

ARMSTRONG+COMBITHERM HEAT PUMP SOLUTIONS

HIGH-EFFICIENCY HEATING, COOLING AND
HOT WATER GENERATION FOR INDUSTRIAL
AND INSTITUTIONAL APPLICATIONS





OUR EXPERIENCE MAKES A WORLD OF DIFFERENCE

Founded in 1900, Armstrong International is a privately held, fifth-generation, family-owned company. Our unique heritage of sage knowledge and in-depth experience in thermal utilities enables us to serve you in ways no one else can. Today, Armstrong's industry-leading equipment is hard at work in more than 100 countries, saving time, money and energy for some of the world's largest, most efficient companies in industrial and institutional markets alike.

ON THE FOREFRONT OF TECHNOLOGY AND INNOVATION

Armstrong is committed to providing ongoing advancements and new product developments to meet the evolving demands of your industry, company and global location. Often the first to market, our company has been granted more than 70 patents on exceptional equipment and software. We're here to solve your problems and prevent them with groundbreaking technology and rugged, reliable products that demonstrate unparalleled value and improved thermal utility system performance.

ARMSTRONG+COMBITHERM

In our mutual efforts to address the global need for decarbonization, Armstrong International has entered into a partnership agreement with Combitherm GmbH, a leading German manufacturer of heat pumps. Together, we develop and distribute leading-edge heat pump solutions that allow companies to significantly reduce their reliance on fossil fuel energy and lower their CO2 emissions.

CUSTOM-ENGINEERED FOR SUPERIOR THERMAL EFFICIENCY, DE-STEAMING, AND DECARBONIZATION

Whether your goal is cutting energy costs, reaching net zero, or both, your ARMSTRONG+COMBITHERM Heat Pump will carry you into the future by reclaiming your wasted heat and putting it to work where you need it most—as a replacement for purchased fuel. Use your waste heat to produce hot water for your high-temperature cleaning or process applications instead of burning fossil fuels to generate steam or hot water.

ARMSTRONG+COMBITHERM Heat Pumps allow you to reuse the low-temperature heat (< 204°F [90°C]) rejected by process and cooling systems that is currently being wasted in most industrial plants. Through the refrigeration cycle of our Heat Pumps, hot water temperature is increased at relatively high levels—up to 248°F (120°C).

ARMSTRONG+COMBITHERM HEAT PUMPS OFFER SIGNIFICANT ADVANTAGES OVER TRADITIONAL, COMBUSTION-BASED AND ELECTRICAL HEATING METHODS



- | Lower operating costs
- | Less maintenance
- | Reduced carbon emissions
- | Heating and cooling capabilities
- | Proven reliability
- | Longer lifespan

HIGHER THAN 100% EFFICIENCY


In a steam or electrical heating system, the amount of heat produced is a portion of the energy consumed to produce it, so efficiency is less than 100%. The ARMSTRONG+COMBITHERM Heat Pump extracts wasted heat from a heat source (chilled water, cooling tower water, or any consistent waste heat) and raises the temperature to a useful level. Because the amount of heat produced is not dependent on the amount of energy consumed, efficiency can surpass 100%.

ARMSTRONG+COMBITHERM BRINGS YOU CLOSER TO YOUR NET-ZERO GOAL

As companies strive to decarbonize thermal generation and reduce or eliminate their dependence on fossil fuels, the ability to reclaim and use wasted heat becomes essential. Compared to other renewable alternatives, the impact of ARMSTRONG+COMBITHERM Heat Pumps (fueled by renewable electricity) on reducing CO2 emissions makes tackling the thermal decarbonization challenge easier and more cost-effective.

NO TIME OR ENERGY TO WASTE.

ARMSTRONG+COMBITHERM Heat Pumps provide a higher COP while consuming only half the electrical power of a simple electric steam boiler or hot water generator. In addition to recovering wasted heat, our Heat Pump Packages offer an efficient solution for using shallow geothermal or water from rivers, lakes, or even sewage, as a heat source.



THE ARMSTRONG+COMBITHERM HEAT PUMP IS INTEGRAL TO CIRCULAR THERMALSM, THE HEART OF OUR DECARBONIZATION METHODOLOGY.

By allowing you to reclaim your wasted heat for use as a replacement for fossil fuels in your industrial process, Circular ThermalSM becomes an essential part of optimization—the no-regret first step on your Roadmap to Thermal Decarbonization.

ARMSTRONG'S CIRCULAR THERMALSM—A BETTER SOLUTION FOR YOUR COMPANY AND THE PLANET

Circular ThermalSM makes a fundamental change in thermal utility systems by using steam only for applications above 250°F (120°C). Because hot water systems have higher efficiency than steam systems, hot water replaces steam for all applications below 250°F (120°C). This de-steaming not only brings a significant gain in efficiency—it also creates the backbone for using direct heat recovery, or heat exchangers, to recover high-grade wasted heat. By adding ARMSTRONG+COMBITHERM Industrial High-Temperature Heat Pumps, low-grade heat from cooling systems and process stacks can be recovered and upgraded to valuable high-grade heat.

AN INTEGRATED SOLUTION, BUILT FOR THE REQUIREMENTS OF YOUR COMPANY AND INDUSTRY

We understand that every facility is different, so Armstrong's experienced specialists will conduct a pinch analysis to determine the best configuration to address the unique needs of your project and application.

INDUSTRY APPLICATIONS

- | BREWERY AND MALT HOUSE—Wort preparation, drum and bottle cleaning, malt drying
- | DAIRY—Container sterilization
- | SUGAR PRODUCTION—Boiling process for making syrups, thickening
- | FOOD MANUFACTURING—Boiling processes, grain and fodder drying
- | INSTITUTIONS—Hot and chilled water for hotels, hospitals, schools and universities
- | PAPER PRODUCTION—Pulp drying
- | PROCESSING TECHNOLOGY—Reclaiming of cleaning solutions
- | PHARMACEUTICAL—Hot water and chilled water for air handling units, process heating and cooling

Institutional



Electroplating



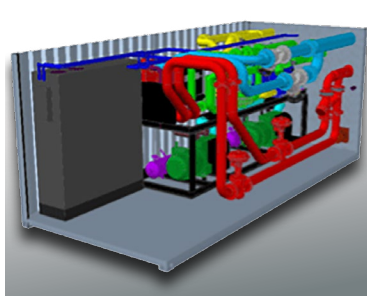
Dryer Heat Recovery, Chiller & Pool Heating



Outdoor Installation



Container Solution



Hydraulic Extension





FEATURES AND BENEFITS

CUSTOM ENGINEERING

- | Tailor-made heat pumps, heat recovery chillers, special applications
- | Special heat exchanger materials for various mediums
- | Position and execution of connections according to customer requirements
- | CAD construction and CFD simulation
- | Adapted design for replacement or special insertion

FULL RANGE OF SYSTEM COMPONENTS

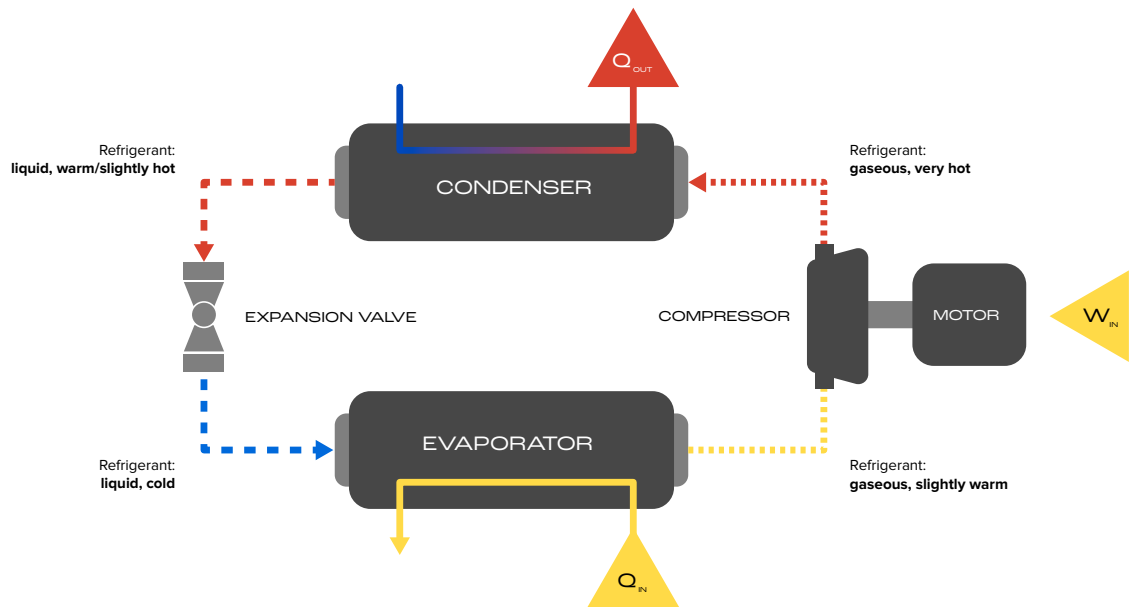
- | Additional equipment, such as pumps, valves, sensors, buffer vessels
- | Integrated on the machine or supplied separately
- | Adaption of frame size to accommodate special conditions
- | Sound-isolating and weather-proofed housing
- | Container installation or truck-mounted aggregates

PRECISION ELECTRICAL DESIGN

- | Electrical cabinet attuned to all components and accessories
- | Control by Programmable Logic Controller (PLC)
- | Data input and output via touch panel
- | Extensive visualization of refrigeration circuit and periphery
- | All common communication protocols like Modbus, Profibus, Profinet and BACNet

HOW DO ARMSTRONG+COMBITHERM HEAT PUMPS WORK?

Simply stated, heat is transferred by pumping a working fluid between two heat exchangers in a cycle of evaporation and condensation.



1. The working fluid enters a low-temperature heat exchanger, or evaporator, where it evaporates at low pressure and absorbs heat from a heat source such as chilled water / cooling tower water / any consistent waste heat.
2. A compressor is then used to increase pressure and raise the temperature of the working fluid to the required condensing temperature.
3. The working fluid enters the high-temperature heat exchanger as a high-temperature vapor. There, it releases the previously absorbed heat to the heat sink by condensation at high pressure, leaving as high-temperature liquid, or hot water.

The heat pump is also known as a heat recovery chiller when waste heat in returned chilled water is used as a source in the heat pump evaporator.

YOUR HEAT PUMP WILL BE A COMPLETE PACKAGE SOLUTION

Your ARMSTRONG+COMBITHERM Heat Pump Package may include the following: heat pump, secondary water heater, mixing station with digital recirculating valve, buffer tank, flow and BTU meters, COP monitoring system, recirculation pump skid, secondary heat exchanger skid, heat pump housing, power and control panel, and more.

COMPRESSOR

- | Semi-hermetic reciprocating compressors or semi-hermetic compact screw compressors as single or tandem version, with stepped or continuously variable power control
- | Semi-hermetic compact screw compressors, stepped or continuously variable capacity control
- | All Compressors with special working fluid oil and comprehensive oil management (oil separator, oil level monitoring, and oil heater), check valve, integrated protection device, shut-off valves, vibration dampers, start unloading

HEAT EXCHANGER

- | Brazed plate and frame heat exchanger for small working fluid filling quantity and low temperature difference for efficient operation
- | Tube and shell heat exchanger for high capacity, multiple working fluid circuits in one device, inspection opening for cleaning

PUMPS

- | Electronic inline pumps with integrated frequency converter, piping and all necessary attachments, including flow monitor, strainer, stop valve, check valve and sensors

EXPANSION VALVE

- | Electromagnetic expansion valve for optimal working fluid injection

CONTROLLER

- | PLC regulation with touch panel for visualization of refrigeration cycle, duty point, limitations of use, temperatures, pressures, and clear text fault messages in case of malfunctions
- | Periphery control
- | Communication protocol and remote control on demand

ELECTRICAL CONTROL CABINET

- | Panels adhere to industrial standards, including, switches, safety components and wiring
- | Touch screen HMI

REFRIGERATION ACCESSORIES

- | Pressure switches
- | Pressure transmitter
- | Freeze control switch
- | Subcooler
- | Refrigeration piping within the unit, including filter dryer, inspection glass, working fluid collector with inspection glass and shut-off valve, working fluid filling

FRAME

- | All units are built on stable profile frame with vibration dampers

ADDITIONAL ACCESSORIES AND ATTACHMENTS

- | Sound-absorbing and weather proofed housing
- | Capacity control by frequency converter
- | Additional compressor cooling
- | Individual coat of lacquer
- | Collection tray
- | COP monitoring system

A COMPREHENSIVE RANGE OF WORKING FLUIDS, TEMPERATURES AND APPLICATIONS

Armstrong has an ongoing commitment to technical and environmental innovation, and to maintaining our proven quality standards throughout product development. As we move forward, widening the performance spectrum for higher media temperatures is an important step, but it presents some challenging requirements. In response, Armstrong offers a wide range of scroll, reciprocating, and screw compressors, embedded with quality components and low GWP working fluids in packaged system solutions.

<h3>R513A</h3> <p>"O" ODP 573 GWP</p> <h3>R450A</h3> <p>"O" ODP 547 GWP</p>	<h3>R515B</h3> <p>"O" ODP 293 GWP</p>	<h3>R245fa</h3> <p>"O" ODP 1030 GWP</p>	<h3>R1234yf</h3> <p>"O" ODP 4 GWP</p>												
<table border="1"> <tr> <th>SOURCE</th> <th>HW TEMP</th> </tr> <tr> <td>5F to 104F -15C to 40C</td> <td>95F to 172F 35C to 78C</td> </tr> </table>	SOURCE	HW TEMP	5F to 104F -15C to 40C	95F to 172F 35C to 78C	<table border="1"> <tr> <th>SOURCE</th> <th>HW TEMP</th> </tr> <tr> <td>18F to 122F -8C to 50C</td> <td>140F to 194F 60C to 90C</td> </tr> </table>	SOURCE	HW TEMP	18F to 122F -8C to 50C	140F to 194F 60C to 90C	<p>RECIPROCATING COMPRESSOR</p>	<table border="1"> <tr> <th>SOURCE</th> <th>HW TEMP</th> </tr> <tr> <td>5F to 104F -15C to 40C</td> <td>95F to 172F 35C to 78C</td> </tr> </table>	SOURCE	HW TEMP	5F to 104F -15C to 40C	95F to 172F 35C to 78C
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<p>SCREW COMPRESSOR</p> <p>154F/68C HW CAPACITY: 80kW to 2500kW SOURCE: 50F/10C to 95F/35C</p> <p>167F/75C HW CAPACITY: 60kW to 400kW SOURCE: 50F/10C</p> <p>172F/78C HW CAPACITY: 85kW to 550kW SOURCE: 68F/20C</p> <p>172F/78C HW CAPACITY: 115kW to 735kW SOURCE: 86F/30C</p> <p>172F/78C HW CAPACITY: 150kW to 980kW SOURCE: 104F/40C</p> <p>RECIPROCATING COMPRESSOR</p> <p>180F/82C HW CAPACITY: 40kW to 600kW SOURCE: 50F/10C to 95F/35C</p>	<p>SCREW COMPRESSOR</p> <p>171F/77C HW CAPACITY: 80kW to 760kW SOURCE: 50F/10C</p> <p>185F/85C HW CAPACITY: 115kW to 960kW SOURCE: 68F/20C</p> <p>194F/90C HW CAPACITY: 140kW to 1200kW SOURCE: 86F/30C</p> <p>194F/90C HW CAPACITY: 180kW to 1600kW SOURCE: 104F/40C</p> <p>194F/90C HW CAPACITY: 240kW to 2100kW SOURCE: 122F/50C</p> <p>RECIPROCATING COMPRESSOR</p> <p>198F/92C HW CAPACITY: 40kW to 560kW SOURCE: 50F/10C to 113F/45C</p>	<p>RECIPROCATING COMPRESSOR</p> <p>208F/98C HW CAPACITY: 40kW to 300kW SOURCE: 77F/25C</p> <p>248F/120C HW CAPACITY: 40kW to 300kW SOURCE: 149F/65C</p>	<p>SCREW COMPRESSOR</p> <p>154F/68C HW CAPACITY: 80kW to 2500kW SOURCE: 50F/10C to 95F/35C</p> <p>167F/75C HW CAPACITY: 60kW to 400kW SOURCE: 50F/10C</p> <p>172F/78C HW CAPACITY: 85kW to 550kW SOURCE: 68F/20C</p> <p>172F/78C HW CAPACITY: 115kW to 735kW SOURCE: 86F/30C</p> <p>172F/78C HW CAPACITY: 150kW to 980kW SOURCE: 104F/40C</p> <p>RECIPROCATING COMPRESSOR</p> <p>180F/82C HW CAPACITY: 40kW to 550kW SOURCE: 50F/10C to 95F/35C</p>												

ARMSTRONG+COMBITHERM's proven R513A / R1234yf / R450A / R134a heat pumps can be employed for a temperature range of up to 180°F (82°C), and we offer a variety of compressors and heat exchanger types that can be adapted to your respective need. In addition, our R1234ze / R515B heat pumps can be employed for a hot water temperature range up to 198°F (92°C). For highest demand up to 248°F (120°C), the working fluids R245fa or R1233zd(E) are suitable solutions which combine low-pressure characteristic, environmentally friendly properties, and valuable thermodynamic capability.

R1234ze		R1233zd	
"O" ODP 7 GWP		"O" ODP 4.5 GWP	
SOURCE	HW TEMP	SOURCE	HW TEMP
18F to 122F -8C to 50C	95F to 194F 35C to 90C	97F to 140F 36C to 60C	176F to 248F 80C to 120C
SCREW COMPRESSOR		SCREW COMPRESSOR	
171F/77C HW CAPACITY: 80kW to 770kW SOURCE: 50F/10C		176F/80C HW CAPACITY: 282kW to 977kW SOURCE: 97F/36C	
185F/85C HW CAPACITY: 120kW to 1000kW SOURCE: 68F/20C		212F/100C HW CAPACITY: 277kW to 957kW SOURCE: 97F/36C	
194F/90C HW CAPACITY: 150kW to 1250kW SOURCE: 86F/30C		248F/120C HW CAPACITY: 277kW to 954kW SOURCE: 97F/36C	
194F/90C HW CAPACITY: 180kW to 1600kW SOURCE: 104F/40C		176F/80C HW CAPACITY: 422kW to 1469kW SOURCE: 122F/50C	
194F/90C HW CAPACITY: 240kW to 2100kW SOURCE: 122F/50C		212F/100C HW CAPACITY: 402kW to 1398kW SOURCE: 122F/50C	
RECIPROCATING COMPRESSOR		248F/120C HW CAPACITY: 384kW to 1335kW SOURCE: 122F/50C	
198F/92C HW CAPACITY: 40kW to 560kW SOURCE: 50F/10C to 113F/45C		176F/80C HW CAPACITY: 551kW to 1918kW SOURCE: 140F/60C	
		212F/100C HW CAPACITY: 516kW to 1802kW SOURCE: 140F/60C	
		248F/120C HW CAPACITY: 478kW to 1669kW SOURCE: 140F/60C	

A SUPERIOR PERFORMANCE IN EVERY APPLICATION

Our custom-engineered Heat Pump Packages include rugged, dependable components and state-of-the-art technologies to deliver single- or multiple-circuit versions across the entire performance spectrum. ARMSTRONG+COMBITHERM systems are available for plants equipped with one screw or piston compressor for small capacity, such as in the commercial sector, as well as up to three screw compressors appointed for large industrial processes. For high temperature differences between heat sink and heat source, multi-stage systems provide an exceptional solution.





CONTACT YOUR ARMSTRONG REPRESENTATIVE

If you're interested in learning more about
ARMSTRONG+COMBITHERM Heat Pump Systems and our
solutions for Circular ThermalSM, contact us for details.

To get more information or to find your representative, visit
armstronginternational.com



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