



CO₂ chillers and CO₂ high temperature heat pumps



Environmentally friendly key technology for heating and cooling

A generational decision has been taken: The most important industrial nations want to decarbonise our heat and cold supply within the next 20 years.

Renewable energy technologies such as wind power, hydropower and photovoltaics are used mainly to produce electricity. The energy revolution also requires energy efficiency as well as conversion and storage technologies.

Heat pumps, a technology that has proven itself over many decades, can efficiently convert electrical energy into heat and simultaneously provide cold - without exhaust fumes, particulate emissions or appreciable heat losses.

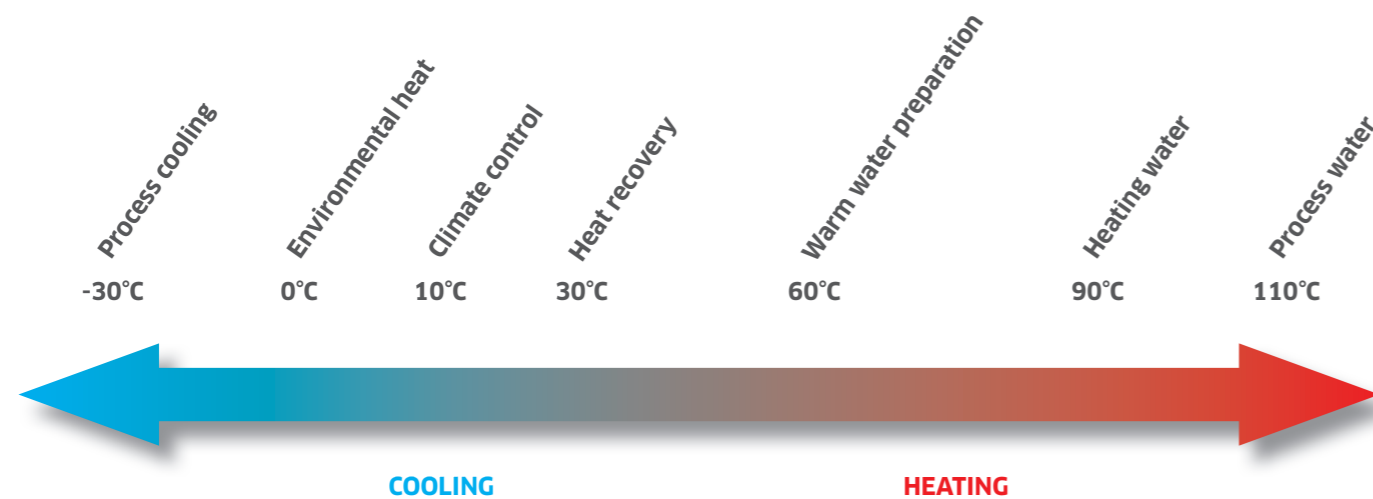
Heat pumps improve energy efficiency and help with optimal utilisation of existing energies. If they are powered by renewable sources, it is possible even today to provide an energy supply without emitting CO₂ emissions (decarbonisation).

Heat pumps are a very versatile way to provide heating and cooling.

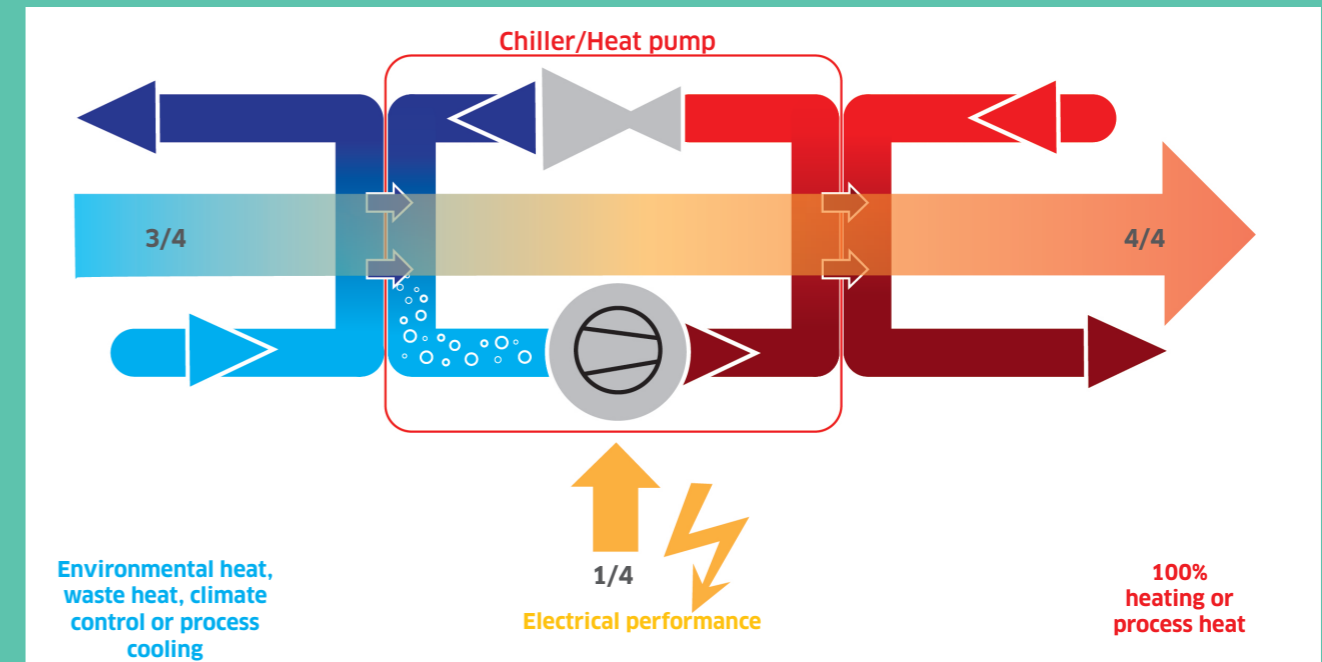
The most famous example is the use of geothermal heat to heat buildings. But clothes dryers and fridges also utilise the principle of the heat pump. All of these examples have one thing in common: The heat on one side and simultaneously cool on the other. Depending on the side we make use of, we refer to the principle as a heat pump or chiller.

New economic applications in industry, commerce and building technology will be opened up for this fascinating key technology by the new temperature range and carbon dioxide, the future-proof refrigerant used in therm-eco₂ chillers and high temperature heat pumps.

That means it is more than just a generational decision: Do we use a tried and tested technology, or do we keep burning fossil fuels? It is also a decision for a sustainable energy cost reduction and a secure energy supply that does not depend on finite resources.



Overview of application ranges of heat pumps and chillers



Energy flow within a heat pump

Application areas for CO₂ chillers and CO₂ high temperature heat pumps

Building technology

- > Heat supply for properties
- > Cold supply for properties
- > Hospitals
- > Large, energy-intensive buildings (e.g. data centres, media complexes)
- > Hotel complexes

Central building services engineering

- > Local heat networks (e.g. belonging to public utilities and local authorities, private energy suppliers, energy service providers)
- > Industrial heat and cold supply networks

Process technology

- > Condensation dehumidification in process air technology (painting systems, coating systems)
- > Hot water creation for washing and cleaning processes (food, meat, product washes) with cold generation where necessary
- > Hot air generation for drying processes (sludge, biomass, washed products) with cold generation possible
- > Air preheating for spray dryers, power plants and heat generation plants

Refrigeration technology

- > Cooling brine systems for the food, pharmaceutical and chemical industries
- > Commercial refrigeration
- > Ice rinks

Quality made in Germany

CO₂ high temperature heat pumps and CO₂ chillers of the thermeco₂ series are developed, designed and produced in Germany.

The machines have EC prototype approval provided by TÜV SÜD as well as the CE mark. They are produced in line with ISO 9001:2008. Plant-side quality inspections such as pressure strength tests, leak tests and electrical tests are certified.

Functional safety and reliability are a top priority. The thermeco₂ heat pumps and thermeco₂ chillers contain only products from premium-quality manufacturers.

The system control is easy to implement, thanks to the large display of the thermeco₂ control system and an intuitive menu navigation. Connection to customer-side control systems is possible via a ProfiNet Bus interface among others.

Tried and tested technology is used in the semi-hermetic reciprocating compressors and heat exchangers. Frequency converters make capacity control more precise. The oil separators and oil collectors were developed specifically for CO₂ applications.



Technical data



Machine type HHR		45	65	90	130	180	260	360	520	720	1000	1440
Nominal point for heating at 20/80 °C and cooling at 20/14 °C												
Heating capacity	kW	51	65	93	132	194	268	385	554	781	1,100	1,460
Refrigeration capacity	kW	39.3	50.7	72.2	103	150	205	298	421	605	836	1,090
Power consumption	kW	11.9	15.3	22.5	31	47	67	93	140	187	279	434.4
Heating COP		4.3	4.3	4.1	4.2	4.2	4.0	4.1	4.0	4.2	3.9	3.9
Total COP (heating and cooling)		7.6	7.6	7.2	7.4	7.4	7.0	7.2	7.0	7.4	6.8	6.8
Reciprocating compressor												
Compressor quantity (type)		1(90)	1(110)	1(170)	1(230)	1(345)	2(250)	2(345)	3(345)	4(345)	6(345)	8(345)
Voltage / frequency		3~/380-420 V/50 Hz or 3~/440-480 V/60 Hz (all values relate to 50 Hz)										
Capacity control initial current limitation		with VSD					continuous control (depending on no. of compressors) as standard					
Dimensions and weights												
Length	mm	2,000	2,000	2,000	2,000	2,000	4,250	4,250	4,250	5,500	6,000	7,000
Width	mm	1,000	1,000	1,000	1,000	1,000	1,200	1,200	1,200	1,500	1,500	1,500
Height	mm	2,000	2,000	2,000	2,200	2,200	2,200	2,200	2,200	2,400	2,400	2,400
Empty weight approx.	kg	1,200	1,250	1,300	1,600	1,650	2,900	3,550	4,200	6,100	8,500	6,580
Operational weight	kg	1,250	1,300	1,350	1,650	1,700	3,000	3,600	4,650	6,300	8,700	7,050

The table specifies the capacities for the thermeco₂-HHR series. Depending on requirements, other operating points within this application range are possible as well.

Safe investment in the future

Today, sustainability is no longer an idea, but rather a concrete goal:

The F-Gas Regulation serves to reduce direct emissions and prohibits refrigerants that are extremely harmful to the environment.

The F-Gas Regulation calls for a reduction in the emission of fluorinated greenhouse gases: By 2030 the CO₂ equivalent will be reduced to approx. one fifth of the 2015 quantity.

Above all, however, the availability of refrigerants in the market will become a central issue for the safe operation of heat pumps and chillers.

Carbon dioxide, a natural refrigerant, provides operating companies of heat pumps and chillers with the opportunity to make future-proof investments, comply long-term with legal regulations, and to run systems in an energy-efficient manner.

Product advantages at a glance

Sustainability & efficiency

- **Natural refrigerant**
Environmentally friendly alternative to traditional refrigerants
- **Effective cogeneration of refrigeration and heat**
Effective refrigeration with simultaneous heat production on a high temperature level
- **Effective heat recovery**
Use of industrial waste heat sources and waste water
- **Low pollutant emission**
Reduction of CO₂ pollutant emissions through oil and gas savings
- **High cost-effectiveness**
Machines can be pay off in very short time

Technology & practice

- **Robust industry design**
High quality "made in Germany" through certified production
- **State-of-the-art control technology**
Full control and even remote monitoring
- **Compact design**
Individual modifications of machines on site

The right temperature for every process: ENGIE Refrigeration

ENGIE Refrigeration GmbH in figures (2017)



Globally active

135

Years of experience in industrial refrigeration and heat technology

3.120

QUANTUM chillers sold

1.430

Customer projects implemented since 2012

500

Refrigeration technology training from the dka since 2004

ENGIE Refrigeration supplies the right cooling for every process: from efficient chillers, environmentally friendly heat pumps and modular re-cooling systems to turnkey solutions such as refrigeration containers or modules. Efficiency, sustainability, cost effectiveness and first-class expertise in technical solutions are hallmarks of every ENGIE Refrigeration project. Our individualised advice and comprehensive services are centred around our customers and their requirements. As a member of the worldwide ENGIE Group, we have a global network of specialists at our disposal and can realise our refrigeration solutions both at home and abroad.

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