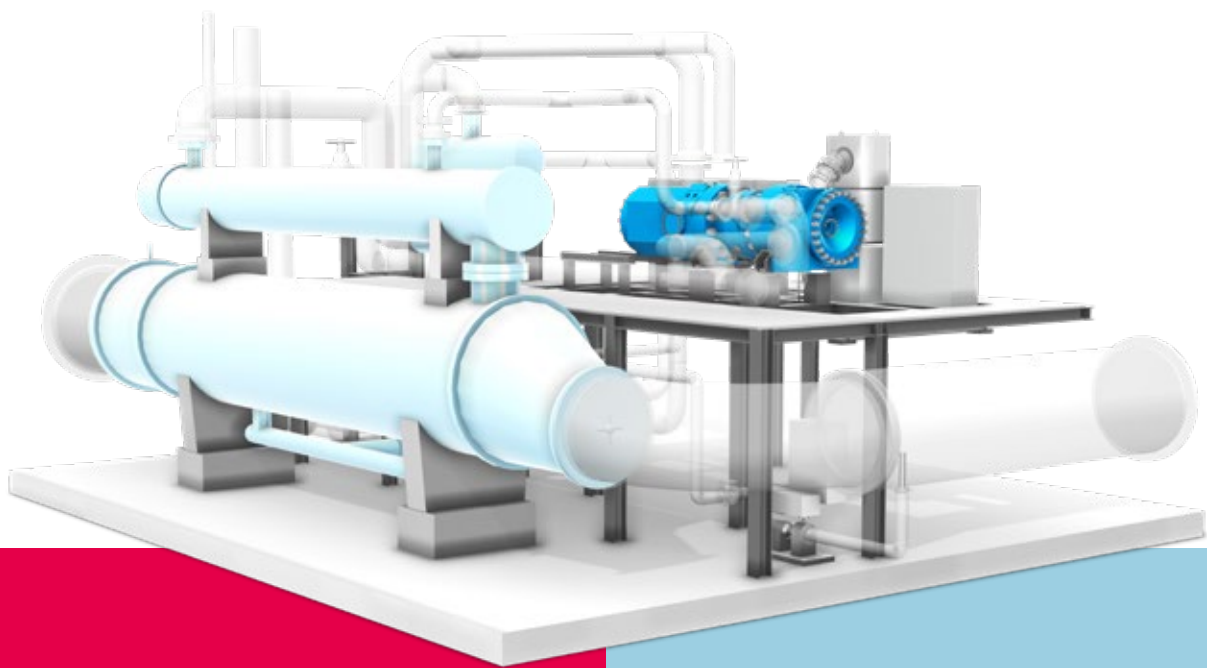


# TCC Heat pump



This high temperature, emission-free Everllence heat pump solution makes efficient use of the special properties that CO<sub>2</sub> offers as working fluid.

#### **Benefits at a glance**

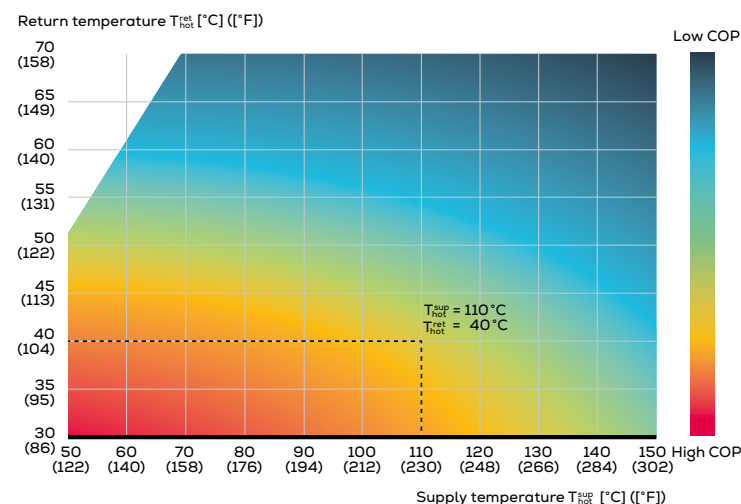
- Low maintenance and remote operation
- Natural refrigerant
- Up to 50 MW heat and 30 MW cooling per unit
- Temperatures up to 150 °C (302 °F)
- Fast start-up, shut down and load change
- Participation in the primary and secondary balancing market (FCR, aFRR)
- Flexible adaptation under operation
- High power density

# Everllence

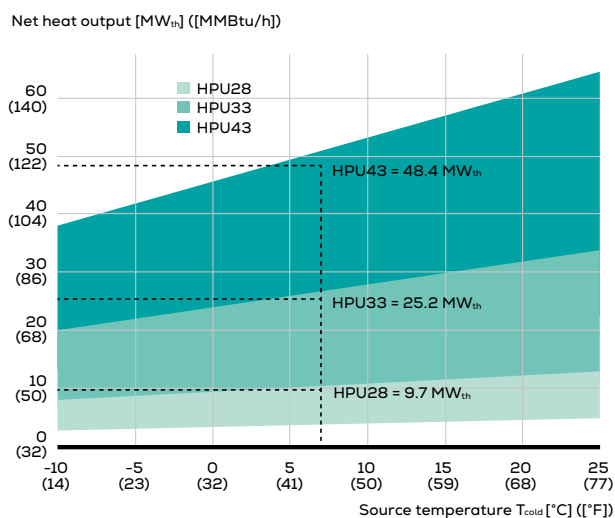
## Nominal Conditions

	Unit	Everllence HPU28	Everllence HPU33	Everllence HPU43
<b>No. compressors</b>	Pcs.	1	1	1
<b>Variable speed drive (VSD)</b>	–	Yes	Yes	Yes
<b>Max. thermal turndown</b>	%	50	50	50
<b>Refrigerant charge (CO<sub>2</sub>)</b>	kg (lbs)	9,000 (19,841)	13,750 (30'313)	20,000 (44'092)
<b>Electrical supply voltage</b>	kV	min. 4.16	min. 6	Min. 6
<b>Heating capacity</b>	kW <sub>th</sub> (MMBtu / h)	9,670 (33)	25,230 (86)	48,400 (165)
<b>Cooling capacity</b>	kW <sub>th</sub> (tons)	6,270 (1783)	16,730 (4757)	32,500 (9241)
<b>Motor input power</b>	kW <sub>el</sub>	3,400	8,500	15,900
<b>COP (Hot)</b>	–	2.84	2.97	3.04
<b>COP (Cold)</b>	–	1.84	1.97	2.04
<b>COP (total excl. pumps)</b>	–	4.68	4.94	5.08
<b>Dimensions (L/W/H)</b>	m (ft)	12/8/8 (40/26/26)	16/8/8 (52/26/26)	19/10/8 (62/33/26)
<b>Floor load</b>	kN / m <sup>2</sup> (psf)	10 (209)		
<b>Connections at heat sink</b>	–	DN200 (4")	DN300 (12")	DN400 (16")
<b>Connections at heat source</b>	–	DN500 (20")	DN900 (36")	DN1400 (56")
<b>Design pressure</b>	Barg (psig)			180 (2610)
<b>Design temperature</b>	°C (°F)			200 (392)
<b>Controller type</b>	–	Programmable logic controller (PLC)		
<b>Communication protocol</b>	–	MODBUS / PROFINET / Ethernet		

Nominal reference conditions: Heat sink supply / return temp.: 110 °C / 40 °C (230 °F / 104 °F); Heat source temp.: 10 °C (50 °F)



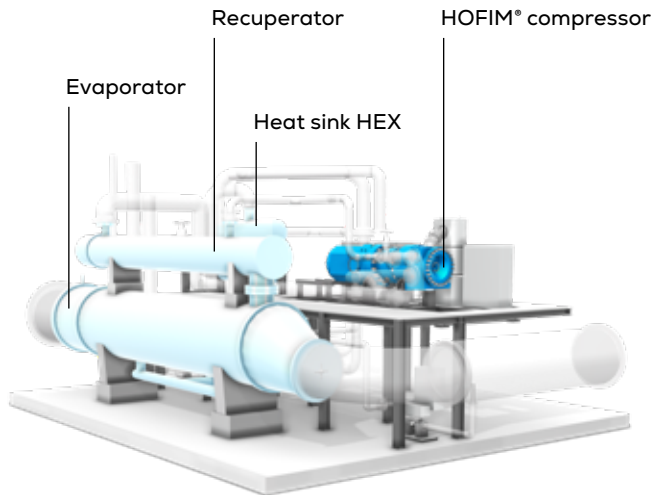
COP operating range as function of heat sink supply and return temperature for a constant source temperature



Net heat output as function of the source temperature  
(Heat sink temp. 110 °C / 40 °C (230 °F / 104 °F))

## Advantages of using CO<sub>2</sub> as a natural refrigerant

- Carbon dioxide is a naturally available gas which is available in large quantities and inexpensive compared to synthetic refrigerants
- Carbon dioxide is an environmentally friendly, low GWP, non-toxic and non-explosive medium
- Carbon dioxide is a very dense refrigerant with a high volumetric heating capacity; this allows the piping sizes and equipment volume to be much smaller than an equivalent HFC system
- Transcritical CO<sub>2</sub> heat pump cycle systems provide a high discharge temperature, therefore removing the need for cascade heat pump systems or additional heating devices
- There is no impending legislation phasing out carbon dioxide; hence it can be considered as a safe refrigerant, matching the clients long-term carbon footprint reduction strategies
- Transcritical CO<sub>2</sub> Everllence heat pump is remarkably suited for significant heat sink temperature differential



Transcritical compression cycle



Dismantled HOFIM® Heat Pump core unit

## Key facts

This high temperature industrial heat pump is able to generate temperatures from 0 °C (32 °F) up to 150 °C (302 °F) and up to 50 MW (170.61 MMBtu / h) of heating load and 30 MW (8530 tons of refrigeration) of cooling load with just one single heat pump unit.

## Key components

### HOFIM®

- Integrated machinery concept comprising of a centrifugal compressor, a high speed electric motor and power recovery turbine stage
- Hermetically sealed design preventing gas leakages to the environment
- Modular concept for maximum process design flexibility
- The active magnetic bearing system ensures a broad operating range, the highest reliability and availability as well as a quick start-up and shutdown; without a lubrication oil system and complex auxiliaries
- Designed for full remote operation, thanks to the comprehensive electric design
- Optimized installation and commissioning as well as lower maintenance since no external cooling medium, no lube oil neither sealing gas is required

### Heat sink HEX

- Printed circuit heat exchanger (PCHE) design
- Very compact and robust design
- Suitable for efficient gas to liquid heat transfer with narrow approach temperatures

### Evaporator

- Different types available based on heat source media (Shell & Tube, PCHE, Plate Fin)

### Recuperator

- Heat exchanger used to optimize the system and reduce system losses
- Different types available based on heat source media (Shell & Tube, PCHE, Plate Fin)

### Expansion

- Turbine stage for recuperation of the usable kinetic energy of the refrigerant in the expansion process
- Expansion valve for the expansion into the two-phase region until evaporation pressure

### Control system

- Process control system for control and operation of the complete heat pump unit
- Advanced digital services for remote operation, real time monitoring and predictive maintenance available

### Other available options

- CO<sub>2</sub> to air evaporators
- CO<sub>2</sub> detection system for machinery room and in the water systems
- Heat exchanger online cleaning systems (on water side)
- Additional CO<sub>2</sub> storage vessel for maintenance purposes
- A wide range of after sales

## Selected applications

Scalable and modular, Everllence mega heat pumps are suitable for mid- to large-scale thermal consumers in the range of 25 – 50 MW per unit and larger.

### District heating, municipal, urban and large facilities

With the Everllence mega heat pumps, you can decarbonize the complete energy supply for district heating networks, urban quarters, small towns and large facilities like airports, universities or shopping malls.

### Process industries

Everllence heat pumps provide cost-efficient carbon-neutral heating or cooling for all kinds of industrial processes with intensive heating and / or cooling demands, especially in the food, beverage and chemical industries.

### Data centers

Data center operators can reduce their CO<sub>2</sub> emissions and electricity costs with a direct supply of cooling energy. An additional revenue stream can be created by participating in the power markets and exporting thermal energy, e.g. for district heating.

# Everllence

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MAN Energy Solutions SE has been renamed to Everllence SE and its products are being rebranded from "MAN" and/or "MAN Energy Solutions" to "Everllence". As this is an ongoing process, any reference to "MAN" and/or "MAN Energy Solutions" is actually a reference to "Everllence".

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