-300-400)
- ✓ SMART ICE connections in all Senna range.

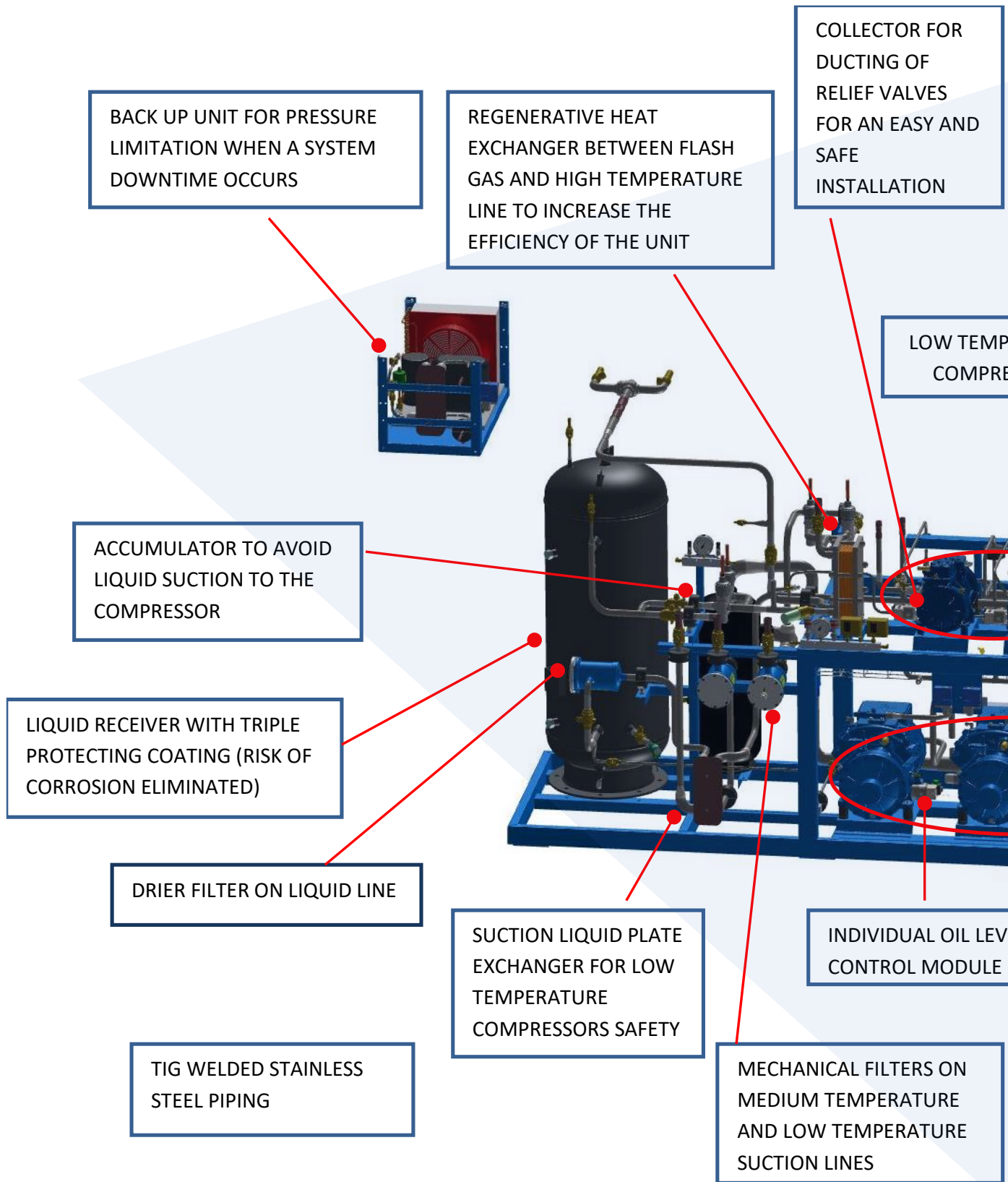
Compressors: optimized for operation under specific conditions with low gas pulsations and low vibrations, low oil carry over rate and low starting currents, extreme reliability and trouble free operation have been reached for many years.

First compressor per stage equipped with inverters mounted and connected to the rack (speed range according to the compressor).

Lubrication oil: PAG oil as standard for better oil management and longer compressor life. POE available as option (not on Senna MINI/SMALL due to gravity oil management system).



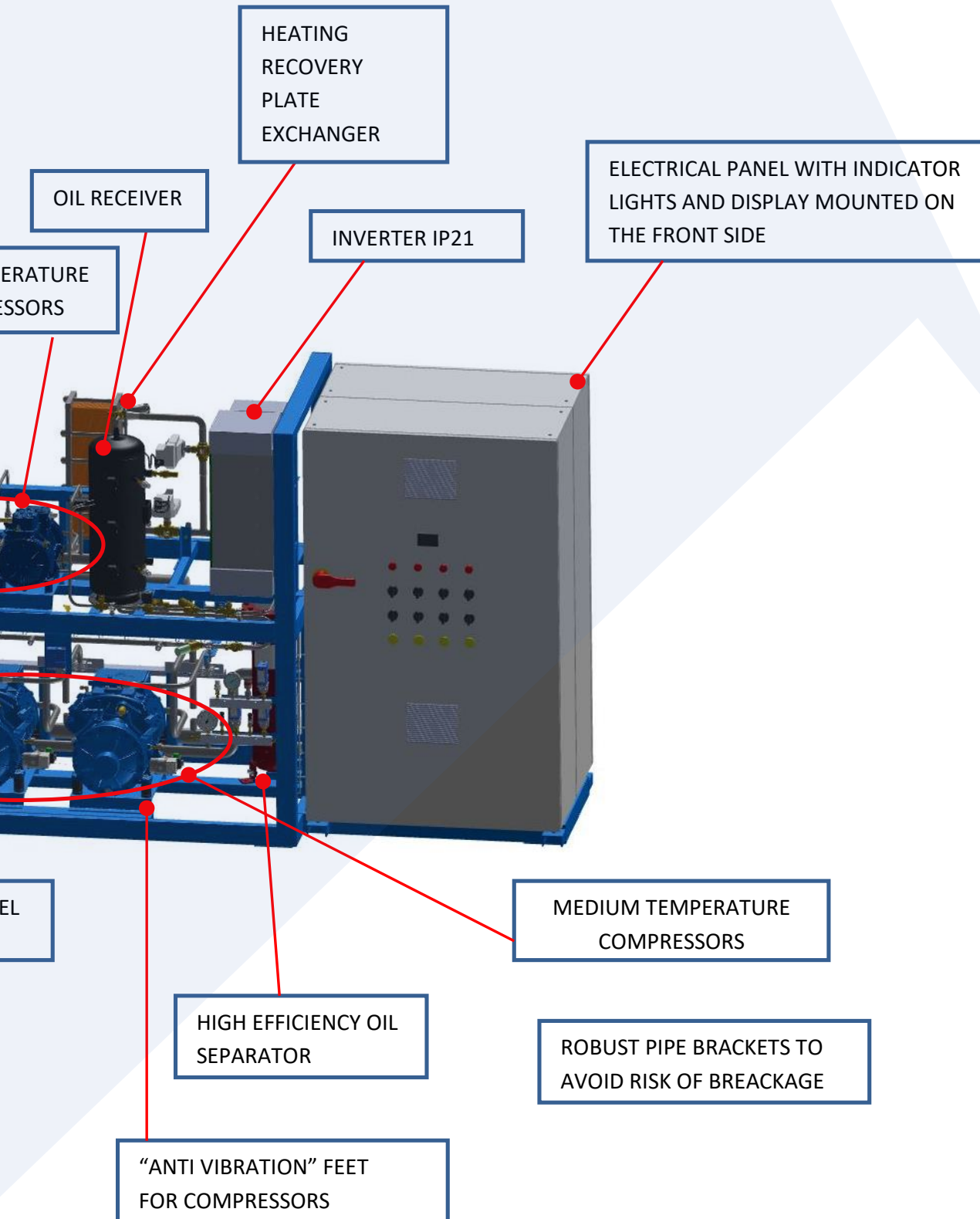
# DISTINCTIVE FEATURES AND BENEFITS OF THE RANGE





# ENEX PATENTS & INNOVATIONS

*Enex developed numerous innovations in the field of CO<sub>2</sub> refrigeration, some of which have given rise to important patents such as the "overfeeding of evaporators" and the "re-compression of flash vapor".*



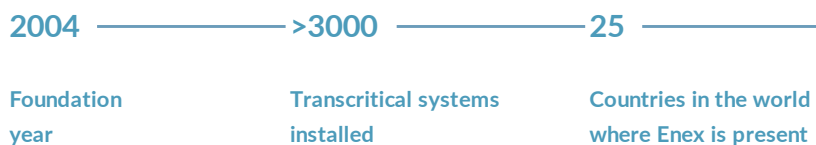
# TECHNOLOGICAL ADVANTAGES ARISING FROM ENEX KNOW HOW

- ◆ High efficiency: optimized booster cycle with regenerative heat exchangers;
- ◆ Robust frame and compact design;
- ◆ Stainless steel pipes;
- ◆ Easily accessible components;
- ◆ Large liquid receiver;
- ◆ Plug and play unit;
- ◆ Standard version: design pressure 30 bar on the LP / 52 MT / 60 IP/ 120 bar on the HP side;
- ◆ CE / PED certification Cat. IV.

## OPTIONS

- ◆ One heat recovery exchanger for Space Heating or DHW applications (two possible on Senna Large 200-300-400);
- ◆ Backup cooling unit (separate supply if housing is not installed on sizes MINI to PLUS);
- ◆ Second stepper HPV + MPV as back up valves with twin backup controller and sensors operating automatically in case of failure of the main controller;
- ◆ Back up controller spare;
- ◆ Complete ducting of the relief valve discharge;
- ◆ Danfoss or Carel controller, others on request;
- ◆ Dorin or Bitzer compressors;
- ◆ Differential circuit breakers 300 mA "Type A" on compressors;
- ◆ Icc max up to 25 kA;
- ◆ Low and high level sensors & sight glasses installed on the external pipe connected to the liquid receiver (available only on Senna LARGE 200-300-400);
- ◆ Main switch with MX coil;
- ◆ Liquid ejector with large MT suction Accumulator;
- ◆ Muffler for low noise applications;
- ◆ LSPM (Line Start Permanent Magnet) compressors.





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