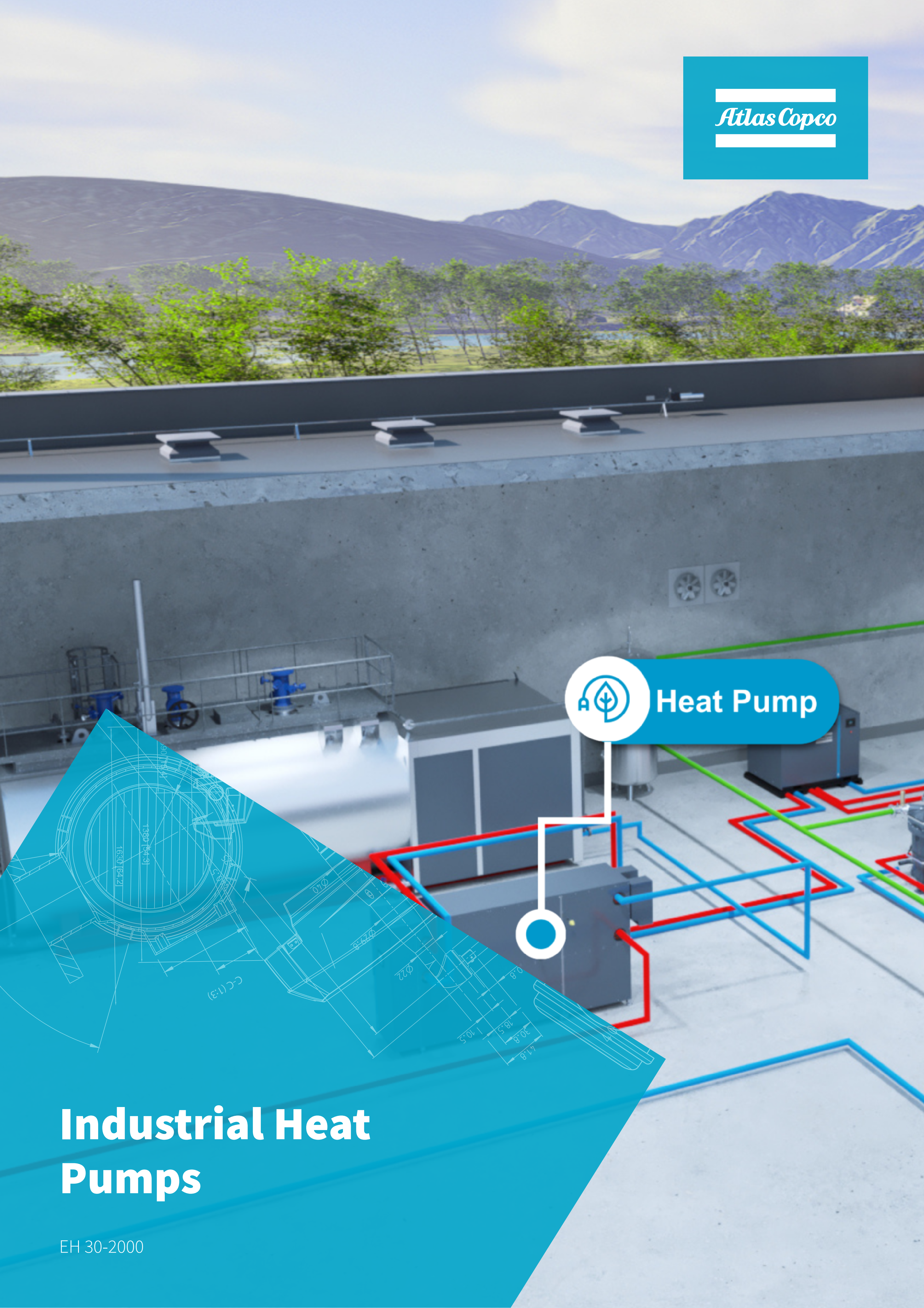


Industrial Heat Pumps

EH 30-2000

From waste heat to useful heat

Industries often produce waste heat that is not hot enough to be reused. Industrial heat pumps can capture this low-temperature waste heat and turn it into **usable high-temperature heat**. This improves **energy efficiency** and helps to **save energy**.

Electrification

Heat pumps are powered by electricity and are a key technology for electrification. They can replace a large portion of fossil fuel-based industrial heating, reducing the use of non-renewable energy sources.

Decarbonize industrial heat

Heat pump technology can significantly reduce CO_2 emissions from industrial heating processes. Industrial heat pumps are highly energy-efficient and provide a sustainable way to generate process heat.

Utilize waste heat

Industrial heat pumps can capture and reuse waste heat from industrial processes. Temperatures can reach up to 120°C, making it possible to use this heat in other processes and improve energy efficiency.

Segments and applications

Heat pumps can be used in be used in various industries with waste heat, below discover a few examples of use.

Food & Beverage

Chemicals

Pulp & Paper

Metal

The food and beverage industry has a dual requirement for both cooling and heating processes. When products are cooled, they produce waste heat which can be effectively upgraded from low temperature to higher useful temperatures. This approach leads to superior energy efficiency and reduces operational costs, bringing the company closer to achieving a low carbon economy.

Waste heat from the food and beverage industry can originate from sources such as cooking, baking, frying, drying, and refrigeration.

High-temperature water or steam is commonly employed for tasks like distillation, sterilization or pasteurization. Heat applications in the food industry encompass a broad range of functions. Pasteurization is employed for milk, beverages, and canned foods to ensure safety and quality. Boiling and sterilization are used for both food and equipment, while cleaning processes also involve heat applications.

The chemical industry relies heavily on high temperatures for its various processes. A large portion of the energy use in the chemical industry is for heating and cooling purposes, such as reaction, separation, purification, and drying processes. By incorporating heat pumps into their operations, chemical industries can decrease the dependence on fossil fuels and lower the operating costs and carbon footprint of the chemical plants. The integration of renewable resources for powering these heat pumps can further contribute to the decarbonization efforts. Improving the energy efficiency and reducing the environmental impact of the heating and cooling processes is a key challenge and opportunity for the chemical industry.

The chemical industry encompasses a wide range of products, including ammonia, fertilizers, pharmaceuticals, alcohols, detergents, resins, polymers, textiles, paints, pigments, and dyes.
Heat-intensive processes in the chemical industry that can be supported by the heat pump, involve distillation or organic compounds, sterilization of equipment and products, pasteurization of liquid products, or drying of chemicals, such as salt, soda ash, and calcium carbonate.

The pulp & paper industry is one of the largest and oldest industries in the world, producing a variety of products, such as paper, cardboard, tissue, and pulp. A significant amount of the energy use in the pulp and paper industry is for heating and drying purposes, such as cooking, bleaching, and paper drying processes.

Drying is a highly energy-intensive process. Heat pumps can recover exhaust heat from drying, using it to reheat condensate and generate steam for subsequent drying stages.
Initially, wet pulp (from wood or recycled paper) is spread onto a wire mesh to form sheets, releasing water through condensate. The sheets are pressed to remove up to 50% of the water content. Subsequently, they pass-through cast-iron cylinders heated to over 100°C for further drying. Integrating heat pumps in this process creates a more circular system, enhancing energy efficiency and minimizing environmental impact.

Furthermore, heat pumps find application in other processes such as cooking of wood chips, bleaching, and heating up water for various processes.

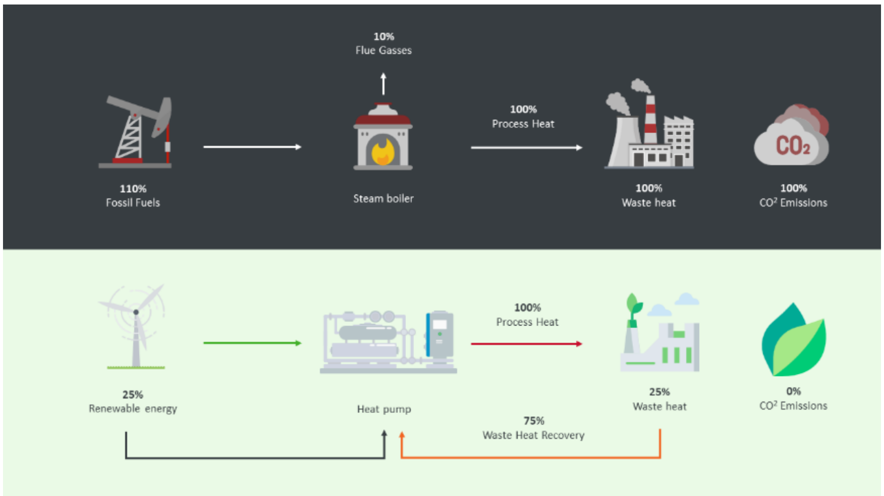
The metal industry encompasses a range of materials, including iron, steel, copper, and various non-ferrous metals.
A considerable amount of the energy use is for heating and cooling purposes, such as melting, casting, forging, rolling, and annealing processes.

High-temperature metalworking processes can lead to the formation of discolored oxide layers or scales on metal surfaces. To remedy this, surface treatments such as pickling are employed to eliminate impurities like rust, stains, or inorganic contaminants. Pickling involves heating baths to temperatures of 100°C or below.
Other applications in the metal industry include annealing of metals, rolling of metals, phosphating, electroplating, and degreasing.
In smelting plants, metals and other by-products are separated through various processes, including smelting, calcination, leaching, purification, and electrolysis, before being cast into their pure metal forms.

Electrification solution for low carbon economy

Electrification solution

An electrically driven industrial heat pump provides higher performance than traditional fuel-fired alternatives. It enables energy circularity, improving the energy efficiency of industrial processes. When powered by renewable electricity, it further strengthens the industry's decarbonization strategy in a sustainable manner. By using electricity from renewable sources, industries can reduce their carbon footprint and move towards a more sustainable future. Heat pumps are a key technology for electrification, providing a clean and efficient way to generate heat for industrial processes. By incorporating heat pumps into their operations, industries can reduce their reliance on fossil fuels and take a significant step towards mitigating CO2 emissions.



Components designed for reliability

1 Smart controller

- Optimize the heat pump's performance and ensure a steady outlet temperature for your operations with smart control algorithms.
- Monitor the heat pump's performance from anywhere with the remote monitoring feature.

2 Compressor

- A semi-hermetic refrigerant compressor suitable for high-temperature heat pumps is included.
- Depending on the thermal capacity required, screw and piston compressors are available.

3 Variable speed drives

- Fluctuating heating capacity requirements are accommodated by the variable speed drives.
- Precise control is enabled, and energy efficiency is improved, reducing energy costs.

4 Sub-cooler

- Additional wasted energy is recovered and converted into usable heat by the sub-cooler.
- The thermal heat capacity is boosted, improving the heat pump's performance.

5 Evaporator

- The high-capacity brazed plate heat exchangers are compact and reliable.
- Heat loss is prevented by insulating the evaporator, improving energy efficiency.

6 Condenser

- Inside the condenser, the high-temperature, high-pressure refrigerant is cooled down, transferring its heat to the application process.
- The unit is compact and easy to install, thanks to the brazed plate heat exchanger.

7 Victaulic connection

- Quick coupling and installation alignment are made possible by the Victaulic connections.
- The unit is ready for connection on-site, saving time and effort.

8 Expansion Valve

The refrigerant temperature is lowered by the efficient expansion valve, improving the cooling capacity at the evaporator.

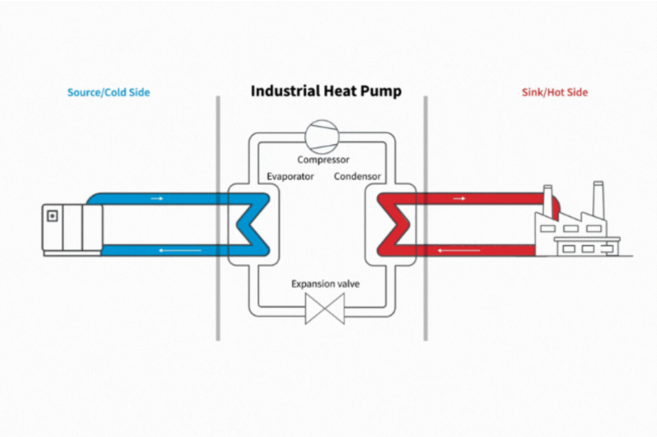
9 Blow of Valves

Safe discharge of the refrigerant is ensured by the blow-off valves, ensuring safe operation.

10 Compact design

The heat pump has a compact design, taking up minimal floor space and allowing for easy installation in tight spaces.

Heat Pump working principle



Heat pumps operate on a closed refrigerant cycle using a vapor compression process, similar to refrigerators. They consist of essential components: an evaporator, compressor, condenser, and expansion valve.

Here’s how a heat pump works:

1. Low-temperature waste heat (water) is directed into the heat exchanger (evaporator) of the heat pump. The heat from the water is transferred to the refrigerant, causing the refrigerant to evaporate. The water exits the evaporator at a lower temperature.
2. The low-pressure and low-temperature refrigerant vapor then enters the compressor, where it is compressed to a high-pressure and high-temperature vapor.
3. The high-pressure and high-temperature refrigerant now moves into another heat exchanger (condenser), where it releases its heat to a customer process. The customer process water, at a lower temperature, enters the condenser and absorbs the heat from the refrigerant, causing the refrigerant to condense. The customer process water exits at a higher temperature, having gained heat.
4. The now condensed refrigerant, at lower temperature and high pressure, returns to the evaporator, where it becomes a low-temperature and low-pressure liquid.
5. This cycle continues as the refrigerant re-enters the evaporator repeatedly.

Monitoring, control and service

Global monitoring system

- Remote monitoring of one or several heat pumps separately or as whole system.
- Versatile and visual reporting and comprehensive subprocesses trends monitoring.
- Operations support and optimization as a remote service to destinations around the world.
- High usability, minimizing maintenance costs and downtime.
- Improve user experience, reliability, efficiency, durability and safety of our products.
- Please contact your Atlas Copco representative

Control panel *(as standard in heat pump units)*

- Clear and graphically informative user interface that controls one or multiple heat pumps.
- Control according to the produced temperature(s) of the cold- or/and hot side(s) function(s).
- In addition, control of the brine circulation pumps on the cold and/or the hot side.
- Modbus RTU bus interface as standard, optionally available Modbus TCP, Profibus, BACnet and Profinet bus interfaces.
- Remote monitoring possibility.

Service

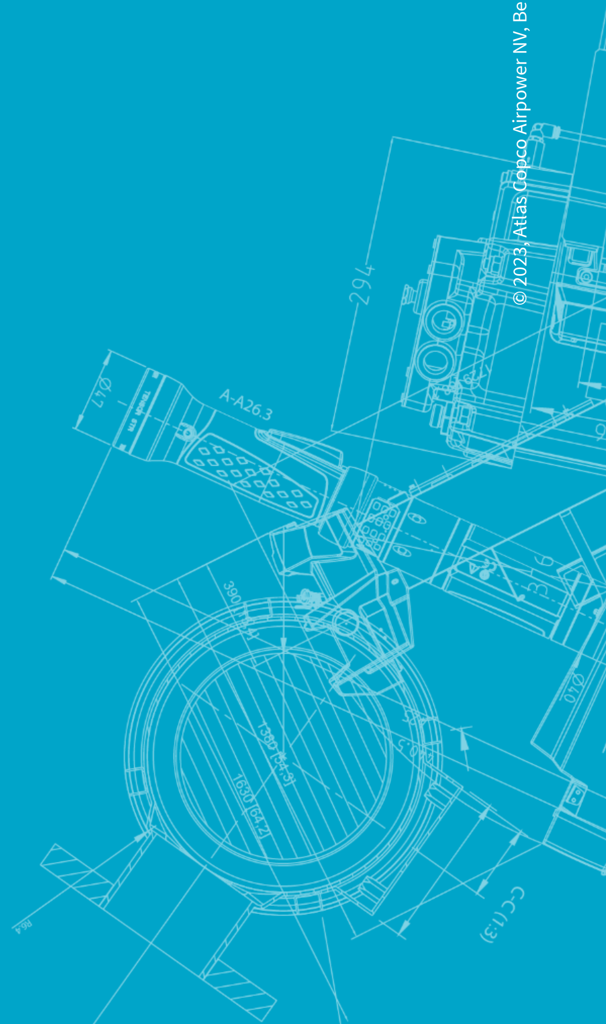
Proper operation of heat pumps saves energy. Timely care of the heat pumps will lower the operating costs and minimizes the risk of unplanned break downs or production stops. Atlas Copco offers maintenance plans, service repairs, spare parts for all heat pumps. Entrust service to our experts and ensure lowest TCO for the products.

Technical data

Industrial heat pump – technical data

<table>
<tr><th rowspan="2">Model name</th><th rowspan="2">Temperatures produced</th><th rowspan="2">No. of refrigerant circuits</th><th colspan="3">*Dimensions [mm]</th><th rowspan="2">Refrigerant**</th><th>Fuse size***</th><th rowspan="2">Weight [kg]</th></tr>
<tr><th>Height</th><th>Length</th><th>Width</th><th>A, 3/N/PE 400 V 50 Hz</th></tr>
<tr><td>EHR 30</td><td rowspan="8">Maximum temperature 120°C
Minimum temperature -7°C</td><td rowspan="4">1</td><td>1297</td><td>1079</td><td>750</td><td rowspan="8">R1234ze, R1233zd</td><td>3x63A</td><td>530</td></tr>
<tr><td>EHR 60</td><td rowspan="12">2091</td><td rowspan="4">1571</td><td rowspan="12">911</td><td>3x125A</td><td>920</td></tr>
<tr><td>EHR 100</td><td>3x160A</td><td>1200</td></tr>
<tr><td>EHR 150</td><td>3x200A</td><td>1300</td></tr>
<tr><td>EHR 220</td><td rowspan="4">2</td><td>3x400A</td><td>2300</td></tr>
<tr><td>EHR 300</td><td>2723</td><td>3x630A</td><td>2600</td></tr>
<tr><td>EHR 380</td><td rowspan="2">3866</td><td rowspan="2">3x800A</td><td>3100</td></tr>
<tr><td>EHR 450</td><td>3700</td></tr>
<tr><td>EHZ 180</td><td rowspan="11">Maximum temperature 85°C
Minimum temperature -12°C</td><td rowspan="5">1</td><td rowspan="5">2551</td><td rowspan="11">R1234ze</td><td>250</td><td>2300</td></tr>
<tr><td>EHZ 280</td><td>355</td><td>2900</td></tr>
<tr><td>EHZ 380</td><td>500</td><td>3600</td></tr>
<tr><td>EHZ 490</td><td>630</td><td>4000</td></tr>
<tr><td>EHZ 580</td><td>800</td><td>4500</td></tr>
<tr><td>EHZ 600</td><td rowspan="6">2</td><td rowspan="6">2100</td><td rowspan="6">5000</td><td rowspan="6">2000</td><td>2x3x400</td><td>3200</td></tr>
<tr><td>EHZ 800</td><td>2×500</td><td>4000</td></tr>
<tr><td>EHZ 1000</td><td>2×630</td><td>4500</td></tr>
<tr><td>EHZ 1200</td><td>2×800</td><td>5300</td></tr>
<tr><td>EHZ 1500</td><td>2x3x800</td><td>6500</td></tr>
<tr><td>EHZ 2000</td><td>2×1250</td><td>7500</td></tr>
<tr><td>EHX 210</td><td rowspan="3">Maximum temperature 62°C
Minimum temperature -15°C</td><td>1</td><td rowspan="3">2091</td><td>1571</td><td rowspan="3">911</td><td rowspan="3">R410A</td><td>3x200A</td><td>1600</td></tr>
<tr><td>EHX 330</td><td rowspan="2">2</td><td rowspan="2">2723</td><td rowspan="2">3x400A</td><td>1800</td></tr>
<tr><td>EHX 420</td><td>2000</td></tr>
</table>

The performance values of the heat pump products under different conditions are calculated using the Selection Tool selection program.
*) Dimensions without a frequency converter.
**) Other refrigerant options available upon demand
***) Fuse size dimensioned in the most demanding conditions.



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