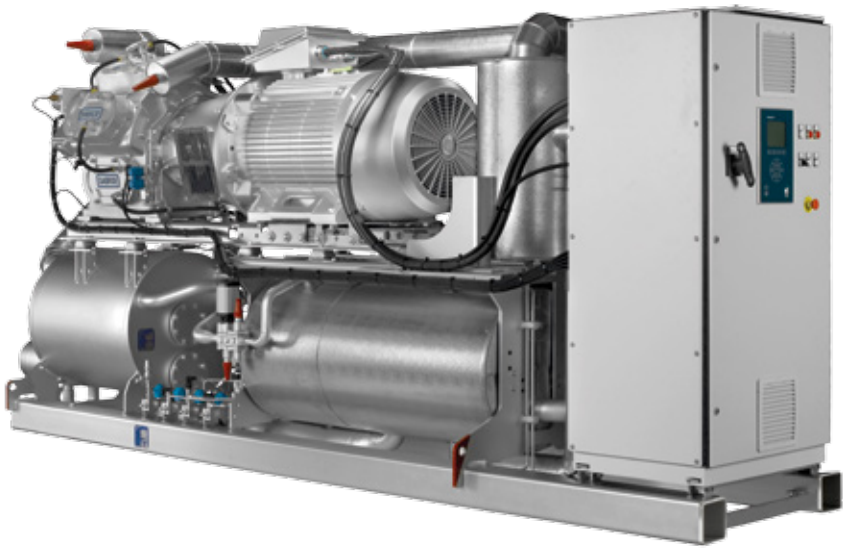
# **SABROE HeatPAC** heat pumps

## Ammonia-based heat pumps using a reciprocating compressor, with a 300–2000 kW capacity range

HeatPAC units are extremely compact heat pumps based on ultra-reliable SABROE HPO/HPC high-pressure reciprocating compressors, using ammonia as refrigerant. They are usually most cost-effective when fitted with a variable-speed drive (VSD) that makes it easy to deal with changing circumstances and different operating requirements. These highly customisable integrated units are based on a unique vibration-resistant design, featuring an uncomplicated flooded evaporating system. They provide exceptional heat pump capacity from the smallest possible footprint, and with only a very small refrigerant charge.

SABROE HeatPAC heat pumps are the ideal solution for effectively exploiting low-temperature waste heat, and turning it into hot water (up to 75°C), using only a minimum of electrical energy. These units are designed to provide a cost-effective way to tackle needs for cooling and heating at the same time, providing an extremely high coefficient of performance (COP).



HeatPAC 108 with panel-mounted Unisab III systems controller

### Range

There are 7 standard models in this range of heat pump systems, with capacities ranging from 310 kW to 2075 kW.

| | Advantages | Benefits |
|---|---|---|
| | Factory-assembled, pre-tested packaged units based on SABROE reciprocating compressors world-renowned for their reliability | Easy pre-commissioning makes installation and running-in both faster and cheaper |
| | Integrated configuration weighs less, and has less than half the footprint of bespoke heat pump designs | Low installation costs. Easy to mount even in confined spaces or unconventional locations |
| | Indirect cooling and an uncomplicated flooded evaporating system, using natural ammonia (R717) only | Greater safety and outstanding reliability |
| | Exceptional COP and outstanding part-load performance | Low operating costs |
| | Refrigerant charge 50% smaller than with conventional heat pumps, because of special condenser/evaporator design | Higher output per unit kW/kg refrigerant, lower unit cost and lower installation costs |

### Options

- Cascade evaporator
- Variable-speed drive (VSD)
- Soft-starter or Y/D starter
- Desuperheater
- Subcooler
- Control panel mounted separately
- Factory acceptance test (FAT), customer-witnessed.

## Compliance

All HeatPAC heat pumps are fully compliant with appropriate major international design codes and the specifications laid down by the most common classification societies.
Approval in accordance with other technical requirements, specific national legislation or other classification societies' requirements is available on request.


Unisab control for heat pump application



**Condenser water inlet +60°C, outlet +70°C**
**Evaporator water inlet +39°C, outlet +34°C**

| Type | Heating capacity kW | Cooling capacity kW | Line power consumption kW | COP line heat | R717 charge kg | Dry weight kg | Unit dimensions in mm L | W | H | Sound level dB(A) |
|---|---|---|---|---|---|---|---|---|---|---|
| HeatPAC 24-W | 310 | 263 | 50 | 6.1 | 29 | 2020 | 2800 | 1000 | 2000 | 75 |
| HeatPAC 26-W | 465 | 395 | 76 | 6.1 | 38 | 2230 | 2850 | 1000 | 2000 | 76 |
| HeatPAC 28-W | 620 | 527 | 101 | 6.1 | 48 | 2420 | 2900 | 1000 | 2000 | 77 |
| HeatPAC 104-W | 731 | 618 | 120 | 6.1 | 55 | 2630 | 3050 | 1000 | 2000 | 81 |
| HeatPAC 106-W | 1081 | 911 | 180 | 6.0 | 74 | 3300 | 3750 | 1000 | 2000 | 82 |
| HeatPAC 108-W | 1441 | 1216 | 239 | 6.0 | 87 | 3950 | 4050 | 1000 | 2000 | 83 |
| HeatPAC 112-W | 2075 | 1735 | 345 | 6.0 | 110 | 5270 | 5050 | 1000 | 2100 | 85 |

W = Heat pump unit water/water.
All data and nominal capacities kW at 1800 rpm.
All HeatPACs: 60 Hz or VSD operation possible.

Sound pressure levels in free field, over reflecting plane and one metre distance from the unit.

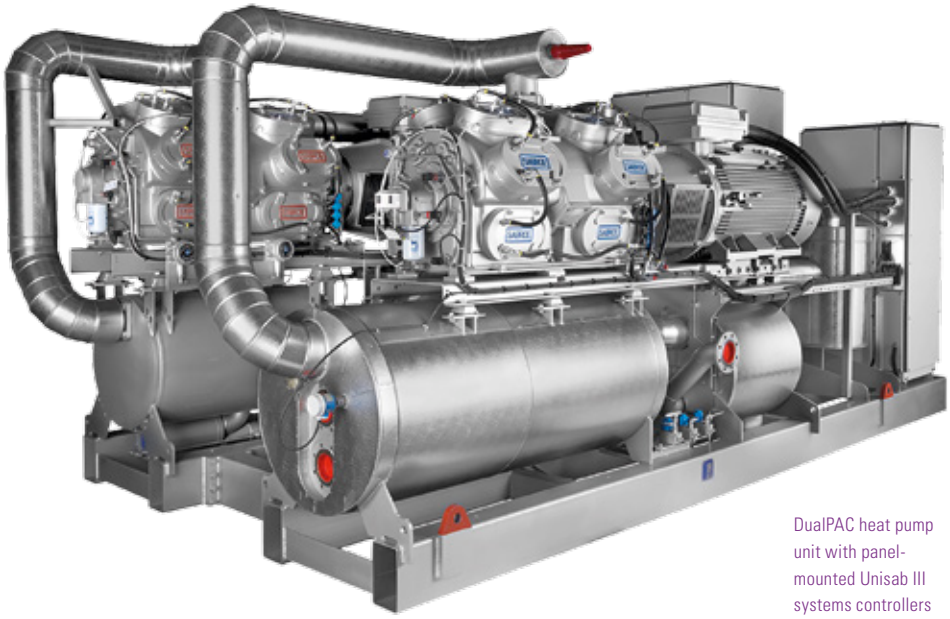
# **SABROE DualPAC** heat pumps

Two-stage ammonia-based heat pumps with capacities of up to 2500 kW

SABROE DualPAC heat pumps combine ChillPAC, HeatPAC and HeatPAC HPX units into one single heat pump, using an ingenious modular system that makes it possible to achieve high temperature lifts, with the advantages of compact design and attractive operating economics.

The DualPAC is a two-stage high-temperature heat pump configuration that uses ammonia as refrigerant, and is designed with the sole aim of best possible performance and versatile operating conditions along with the same practical benefits – including small refrigerant charges and limited footprint – as any other SABROE heat pump. This unique setup ensures maximum flexibility in both configuration and capabilities, because all standard ChillPAC and HeatPAC models can be used.

The setup is possible due to a purpose-designed open inter-stage cooler that operates with a minimal refrigerant charge.



DualPAC heat pump unit with panel-mounted Unisab III systems controllers

| Advantages | Benefits |
|---|---|
| Stepless, skip-free capacity control ensures that output always matches requirements | Lowest possible operating costs and maximum return on investment |
| Consistently high performance at both full and part load | Maximum part-load efficiency and low life cycle costs |
| Unique two-stage solution featuring patented technology | Makes it possible to deal with multiple sets of running conditions |
| Space-saving footprint, with fewer moving parts and very low vibration | Exceptional reliability and low maintenance costs |
| Supports Condition Based Service (CBS) schedules | Optimised service/maintenance intervals, with a minimum of unscheduled downtime |

The DualPAC benefits from all of the advantages of the ChillPAC and HeatPAC product ranges, based on patented SABROE evaporator and condenser designs along with the most extensive range of reciprocating compressors available anywhere in the world, and featuring configurations with HPO/HPC or HPX compressors as the high stage and SMC compressors on the low stage.

Within the extensive portfolio of SABROE heat pumps, these dual versions are ideal wherever there is a need for big temperature lifts along with good performance in order to make the installation financially advantageous.

The DualPAC configuration is optimised for use in district heating and ground-source cooling, so that thermal energy can be put to the most cost-effective use. The water circuit on the hot side consists of a series of heat exchangers built into one single vessel that extracts the heat from de-superheating, condensing and subcooling processes. In many cases even de-superheating at the low stage is profitable, and serves to increase performance still further.



**Condenser: water inlet: 50 °C, outlet 70 °C**
**Evaporator: water inlet 30 °C, outlet 20 °C**

| Type | Heating capacity kW | Cooling capacity kW | Power consumption kW (shaft) | COP heat (shaft) | R717 charge | Dry weight kg (approx.) | Unit dimensions in mm (approx.) | | | Sound level dB(A) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | L | W | H | |
| DualPAC 24-W | 387 | 312 | 75 | 5.1 | 35 | 4020 | 2900 | 3000 | 2000 | 82 |
| DualPAC 26-W | 581 | 455 | 115 | 5.0 | 40 | 4460 | 2900 | 3000 | 2000 | 83 |
| DualPAC 28-W | 775 | 619 | 155 | 4.9 | 45 | 4840 | 2900 | 3000 | 2000 | 84 |
| DualPAC 104-W | 935 | 745 | 189 | 4.9 | 65 | 5500 | 4500 | 3000 | 2000 | 84 |
| DualPAC 106-W | 1388 | 1109 | 282 | 4.9 | 70 | 6700 | 5000 | 3000 | 2000 | 85 |
| DualPAC 108-W | 1850 | 1471 | 379 | 4.8 | 95 | 7890 | 6000 | 3000 | 2200 | 86 |
| DualPAC 112-W | 2777 | 2190 | 584 | 4.7 | 115 | 10450 | 7500 | 3000 | 2200 | 86 |
| DualPAC 704-W | 435 | 348 | 86 | 5.0 | 40 | 6500 | 3500 | 3000 | 2100 | 86 |
| DualPAC 706-W | 652 | 520 | 132 | 4.9 | 45 | 7900 | 3700 | 3000 | 2100 | 86 |
| DualPAC 708-W | 870 | 690 | 180 | 4.8 | 55 | 10000 | 4100 | 3000 | 2100 | 87 |
| DualPAC 712-W | 1305 | 1025 | 280 | 4.6 | 75 | 13500 | 5000 | 3000 | 2100 | 88 |
| DualPAC 716-W | 1740 | 1365 | 375 | 3.6 | 115 | 16500 | 6000 | 3000 | 2100 | 89 |

**Condenser: water inlet: 70 °C, outlet 90 °C**
**Evaporator: water inlet 15 °C, outlet 5 °C**

| Type | Heating capacity kW | Cooling capacity kW | Power consumption kW (shaft) | COP heat (shaft) | R717 charge | Dry weight kg | Unit dimensions in mm (approx.) | | | Sound level dB(A) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | L | W | H | |
| DualPAC 704-W | 444 | 308 | 140 | 3.1 | 40 | 6500 | 3500 | 3000 | 2100 | 86 |
| DualPAC 706-W | 666 | 460 | 212 | 3.3 | 45 | 7900 | 3700 | 3000 | 2100 | 86 |
| DualPAC 708-W | 888 | 610 | 287 | 3.0 | 55 | 10000 | 4100 | 3000 | 2100 | 87 |
| DualPAC 712-W | 1332 | 907 | 441 | 3.0 | 75 | 13500 | 5000 | 3000 | 2100 | 88 |
| DualPAC 716-W | 1775 | 1205 | 595 | 2.9 | 115 | 16500 | 6000 | 3000 | 2100 | 89 |

Please contact your SABROE representative for availability.

# SABROE HeatPAC HPX heat pumps

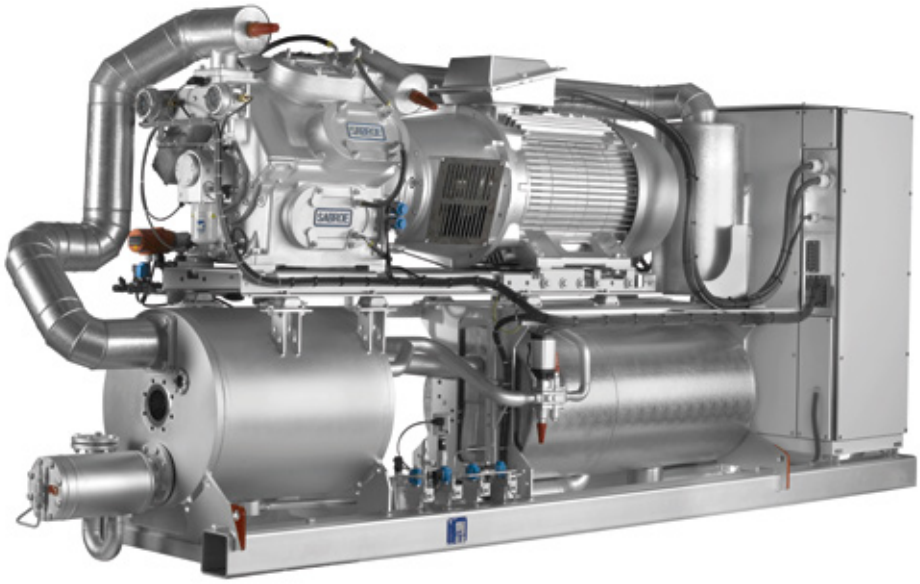
## Single-stage high-pressure ammonia-based heat pumps, using a reciprocating compressor, with a 326–1300 kW capacity range

SABROE HeatPAC HPX heat pumps are compact units with an integrated single-stage configuration that features less than half the space and weight requirements of any other heat pump designs usually needed to achieve 90°C hot water outputs.

These energy-efficient units feature a breakthrough HPX hybrid compressor design that allows differential pressures as high as 40 bar and discharge pressures as high as 60 bar, combined with space-saving evaporator technology from the ChillPAC packaged ammonia chiller.

HeatPAC HPX heat pumps make it easy to produce hot water at temperatures up to 90°C, using any suitable source of low-temperature heat, with only tiny energy inputs needed.

They provide a low-cost supply of hot water at temperatures ideal for sterilisation and pasteurisation – as well as many other hygiene-sensitive functions and processes.



HeatPAC HPX with panel-mounted Unisab III systems controller

| Advantages | Benefits |
|---|---|
| Factory-assembled, pre-commissioned units based on ultra-reliable SABROE reciprocating compressors | Easy, rapid commissioning saves time money and manpower, and minimises disruption |
| Compact single-stage configuration weighs less and takes up less space than bespoke and/or two-stage heat pump designs | Easy to mount or retrofit, even in confined spaces or unconventional locations |
| Exceptional Coefficient of Performance (COP) in high-temperature single-stage configuration | High energy-efficiency, low operating costs |
| Variable-speed drive (VSD) and Unisab III compressor package controller as standard | Outstanding part-load performance and maximum operating flexibility |
| Service and maintenance based on Load Based Service (LBS) schedules | Improved reliability, longer service intervals, minimal downtime, low cost of ownership |

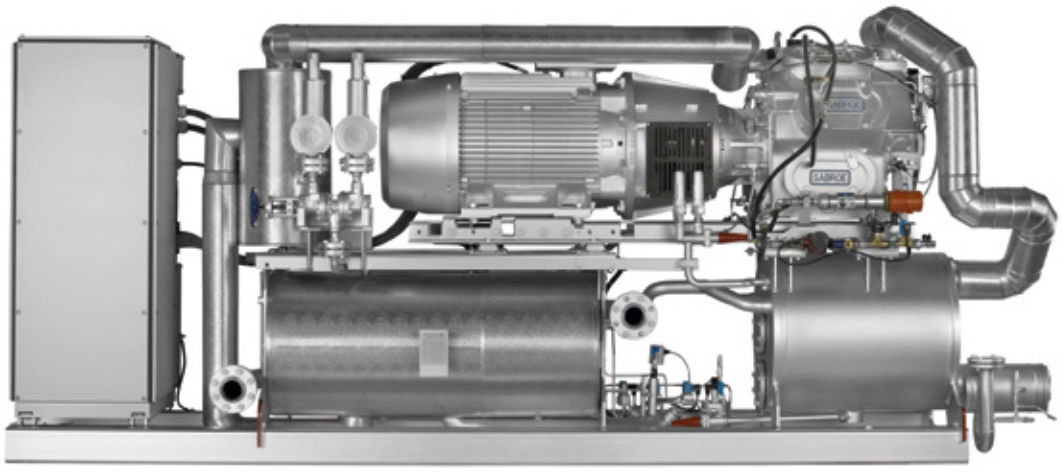
### Options

- Cascade evaporator
- Subcooler
- Control panel mounted separately
- Factory acceptance test (FAT), customer-witnessed.

## Compliance

HeatPAC HPX heat pumps are fully compliant with appropriate major international design codes and the specifications laid down by the most common classification societies.

Approval in accordance with other technical requirements, specific national legislation or other classification societies' requirements is available on request.



HeatPAC HPX with panel-mounted Unisab III systems controller



**Condenser water inlet +70°C, outlet +90°C**
**Evaporator water inlet +39°C, outlet +34°C**

| Type | Heating capacity kW | Cooling capacity kW | E-motor kW | COP line heat | R717 charge kg | Dry weight kg | Unit dimensions in mm L | W | H | Sound level dB(A) |
|---|---|---|---|---|---|---|---|---|---|---|
| HeatPAC 704-W | 338.7 | 266.7 | 91 | 4.2 | 19 | 3500 | 3500 | 1000 | 2100 | 83 |
| HeatPAC 706-W | 508.1 | 400.2 | 136 | 4.2 | 29 | 4200 | 3700 | 1000 | 2100 | 85 |
| HeatPAC 708-W | 677.5 | 533.6 | 200 | 4.2 | 35 | 5000 | 4100 | 1000 | 2100 | 86 |
| HeatPAC 712-W | 1016 | 800.6 | 303 | 4.2 | 55 | 6250 | 4700 | 1000 | 2100 | 87 |
| HeatPAC 716-W | 1355 | 1067 | 345 | 4.2 | 75 | 7000 | 6000 | 1000 | 2100 | 88 |

W = Heat pump unit water/water.
Capacities are nominal at 1800 rpm.
VSD drive is standard.

Sound pressure levels in free field, over reflecting plane and one metre distance from the unit.

# **SABROE** heat pumps

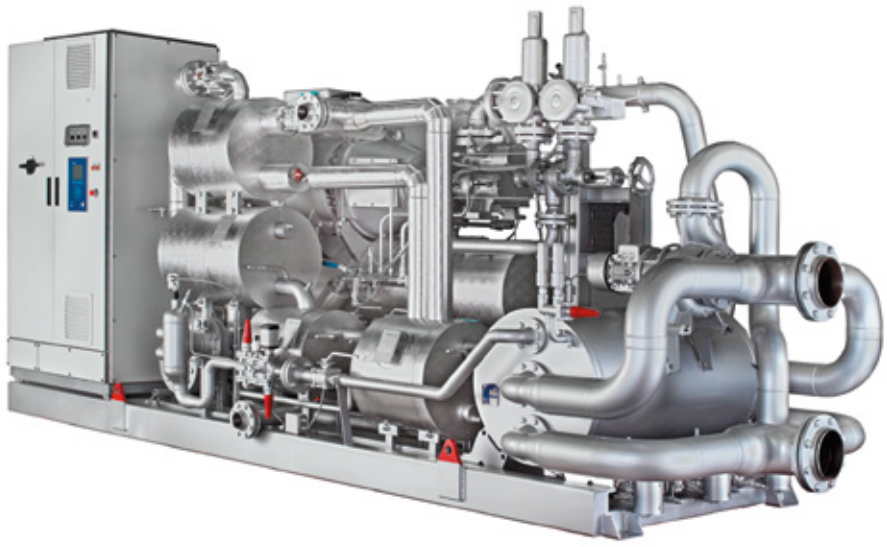
## Ammonia-based heat pumps using a screw compressor, with a capacity of up to 1800 kW

SABROE heat pumps are extremely compact units based on ultra-reliable SABROE high-pressure screw compressors, using ammonia as refrigerant.

These highly customisable integrated units, featuring an uncomplicated flooded evaporating system, provide exceptional heat pump capacity from the smallest possible footprint, and with only a very small refrigerant charge. They are designed to provide a cost-effective way to tackle needs for cooling and heating at the same time, providing an extremely high coefficient of performance (COP).

SABROE heat pumps are the ideal solution for effectively exploiting low-temperature waste heat, and turning it into hot water (up to 90°C), using only a minimum of electrical energy.

SABROE heat pumps provide considerable scope for customisation to meet specific customer requirements.



Heat pump with panel-mounted Unisab III systems controller

| Advantages | Benefits |
|---|---|
| Factory-assembled, pre-tested packaged units based on SABROE screw compressors world-renowned for their reliability | Easy pre-commissioning makes installation and running-in both faster and cheaper. Factory acceptance test (FAT) available as an option |
| Integrated configuration weighs less, and has less than half the footprint of bespoke heat pump designs | Low installation costs<br>Easy to mount even in confined spaces or unconventional locations |
| Indirect cooling and an uncomplicated flooded evaporating system, using natural ammonia (R717) only | Greater safety and outstanding reliability |
| Exceptional COP and outstanding part-load performance | Low operating costs |
| Refrigerant charge 50% smaller than with conventional heat pumps, because of special condenser/ evaporator design | Higher output per unit kW/kg refrigerant, lower unit cost and lower installation costs |

### Options

- Cascade evaporator
- Control panel mounted separately
- Factory acceptance test (FAT), customer-witnessed.

## Compliance

All SABROE heat pumps are fully compliant with appropriate major international design codes and the specifications laid down by the most common classification societies.
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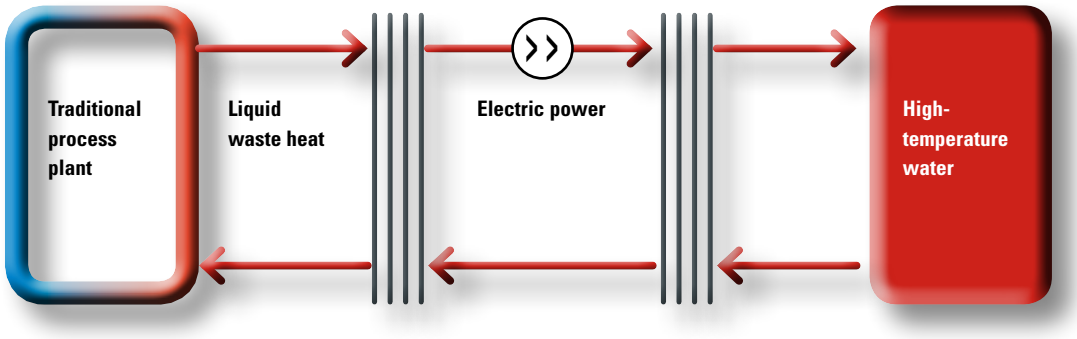
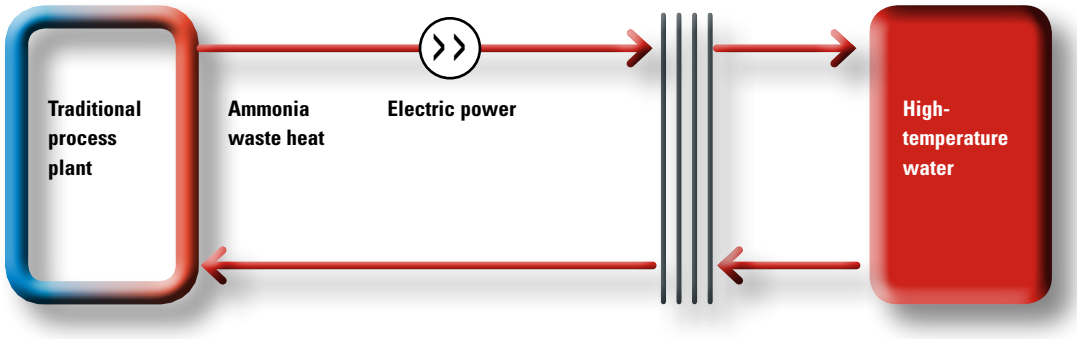
Water/water condenser heat recovery (cascade type)




Ammonia/water condenser heat recovery (supercharge type)




A SABROE heat pump can cope with a wide range of operating conditions. These units are particularly efficient under part-load conditions due to the variable speed drive (1000–6000 rpm) fitted as standard.

Each unit is specially configured to comply with the specific set of operating conditions, in order to ensure the most effective exploitation of the waste heat available.

**Heat pumps**

| Cold side | | | | | Hot side | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature in °C | Temperature out °C | Flow m³/h | Cooling capacity kW | | Temperature in °C | Temperature out °C | Flow m³/h | Heating capacity kW | Power motor kW | COP |
| Water | 40 | 35.9 | 300 | 1422 | Water | 40 | 85 | 34.8 | 1792 | 407 | 4.4 |
| Water | 30 | 26.8 | 300 | 1107 | Water | 40 | 85 | 28.2 | 1453 | 381 | 3.8 |
| Water | 20 | 17.6 | 300 | 818 | Water | 40 | 85 | 22.0 | 1121 | 335 | 3.3 |
| Water | 10 | 8.3 | 300 | 588 | Water | 40 | 85 | 16.5 | 852 | 290 | 2.9 |

Capacities are nominal at 6000 rpm. Specific capacity must be calculated for actual running conditions. Available on request.

All information is subject to change without notice