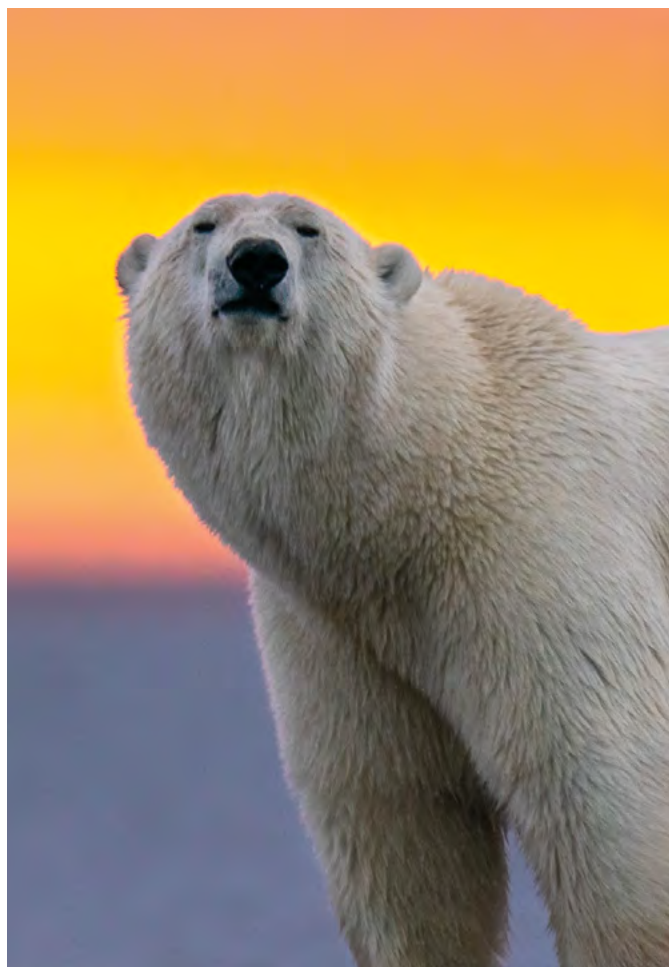




# Sabroe® products 2024/25



Sabroe® - creating customer confidence

The power behind **your mission**





A full-page photograph of a birch forest. The trees have characteristic white bark with dark, horizontal lenticels and vertical scar marks. The ground is covered in lush green grass and undergrowth. Sunlight filters through the canopy, creating a warm, golden glow and lens flare effects. A semi-transparent grey rectangular box is positioned in the upper left quadrant, containing white text.

Sabroe® products  
– smart, safe  
and sustainable





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# Sabroe – creating customer confidence for a better world

Our customers are our community. We work every day to keep their trust and support their environments so they succeed. Our rigorous engineering and testing enables consistently safe, reliable, and high-performing solutions. When our customers are confident, we are successful.

With a long history of product innovation, we always move forward with a focus on leading our customers to greener, safer, and more profitable solutions. We deliver the “heart” of our customers’ processes and we take our role seriously – from the support of the world’s healthy food supply to the energy that fuels our world.

We drive positive changes in the industries we serve as the world champions in green cooling and heating solutions, offering supreme flexibility and relentless quality.

## Part of Johnson Controls

The Sabroe product brand is owned by Johnson Controls, a pure-play buildings leader serving customers in more than 150 countries.

This means we can provide Sabroe customers with a comprehensive range of products, systems, and services for meeting heating, ventilating, air conditioning, and refrigeration needs in industrial, commercial, and residential buildings of all kinds.

Sabroe is a registered trademark of Johnson Controls in the EU, the United States of America and other countries.

Other trademarks:  
ChillPAC, UniSAB.



**SabroeSalesTools**



**SabroeRecip**



**SabroeScrew**



**SabroeChill**



**SabroeFreeze**



**SabroeHeat**



**SabroeControl**



**SabroeHex**



**SabroeVessel**



**SabroeCustom**



# More than 125 years of new ideas and better technology

We've proved we can repeatedly and consistently meet our customers' needs – regardless of size and complexity.

We listen to where your real difficulties lie and what you really want to achieve. With more than 125 years of specialised knowledge and experience, we can be trusted to help you achieve it all.



**SABROE**



- 2024 HitemHP
- 2024 UniSAB 4
- 2023 HyePAC
- 2023 HicaHP
- 2023 COMP2
- 2022 ChillPAC Air
- 2022 Chiller and Heat Pump Plant Control (CHPPC)
- 2022 Heat exchangers and vessels
- 2021 Heat pump 273, 63 bar
  
- 2020 SAB 193 & 233 40 bar
- 2019 TSMC, HPC Mk 5
- 2018 SMC Mk 5
- 2018 HPC 112-116
- 2017 DualPAC
- 2017 NS heat pump 40 bar
- 2017 Chiller Plant Controller (CPC)
- 2016 ComPAC
- 2015 HeatPAC HPX
- 2015 ChillPAC Mk 3
- 2013 SABflex
- 2011 SABlight
- 2011 iRIS
  
- 2010 HeatPAC
- 2007 UniSAB III
- 2006 SABcube
- 2006 CAFB
- 2005 SABscrew redesign
- 2004 ChillPAC
- 2002 Variable-speed drive
  
- 1995 Unisab II
- 1995 PAC
- 1994 SAB 202
- 1991 SAB 110
  
- 1989 Unisab I
- 1989 HPO, HPC
- 1988 Prosab II
- 1985 µProsab
- 1985 SAB 163
- 1982 SAB 128
  
- 1967 First heat pump
- 1965 CMO
  
- 1955 SMC
  
- 1929 SA
  
- 1897 First CO<sub>2</sub> compressor
- 1897 Introduction of natural refrigerants
- 1897 Sabroe founded



# Sustainability is at the heart of our business and fundamental to everything that we do

## United Nations Sustainable Development Goals

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries – developed and developing – in a global partnership.


Johnson Controls supports the goals adopted by the United Nations to end poverty, protect the planet and ensure prosperity for all. We promote sustainability through the way we do business, the solutions we provide and our engagement in society.

## Accelerating our mission for a healthy, sustainable planet

As the global leader for smart, healthy and sustainable infrastructures, Johnson Controls has set new ambitious environmental, social and governance (ESG) commitments, science-based targets as well as a net zero carbon pledge. From the way we run our manufacturing plants to the work we do with our customers, we are constantly looking for new and innovative ways to ensure a more sustainable future for our planet.





 **Double**  
customers' annual avoided emissions by 2030 through Johnson Controls OpenBlue digitally-enabled products and services

**Link**   
executive compensation to sustainability and diversity goals to drive leadership accountability

Since **2002**   
history of transparency sustainability data publicly reported

 **75%**  
Direct R&D investment on new product development to sustainable solutions

**net zero**   
Achieve carbon emissions before 2040

 **Maintain a Board**  
diverse in gender, ethnicity, citizenship and skills

**Use 100%**   
renewable energy by 2040

Launch an initiative focused on underserved markets and increase spend with **women- and minority-owned businesses**

**Elevate sustainability** as a key performance metric for preferred suppliers and create a supplier sustainability council; provide training to help suppliers cut their emissions



**Double**  
the representation of **women leaders** globally and minority leaders in the United States within five years

 **Sustainability oversight**  
elevated to Board of Directors (Governance and Sustainability Committee)

 **Set 2030 science-based targets**  
consistent with the most ambitious 1.5°C IPCC scenario

 Launch an initiative **to educate**  
educate the next generation of diverse sustainable building industry leaders; partnering with HBCUs

 Non-financial reporting align with recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD)





# Achieve your green commitments with Sabroe solutions

Sabroe refrigeration and heating systems – such as chillers, heat pumps and other customised products – put companies in a better position to achieve their green commitments to the coming generations.

With Sabroe systems using natural refrigerants like ammonia and carbon dioxide, our industrial cooling and heating customers will obtain energy savings with the most energy-efficient products designed for virtually all types of industrial applications and projects.

**We want to make a difference for our planet making sure that you as our customer can live up to your climate goals.**

- The ISO 14001 certification helps us obeying to the environmental laws and showing our engagement as well as focusing on becoming continuously more efficient thereby saving resources

**By being ISO 14001 certified, we**

- help create a greener future in a more sustainable world
- minimise the environmental impact, taking active steps to reduce our footprint on earth
- strengthen our environmental actions, by focusing on improving our environmental performance





## Applied technology, shared benefits

We can supply the technology to help you make amazing things happen – good for the climate, good for business. Opting for heating or cooling solutions supplied by Sabroe means you and your company are part of the push to tackle climate change in all the many ways laid down in the SDGs.

Get in touch with our experts if you'd like help to roll back the environmental impacts of your heating or cooling setups.

## The power of example

A few examples of groundbreaking low-impact heating/cooling solutions based on Sabroe technology and know-how:

- The new Sabroe HicaHP heat pump family features an industry-first, high-capacity screw compressor, delivering up to 95°C in high-pressure heat pump applications. This technology enables several sectors and industries to move away from fossil fuels towards electrification and renewable energy
- Sabroe DualPAC and HeatPAC heat pumps reclaim waste heat, extract valuable thermal energy, and roll back CO<sub>2</sub> emissions by combining compressor and heat-exchanger technologies with patented Sabroe evaporator and condenser designs
- Sabroe ChillPAC refrigeration plants deliver 1,400 kW of cooling effect using only 55 kg of ammonia refrigerant. This is a significantly lower charge than any other chiller in the market

### Nothing ends up in landfill

The Sabroe Factory has achieved Johnson Controls "Zero Landfill" status.

The Johnson Controls Total Waste Management Program ensures the waste streams from all our activities are treated, reduced, and/or recycled – so nothing ends up in landfills. We want to prevent leaving behind problems for the generations to come.



# Sabroe products – engineered to perfection



## The equipment you need – now and in the future

We provide the equipment you need to put thermal transfers to work in industrial and commercial installations – from a full spectrum of refrigeration compressors of all kinds to industrial chillers and heat pumps.

Sabroe systems are designed to be versatile and future compatible, making it easy for you to repurpose, retrofit, expand, and upgrade your installations and your thermal management capabilities whenever the need arises.

## Documented capabilities and performance

When you sign up for Sabroe solutions and equipment, we make sure you know exactly what you're getting. You don't just get

average performance figures – you get exact, documented capabilities for your particular setup, as tested at the state-of-the-art Sabroe test centre in Denmark, prior to delivery.

## Full satisfaction – no surprises

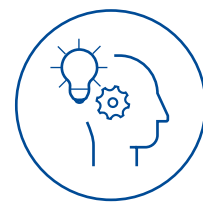
We're committed to full transparency and to helping our customers as much as possible. That's why we use the same data and documentation in all subsequent Sabroe calculations concerning your setup.

We document everything and share the results with you and your staff so there are no unwelcome surprises. That means you can put our specialist know-how to the best possible use.





# Knowledge steers you away from risk



## Reap the full potential of your equipment purchases

In the world of industrial refrigeration, the equipment you buy – whether standardised or individually customised – is just part of the overall picture.

You only reap the full potential of your equipment purchases when they are effectively integrated into your existing setup and when all the operating parameters are fine-tuned to ensure maximum cost-effectiveness.

## Prevention is better than cure

With more than a century of heavyweight practical experience in everything even remotely related to industrial refrigeration compressors, Sabroe experts know pretty much all the on-site

pitfalls, glitches, and bottlenecks likely to occur. This means that when you specify Sabroe equipment, you get more than you'd normally expect.

Our unique combination of market-leader expertise and first-mover technology capabilities means that we know how to help prevent difficulties and downtime rather than spending time and money dealing with them once they've cropped up.







## Sabroe Sales Tools – for easy product planning

Your optimum choice for selecting and configuring the best Sabroe products for both industrial cooling and industrial heating

As the market leader within both industrial cooling and industrial heating, Sabroe has a long history of enabling product configuration through our sales tools. For more than 40 years, COMP1 has been an industry-leading tool. Now, with the coming launch of COMP2, we are ready to meet the market demands of the future.

### Sabroe sales tools for easy product planning

With Sabroe sales tools, the well-known COMP1 and, especially, our newly developed COMP2, we are incorporating our 125 years of expert knowledge and experience within industrial refrigeration into a new platform.

A platform that lets you, as a client or contractor, easily configure the Sabroe products to fit your needs and demands for either heating or cooling, while relying on the software to provide the needed expert knowledge.

COMP1 AND COMP2, and EasyParts LCC Tools, cover everything from new product sales to service interval estimations and calculation of the total cost of ownership. It is an extensive portfolio of sales and selection tools dedicated to the configuration and performance evaluation of Sabroe products.

All the tools are continuously updated and part of a feedback loop from our research and development, our end-of-line testing and input from the market. This ensures transparency and ease of use for optimal calculations that enable sustainable long-term solutions for the customer.

### The necessary link for a successful configuration

The Sabroe suite of sales tools creates a link between customer expectations of heating and cooling capacities and the Sabroe product line. The tools provide a complete overview of the portfolio and enable easy and accurate calculations and configuration.

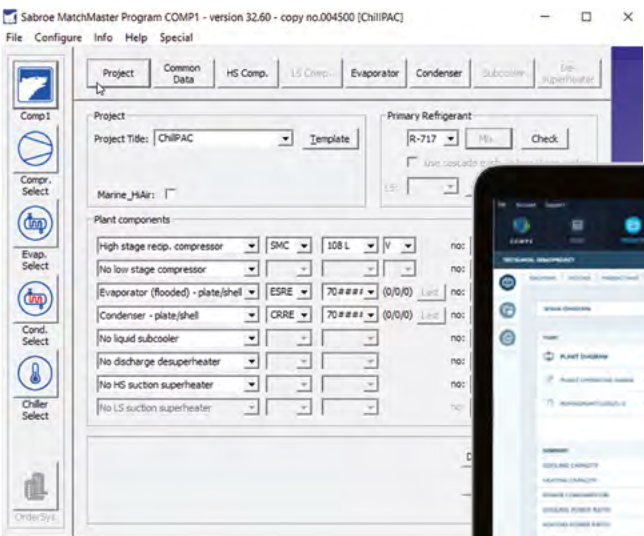
### What to expect

We are constantly adapting and developing our suites and products to meet the market demands of today. Over the next couple of years, our focus will be on transitioning all data to COMP2 to make it the single point of entry for configuration and performance evaluation of all Sabroe products.



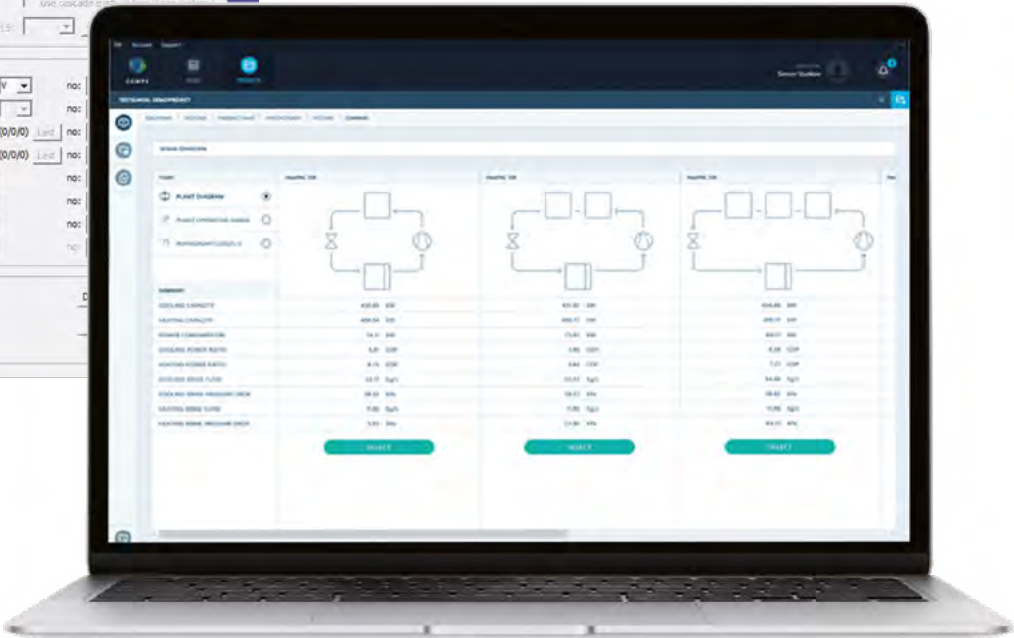
## COMP1 – still going strong

COMP1 continues to be a key pillar when configuring Sabroe products for the industrial cooling and heating markets. The main focus in COMP1 is performance evaluation of predefined products. To ensure support for our legacy products and a smooth transition to the new platform, COMP1 will remain available for the coming years.



## COMP2 – the next generation sales tool

As the demands for a sustainable future increase, with minimised costs and reliable uptime, so do the needs for efficient solutions for specific applications with low total cost of ownership. COMP2 is designed to help our clients face this challenge with a guided product selection tool based on customer demands with less need for expert product knowledge.

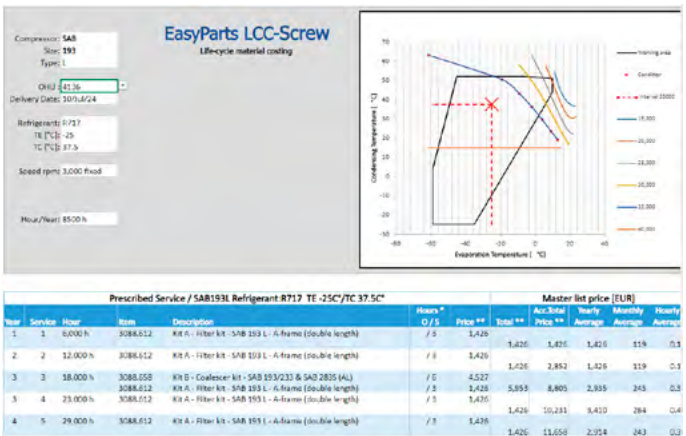


## EasyParts LCC tool

This gives you the full life cycle material cost of your compressor with easy-to-calculate required service intervals and estimated service costs over a decade (minimum) for both the prescribed and extended warranty.

It also provides a complete overview of all the kits and service sets needed to meet the warranty conditions of your compressor.

Available for registered customers via EasyParts on [www.solutionnavigator.com](http://www.solutionnavigator.com)











# Compressors



# World-renowned reciprocating and screw compressors

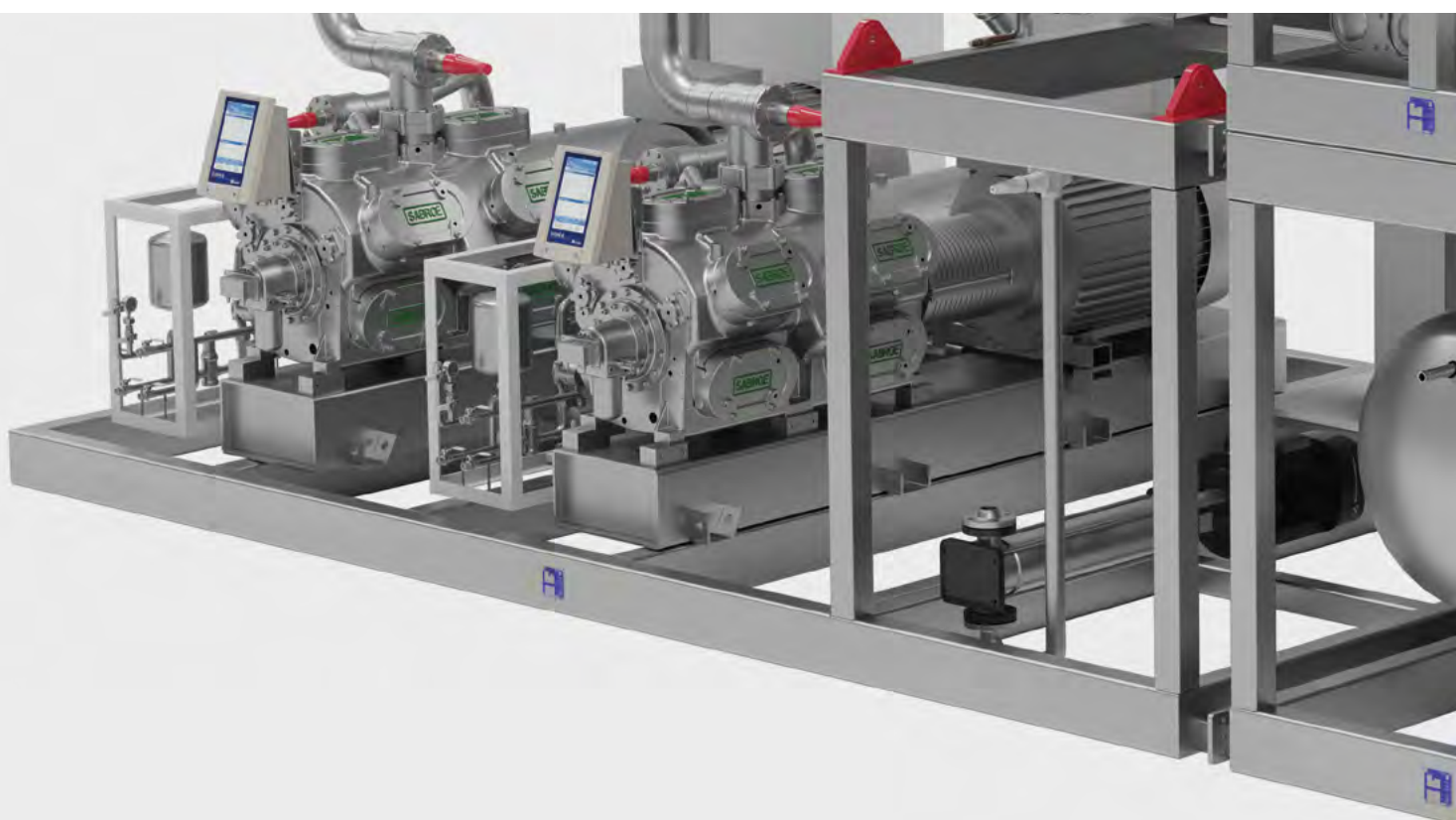
Our compressors are market leading for their efficiency, durability, reliability and safety – even under the most extreme conditions and loads.

## Reciprocating compressors

We manufacture durable reciprocating compressor units for use in refrigeration, air-conditioning and heat-pump operations in the toughest industrial, marine and offshore applications. The reciprocating method is a tried-and-true compressor mechanism, and we've perfected it in our lineup of reliable machines. We have 34 different sizes of single-stage compressors, 13 single-stage sizes for high-pressure applications and six sizes of two-stage compressors for low-temperature applications.

## Screw compressors

Our screw compressors feature highly efficient rotary screw technology and more than 24 standard models and sizes covering capacities from 200 to 8,600 m<sup>3</sup>/h swept volume at 50 Hz. Applicable for industrial refrigeration, process refrigeration, air conditioning or heat pump applications, 8,600 m<sup>3</sup>/h swept volume at 50 Hz.





# What do the Sabroe logos symbolize?



## Blue Sabroe logos

The Sabroe compressor units with their well-known blue logos are configured for use in refrigeration, cooling, and air conditioning.



## Red Sabroe logos

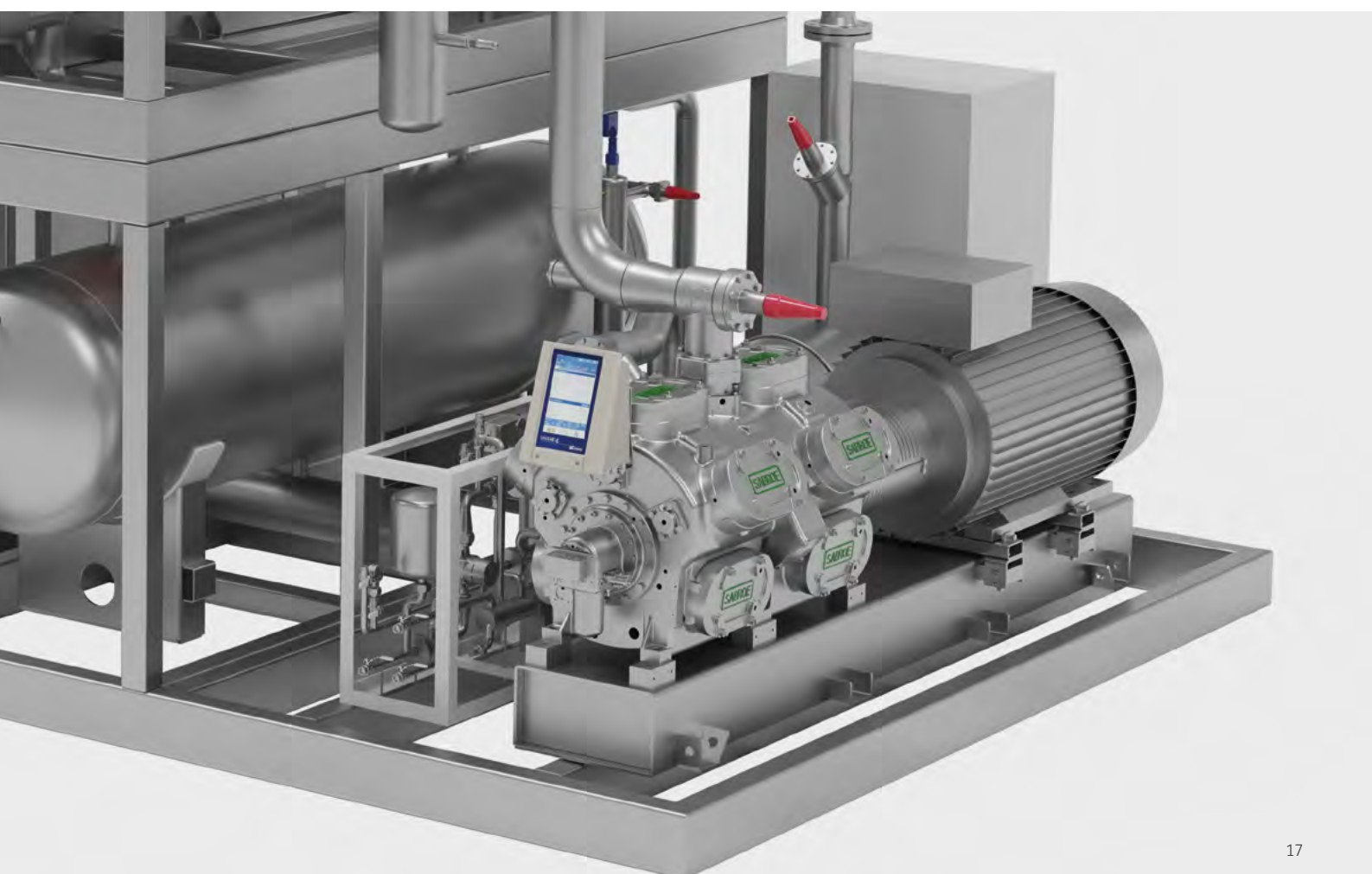
The Sabroe compressors with the red logos are specifically for use in heat pumps and heat recovery setups. These are specially designed to cope with the high pressures normally encountered in such systems. In 2018, we also introduced the red logos on certain compressor top covers.



## Green Sabroe logos

In 2023, a new colour has been launched to the covers of our reciprocating compressors.

The Sabroe compressors with the green logos are for green technology that enable temperatures above 90°C and all the way up to 130°C





# Which compressor should you choose?

Both our screw and reciprocating compressors are viable for use in almost all installations, and both types are often capable of doing the job.

## Variable-speed drive - only using what's needed

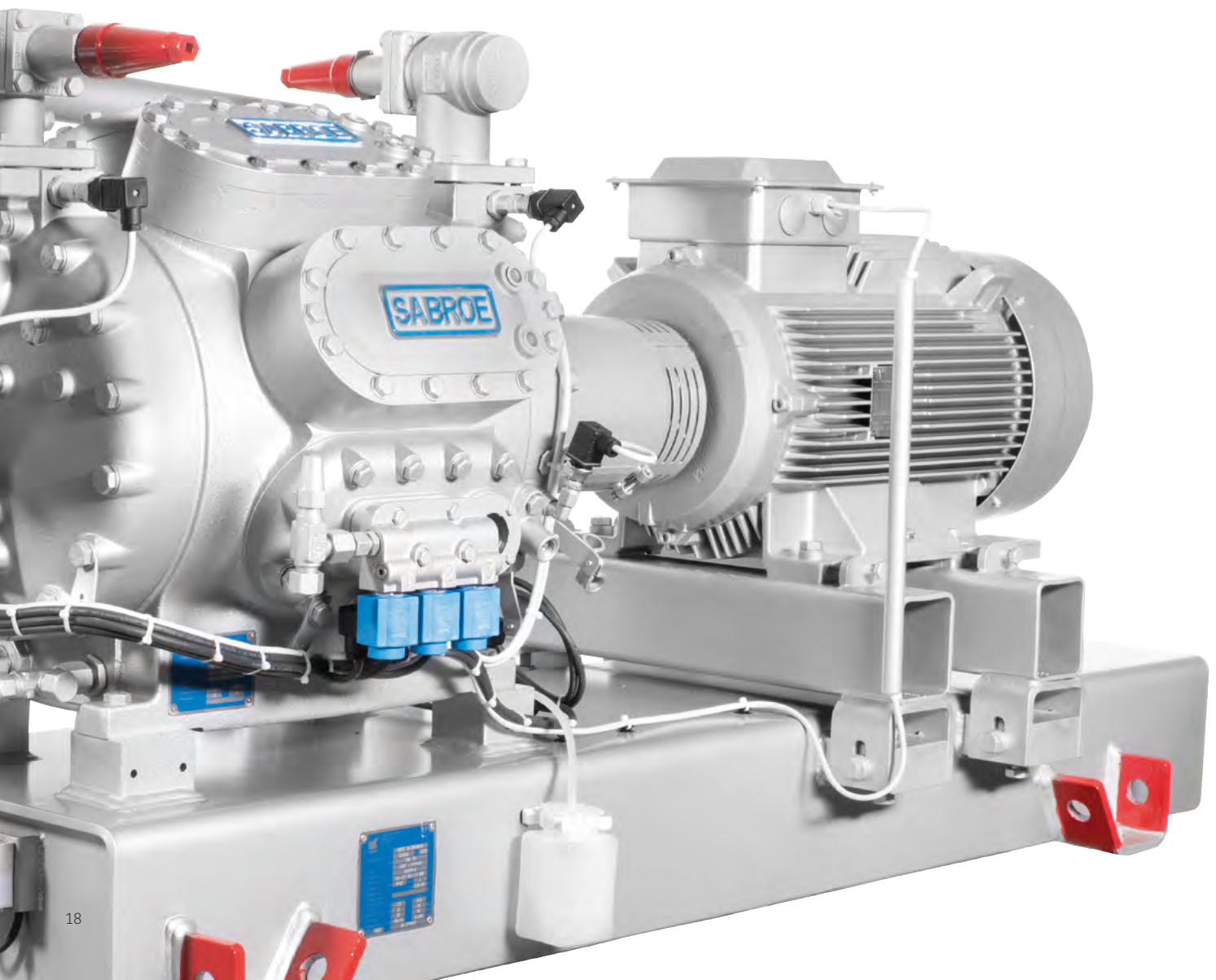
The vast majority of Sabroe compressor models (both reciprocating and screw types) are available with variable-speed drives (VSD) to provide stepless control of your compressor capacity.

Our sole aim is to make sure you get the best out of your particular setup and the best profit margins from your operations. And to do that we can supply state-of-the-art compressors of both types, covering the full scope of normal capacities. This helps you achieve maximum cooling effect using minimum energy, as well as keeping operating costs to an absolute minimum.

The combination of a frequency converter, a VSD motor, and the UniSAB integrated systems controller makes it possible to run the drive motor at speeds that match the load at any given time. This enables you to reduce energy costs by as much as 30% compared with traditional fixed-speed compressors.

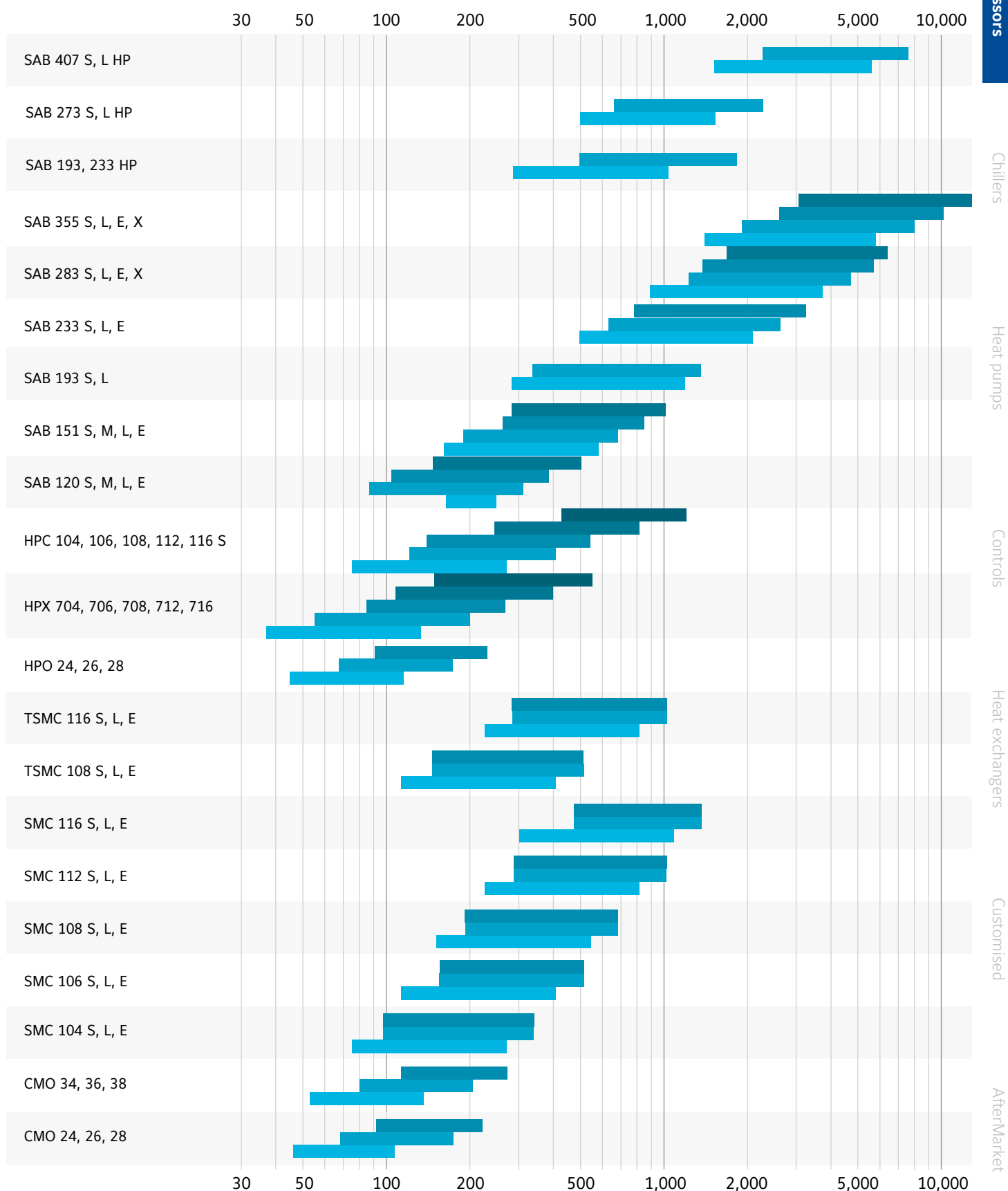
The criteria you have to balance normally includes:

- Required capacity
- Operating conditions
- Available space
- Part-load requirements
- Temperature levels
- Energy consumption
- Choice of refrigerant
- Environmental concerns
- Maintenance issues
- Peak vs average ratio





# Sabroe's compressor programme



Swept volume m³/h at maximum speed  
(reciprocating compressors at 50/60 Hz; screw compressors at 50/60/70/100 Hz).





CMO 28 reciprocating compressor unit with UniSAB systems controller

## Sabroe CMO Reciprocating Compressor Units

Small single-stage compressors with swept volumes of 100–270 m<sup>3</sup>/h

CMO compressor units are small units specially designed for use in smaller-scale refrigeration installations where reliability is a particular concern and uninterrupted service a big priority.

They are an economical, low-maintenance solution for smaller-scale, heavy-duty refrigeration installations, and are most commonly used as standalone units operating at full load, or as small backup compressors.

### Range

Six different models are available to provide swept volumes of between 100 and 270 m<sup>3</sup>/h.

Features	Benefits
High coefficient of performance (COP), with excellent performance, even under part-load conditions	Low power consumption, which greatly reduces operating costs
Special design ensures low noise and vibration	Wider range of possible mounting locations, and minimal expenditure on noise attenuation systems
Variable-speed drive (optional) provides stepless capacity control over the entire operating range	Power consumption and operating costs kept to a minimum
Repairs can be undertaken in situ without removing the compressor	Lower repair costs and less downtime
Easy to access for service, with limited spare parts requirements	Easy, inexpensive maintenance, which helps limit downtime and reduce operating costs



## Technical data

Model	Number of cylinders	Swept volume		Nominal capacities* in kW Single/high stage				Unit dimensions in mm			Weight, excluding motor	Sound pressure level	
		1,500 rpm	1,800 rpm	1,500 rpm		1,800 rpm						1,500 rpm	1,800 rpm
		m³/h	m³/h	-10/+35°C	0/+40°C	-10/+35°C	0/+40°C	L	W	H	kg	db(A)	db(A)
CMO 24	4	97	116	52	80	62	96	2,150-2,400	1,050	1,100	680	69	72
CMO 26	6	146	175	78	120	93	144	2,200-2,400	1,150	1,100	780	71	73
CMO 28	8	194	233	104	160	125	192	2,250-2,400	1,200	1,100	960	72	74
CMO 34	4	114	136	61	94	73	113	2,150-2,400	1,050	1,100	680	70	73
CMO 36	6	170	204	91	141	109	169	2,200-2,400	1,150	1,100	780	72	74
CMO 38	8	227	273	122	187	146	225	2,250-2,400	1,200	1,100	960	73	75

\* Nominal capacities are based on:

1,500 rpm at 50 Hz

1,800 rpm at 60 Hz or VSD

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the compressor block.

Refrigerant: R717

Other refrigerants available on request.

Min./max. speed	R717
CMO 24-26-28	700-1,800 rpm
CMO 34-36-38	700-1,800 rpm

#### For R717

2K liquid subcooling and 0.5K non-usable suction superheat.

Design pressure, HP side: 28 bar

Design pressure, LP side: 21 bar

Differential pressure: 21 bar

## Options

- UniSAB systems controller
- Variable-speed drive line (UniSAB always included)
- Gauges, thermometers and temperature/pressure control switches
- Extended cylinder capacity control
- Oil level regulator (for use in parallel systems)
- ATEX-compliant configuration
- Oil separators with coalescing element
- Special vibration dampening





SMC 116 single-beam reciprocating compressor unit with UniSAB systems controller

## Sabroe SMC Reciprocating Compressor Units

Large single-stage compressors with swept volumes of 200–1,350 m<sup>3</sup>/h

SMC compressor units are ideal for use in medium-sized refrigeration installations where reliable service is a major priority. They are particularly effective under part-load conditions.

Sabroe SMC compressors are world-renowned for their exceptional reliability, making them an economical, low-maintenance solution for heavy-duty refrigeration, using all common refrigerants. Our three-year warranty covers the complete unit, including compressor block, UniSAB, motor and coupling – for all refrigerants.

### Range

Fifteen different models are available to provide swept volumes of between 200 and 1,350 m<sup>3</sup>/h.

Features	Benefits
High coefficient of performance (COP), with excellent performance under part-load conditions	Low power consumption, which greatly reduces operating costs
Variable-speed drive provides stepless capacity control over the entire operating range	Power consumption and operating costs kept to a minimum
Condition-based service intervals embedded in the controls equipment	Minimum downtime and low service costs due to extremely long service intervals
Easy to access for service, with limited spare parts requirements	Easy, inexpensive maintenance, which helps limit downtime and reduce operating costs
Optional special oil separator design based on coalescer technology	Low oil carry-over, which cuts back on oil costs
Configured without oil system	Small footprint and easy service access



## Technical data

Model	Number of cylinders	Swept volume		Nominal capacities * in kW at 1,500 rpm			Nominal capacities * in kW at 1,800 rpm			Unit dimensions in mm			Weight, excluding motor	Sound pressure level	
		1,500 rpm	1,800 rpm	Single/high-stage		Booster	Single/high-stage		Booster					1,500 rpm	1,800 rpm
		m³/h	m³/h	-10/+35°C	0/+40°C	-40/-10°C	-10/+35°C	0/+40°C	-40/-10°C	L	W	H	kg	db(A)	db(A)
SMC 104 S	4	226	271	127	195	35	153	235	42	2,261-2,865	1,213	1,229	1,195	79	82
SMC 104 L	4	283	339	165	250	47	198	300	57	2,261-2,865	1,213	1,229	1,215	80	83
SMC 104 E	4	339	N/A	203	306	58	N/A	N/A	N/A	2,261-2,865	1,213	1,229	1,220	80	83
SMC 106 S	6	339	407	191	293	53	229	352	64	2,286-2,890	1,267	1,247	1,380	81	83
SMC 106 L	6	424	509	247	375	71	297	450	85	2,286-2,890	1,267	1,247	1,400	82	84
SMC 106 E	6	509	N/A	304	459	87	N/A	N/A	N/A	2,286-2,890	1,267	1,247	1,410	82	84
SMC 108 S	8	452	543	255	391	71	306	469	85	2,311-2,915	1,361	1,247	1,595	82	84
SMC 108 L	8	566	679	330	500	94	396	600	113	2,311-2,915	1,361	1,247	1,630	83	85
SMC 108 E	8	679	N/A	406	612	116	N/A	N/A	N/A	2,311-2,915	1,361	1,247	1,650	83	85
SMC 112 S	12	679	814	382	586	106	459	703	127	3,279-3,687	1,475	1,448	2,255	83	85
SMC 112 L	12	848	1,018	495	750	141	593	900	169	3,279-3,687	1,475	1,448	2,280	83	86
SMC 112 E	12	1,018	N/A	609	918	173	N/A	N/A	N/A	3,279-3,687	1,475	1,448	2,330	83	86
SMC 116 S	16	905	1,086	510	782	141	611	938	170	3,329-3,737	1,536	1,445	2,505	84	86
SMC 116 L	16	1,131	1,357	659	1,000	188	791	1200	226	3,329-3,737	1,536	1,445	2,535	84	87
SMC 116 E	16	1,357	N/A	812	1,224	231	N/A	N/A	N/A	3,329-3,737	1,536	1,445	2,590	84	87

\* Nominal capacities are based on:  
1,500 rpm at 50 Hz.  
1,800 rpm at 60 Hz or VSD.

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the compressor block.

Refrigerant: R717

Other refrigerants available on request.

Min./max. speed	R717
SMC S	500-1,800 rpm
SMC L	500-1,800 rpm
SMC E	500-1,500 rpm

## For R717

2K liquid subcooling and 0.5K non-usable suction superheat.

Design pressure, HP side: 28 bar

Design pressure, LP side: 18 bar

Differential pressure: 21 bar

## Options

- UniSAB systems controller
- Variable-speed drive line (UniSAB always included)
- Oil separator for low oil carry-over
- Gauges, thermometers and temperature/pressure control switches
- Extended cylinder capacity control
- Oil level regulator (for use in parallel systems)
- ATEX-compliant configuration
- Special vibration dampening



HPC 108 single-stage reciprocating compressor unit (50 bar) with UniSAB systems controller

## Sabroe HPO/HPC/HPX High-Pressure Reciprocating Compressor Units

High-pressure hybrids of CMO and SMC reciprocating compressors, with swept volumes of 100–1,100 m<sup>3</sup>/h

The blocks of the compressor units in the HPO/HPC/HPX range are cast in high-strength ductile iron, making them particularly strong and capable of operating under exceptionally high pressures.

This results in condensing temperatures of up to 90°C, and makes HPX and HPO/HPC compressors ideal for use in conjunction with heat pumps and hot water applications, and as an extra “supercharge” stage in traditional ammonia plants. The renowned Sabroe high-pressure compressors are ideal for use with either ammonia or CO<sub>2</sub> as refrigerant.

Sabroe high-pressure compressors provide exceptional reliability and big savings on operating costs, because they are based on the high-volume CMO and SMC compressors, and they share the majority of castings and parts. Our three-year warranty covers the complete unit, including compressor block, UniSAB, motor and coupling – for all refrigerants.

### Range

Thirteen different models are available to provide swept volumes of between 100 and 1,100 m<sup>3</sup>/h.

Features	Benefits
High coefficient of performance (COP), with excellent performance under part-load conditions	Low power consumption, especially under part-load conditions. This greatly reduces operating costs
Variable-speed drive (optional) provides stepless capacity control over the entire operating range	Power consumption and operating costs kept to a minimum
Provides exceptionally high condensing temperatures – up to 90°C	Matches radiator temperature in most domestic/commercial heating systems, making HPO/HPC/HPX units ideal in district heating, etc.
Designed for easy service access, and repairs can be undertaken in situ, without removing the compressor	Lower repair and maintenance costs, and less downtime
Special oil separator design based on coalescer technology	Low oil carry-over, which cuts back on oil costs



## Technical data

Model	Number of cylinders	Swept volume		Nominal capacities in kW at 1,800 rpm				Unit dimensions in mm			Weight, excluding motor	Sound pressure level at 1,800 rpm
		1,500 rpm	1,800 rpm	Heating R717		Cooling R717 R744						
		m³/h	m³/h	+35/+73°C	+35/+90°C	0/+55°C	-50/-10°C	L	W	H		
HPO 24	4	97	116	332	N/A	83	116	1,580–1,930	835	985	510	77
HPO 26	6	146	175	497	N/A	125	174	1,600–1,950	940	985	550	78
HPO 28	8	194	233	663	N/A	167	232	1,620–1,970	940	985	580	80
HPC 104	4	226	271	786	N/A	198	214*	2,261–2,865	1,305	1,214	1,340	83
HPC 106	6	339	407	1,177	N/A	297	321*	2,286–2,890	1,345	1,260	1,580	84
HPC 108	8	452	543	1,569	N/A	396	428*	2,311–2,915	1,486	1,247	1,660	85
HPC 112	12	679	814	2,351	N/A	594	642*	3,279–3,687	1,525	1,448	2,520	86
HPC 116	16	905	1,086	3,164**	N/A	792	856*	3,329–3,757	1,525	1,448	2,600	87
HPX 704	4	111	133	380	355	95	133	2,261–2,865	1,213	1,214	1,220	82
HPX 706	6	166	200	570	532	143	200	2,286–2,890	1,267	1,260	1,440	84
HPX 708	8	222	266	760	710	190	266	2,311–2,915	1,278	1,260	1,510	85
HPX 712	12	333	399	1,140	1,065	286	400	3,279–3,687	1,345	1,448	2,430	86
HPX 716	16	443	532	1,520	1,420	381	533	3,329–3,737	1,356	1,445	2,600	87

\* at 1,500 rpm

\*\* 71°C condensing

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the compressor block.

Nominal capacities are based on:

1,500 rpm at 50 Hz.

1,800 rpm at 60 Hz or VSD.

Min./max. speed	R717	R744
HPO	700–1,800 rpm	700–1,800 rpm
HPC	500–1,800 rpm	500–1,500 rpm
HPX	500–1,800 rpm	500–1,800 rpm

**For R717**

2 K liquid subcooling and 0.5 K non-usable suction superheat.

**For R744**

2 K liquid subcooling and 10 K usable suction superheat for R744.

**For HPO**

Design pressure, HP side: 50 bar

Design pressure, LP side: 26 bar

Differential pressure: 25 bar

**For HPC**

Design pressure, HP side: 50 bar

Design pressure, LP side: 26 bar

Differential pressure: 25 bar

**For HPX**

Design pressure, HP side: 60 bar

Design pressure, LP side: 26 bar

Differential pressure: 40 bar

## Options

- Variable-speed drive line
- Gauges, thermometers and temperature/pressure control switches
- Extended cylinder capacity control
- ATEX-compliant configuration
- Special vibration dampening



TSMC 108 two-stage reciprocating compressor unit shown with closed flash inter-stage cooling system and UniSAB systems controller

## Sabroe TSMC Two-Stage Reciprocating Compressor Units

Two-stage versions of SMC reciprocating compressors, with swept volumes of 339–1,000 m<sup>3</sup>/h

**Sabroe TSMC** two-stage reciprocating compressors are an economical operating alternative to single-stage compressors in smaller low-temperature refrigeration installations.

**TSMC** compressor units are also ideal for medium-size industrial refrigeration installations that involve a big temperature range, such as freezer installations. Furthermore, these units are easy to customise with intermediate cooling systems.

Using a two-stage setup built together as a single unit helps avoid equipment duplication – and thus reduce costs

Our three-year guarantee covers the complete unit, including compressor block, UniSAB, motor and coupling – for all refrigerants.

### Range

Eight different models are available to provide swept volumes of between 339 and 1,000 m<sup>3</sup>/h.

Features	Benefits
Splitting the temperature lift into two separate stages reduces overall energy consumption	Two-stage installations are relatively cost-effective, which helps reduce energy costs
Relatively small footprint	Can be installed in relatively small locations, or where space is limited
High coefficient of performance (COP), with excellent performance under part-load conditions	Low power consumption, which greatly reduces operating costs
Variable-speed drive (optional) provides stepless capacity control over the entire operating range	Power consumption and operating costs kept to a minimum



## Technical data

Model	Number of cylinders low/high-pressure side	Swept volume		Nominal capacities* in kW -40/+35°C		Unit dimensions in mm			Weight, excluding motor	Sound pressure level	
		1,500 rpm	1,800 rpm							1,500 rpm	1,800 rpm
		m³/h	m³/h	1,500 rpm	1,800 rpm	L	W	H	kg	db(A)	db(A)
TSMC 108 S	6 / 2	339	407	50	60	2,311-2,915	1,052	1,247	1,746	80	82
TSMC 108 L	6 / 2	424	509	66	79	2,311-2,915	1,052	1,247	1,781	81	83
TSMC 108 E	6 / 2	509	N/A	81	N/A	2,311-2,915	1,052	1,247	1,796	81	83
TSMC 116 S	12 / 4	679	814	100	121	3,329-3,737	1,327	1,445	2,791	81	83
TSMC 116 L	12 / 4	848	1018	133	159	3,329-3,737	1,327	1,445	2,841	82	84
TSMC 116 E	12 / 4	1,018	N/A	163	N/A	3,329-3,737	1,327	1,445	2,891	83	84

\* Nominal capacities are based on:  
1,500 rpm at 50 Hz.  
1,800 rpm at 60 Hz or VSD.

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the compressor block.

Refrigerant: R717

Other refrigerants available on request.

Min./max. speed	R717
TSMC S	700-1,800 rpm
TSMC L	700-1,800 rpm
TSMC E	700-1,500 rpm

## For TSMC

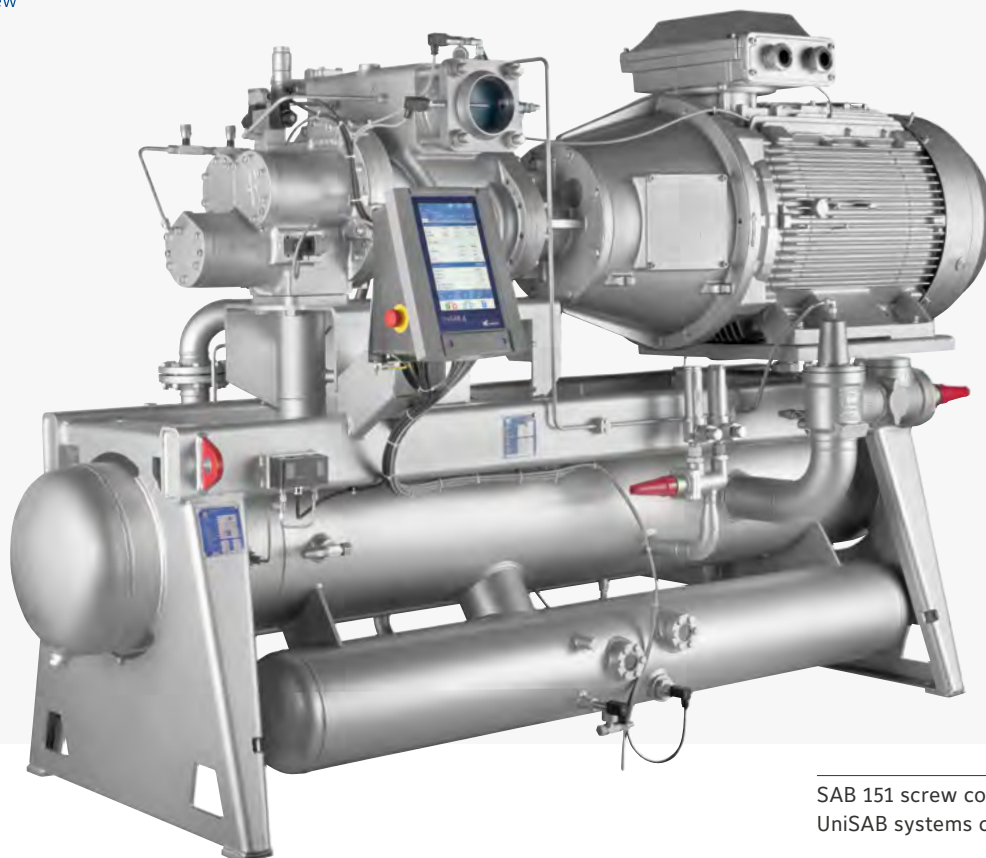
Design pressure, HP side: 28 bar  
Design pressure, LP side: 18 bar  
Differential pressure: 25 bar

## For R717

2K liquid subcooling, 0.5 K non-usable suction superheat and liquid subcooling in intermediate cooler to 10K above intermediate temperature.

## Options

- UniSAB systems controller
- Gauges, thermometers and temperature/pressure control switches
- Oil level regulator (for use in parallel systems)
- ATEX-compliant configuration
- Special vibration dampening
- Intermediate cooling systems



SAB 151 screw compressor unit with UniSAB systems controller

## Sabroe SAB Screw Compressor Units

XJF single-stage compressors with swept volumes of 200–1,000 m<sup>3</sup>/h

Sabroe SAB screw compressors are designed and configured to tackle smaller-scale industrial refrigeration requirements where a combination of exceptional reliability, high performance and low operating costs is essential.

These small units can be used with all the most common refrigerants and process gases, and all the components are selected for good accessibility and ease of service, ensuring cost-effective maintenance.

### Range

Eight different models are available to provide swept volumes of 200–1,000 m<sup>3</sup>/h.

Features	Benefits
Variable-speed drive and stepless capacity control ensures that capacity is always adjusted to suit requirements	Maximum part-load efficiency and lowest possible operating costs
SAB screw compressor units are all equipped with a UniSAB systems controller	More efficient operating profile, less downtime and longer service life
Cold Start valve lubricates the compressor, with no oil pump needed	Lower operating costs and less maintenance
SuperFilter II oil filter captures 99% of all particles larger than five microns	Longer bearing life, providing maximum reliability and savings on both maintenance and replacement
Space-saving design with small footprint	Significant reductions in space requirements



## Technical data

Model	Swept volume		Nominal capacities in kW at 3,600 rpm R717			Unit dimensions in mm	Weight, excluding motor/oil	Sound pressure level	
	at 3,000 rpm*	at 3,600 rpm*	High-stage	Booster	With economiser			3,000 rpm	3,600 rpm
	m <sup>3</sup> /h	m <sup>3</sup> /h	-10/+35°C	-40/-10°C	-40/+35°C			db(A)	db(A)
SAB 120 S*	204	245	145	44	44	2,200 x 1,300 x 1,500	1,200	85	87
SAB 120 M	255	306	191	58	58	2,200 x 1,300 x 1,500	1,200	86	88
SAB 120 L	316	379	243	73	73	2,200 x 1,300 x 1,500	1,300	88	90
SAB 120 E	413	496	325	98	99	2,200 x 1,300 x 1,500	1,300	89	91
SAB 151 S	484	581	373	116	106	3,000 x 1,450 x 1,800	2,050	90	92
SAB 151 M	571	685	448	139	127	3,000 x 1,450 x 1,800	2,050	91	93
SAB 151 L	708	850	565	175	160	3,000 x 1,450 x 1,800	2,050	91	93
SAB 151 E	847	1,016	680	211	193	3,000 x 1,450 x 1,800	2,050	92	94

**2-pole motor:**

3,000 rpm at 50 Hz.

3,600 rpm at 60 Hz or VSD.

**\* 4-pole motor (for SAB 120 S):**

1,500 rpm at 50 Hz.

1,800 rpm at 60 Hz or VSD.

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the compressor block.

Min./max. speed	R717
SAB 120 S	1,000-1,800 rpm
SAB 120 M-L-E	1,000-3,600 rpm
SAB 151 S-M-L-E	1,000-3,600 rpm

**For R717:**

2 K liquid subcooling and 0.5 K non-usable suction superheat.

**28 bar design pressure:**

SAB 120 and SAB 151

## Options

- Variable-speed drive
- Thermosyphon and water-cooled oil coolers, with 3-way oil temperature control valve
- Liquid injection oil cooling (EZ Cool)
- Dual SuperFilter II oil filters (on SAB 151 models only)
- Complete economiser systems
- Demand oil pump – controlled by UniSAB systems controller
- Sensors and transmitters for control by external PLC systems



SAB 233 screw compressor unit  
with UniSAB systems controller

## Sabroe SAB Screw Compressor Units

SGC single-stage compressors with swept volumes of 850–11,000 m<sup>3</sup>/h

The bigger models of Sabroe SAB screw compressors are specifically engineered to deal with larger-scale industrial refrigeration installations in which requirements prioritise exceptional reliability, high performance, and low operating costs. All the components are designed and configured to ensure low maintenance costs as a result of good accessibility and ease of service.

Like their smaller counterparts, these large-capacity compressor units can be used with all common refrigerants and process gases.

### Range

Thirteen different models are available to provide swept volumes of 850–11,000 m<sup>3</sup>/h.

Features	Benefits
Variable-speed drive and stepless capacity control ensure that capacity is always adjusted to suit requirements	Maximum part-load efficiency and lowest possible operating costs
SAB screw compressor units are all equipped with a UniSAB systems controller	More efficient operating profile, less downtime and longer service life
Cold Start valve lubricates the compressor, with no oil pump needed	Lower operating costs and less maintenance
SuperFilter II oil filter captures 99% of all particles larger than five microns	Longer bearing life, providing maximum reliability and savings on both maintenance and replacement
Space-saving design with small footprint	Significant reductions in space requirements
Infinitely variable Vi and capacity control	Saves energy as the compressor matches the system pressures and the load requirements precisely



## Technical data

Model	Swept volume		Nominal capacities in kW at 3,600 rpm R717			Unit dimensions in mm	Weight, excluding motor/oil	Sound pressure level	
	3,000 rpm	3,600 rpm	High-stage	Booster	With economiser			3,000 rpm	3,600 rpm
	m <sup>3</sup> /h	m <sup>3</sup> /h	-10/+35°C	-40/-10°C	-40/+35°C			db(A)	db(A)
SAB 193 S	848	1,018	653	194	193	3,150 x 1,500 x 1,800	2,700	84	86
SAB 193 L	1,131	1,358	872	260	258	3,250 x 1,500 x 1,900	2,800	84	86
SAB 233 S	1,494	1,792	1,172	344	334	3,700 x 1,700 x 2,100	4,600	86	88
SAB 233 L	1,880	2,257	1,477	484	421	3,700 x 1,800 x 2,200	4,750	86	88
SAB 233 E	2,323	2,788	1,826	537	520	3,700 x 1,800 x 2,200	4,800	86	88
SAB 283 S	2,676	3,211	2,096	616	597	3,700 x 1,800 x 2,250	5,500	88	90
SAB 283 L	3,370	4,044	2,638	776	752	4,150 x 1,900 x 2,650	5,850	88	90
SAB 283 E	4,055	4,865	3,159	929	901	4,450 x 2,100 x 2,850	7,650	88	90
SAB 355 S	4,192	5,031	3,236	963	917	4,550 x 2,350 x 3,500	10,000	89	91
SAB 283 X	4,580	5,496	3,592	1,056	1,025	4,600 x 2,100 x 2,850	8,950	88	90
SAB 355 L	5,716	6,860	4,369	1,299	1,240	4,700 x 2,350 x 3,500	10,000	89	91
SAB 355 E	7,275	8,730	5,550	1,630	1,576	4,850 x 2,350 x 3,500	10,200	89	91
SAB 355 X	9,180	11,016	NA	2,053	1,966	5,000 x 2,350 x 3,500	10,400	89	91

## 2-pole motor:

3,000 rpm at 50 Hz.

3,600 rpm at 60 Hz or VSD.

4,200 rpm at 70 Hz or VSD.

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the compressor block.

Min./max. speed	R717
SAB 193	1,000–3,600
SAB 233	1,000–3,600
SAB 283	1,000–3,600
SAB 355	1,000–3,600

## For R717:

2 K liquid subcooling and 0.5 K non-usable suction superheat.

## 28 bar design pressure:

SAB 193, SAB 233, SAB 283 and SAB 355

## Options

- Variable-speed drive
- Thermosyphon and water-cooled oil coolers, with 3-way oil temperature control valve
- Liquid injection oil cooling (EZ Cool)
- Dual external oil filters (SuperFilter II type)
- Complete economiser systems
- Demand oil pump – controlled by UniSAB systems controller
- Sensors and transmitters for control by external PLC systems



SAB 273L high-pressure screw compressor unit

## Sabroe SAB High-Pressure Screw Compressor Units

Variable-speed, high-pressure screw compressor units with swept volumes of 1,000–7,250 m<sup>3</sup>/hour

These unique high-pressure compressor units are ideal for large, site-built ammonia heat pump installations that require condensing temperatures up to 93°C.

Sabroe SAB high-pressure screw compressors are specially designed for variable-speed operation and maximum flexibility, doing away with the traditional capacity limitations of slide-valve technology. The capacity range of all SAB models extends from 1,000 rpm to 3,600 rpm.

The high-pressure configurations, all ductile iron-cased versions of the large Sabroe compressor units, provide substantial base load capacities along with providing exceptional flexibility in frequency converter operation. This ensures the robustness and reliability derived from the thousands of compressors in long-term service in refrigeration plants worldwide.

The high-pressure screw compressor units are configured as standard with the Sabroe Vibration Monitoring system, which monitors the conditions of the bearings to secure optimum uptime on the compressors. Monitoring of motor bearings can also be included on request.

### Range

Four models are available to provide swept volumes of between 1,000 and 7,250 m<sup>3</sup>/h.

Features	Benefits
High-pressure units designed specifically for applications that use ammonia as refrigerant	Increased service intervals, minimising total life cycle cost
Stepless, skip-free capacity control ensures that output always matches requirements	Lowest possible operating costs and rapid return on investment
Consistently high performance at both full and part load	Maximum part-load efficiency and low life cycle costs
Space-saving small footprint, with fewer moving parts and very low vibration	Exceptional reliability and low maintenance costs
Load-based service schedules	Optimised service/maintenance intervals, with a minimum of unscheduled downtime



## Technical data, 40 bar

Model	Max. rpm	Swept volume at max. rpm	Capacities +10°C/72°C		Unit dimensions in mm	Sound pressure level
			Cooling	Heating		
		m³/hr	kW	kW	L x W x H	db(A)
SAB 193 S HP	3,600	1,018	1,266	1,690	3,150 x 1,500 x 1,800	90
SAB 233 S HP	3,600	1,791	2,281	3,021	3,700 x 1,700 x 2,100	90

## Technical data, 63 bar

Model	Max. rpm	Swept volume at max. rpm	Capacities +30°C/93°C		Unit dimensions in mm	Sound pressure level
			Cooling	Heating		
		m³/hr	kW	kW	L x W x H	db(A)
SAB 273 S HP	3,600	1,655	2,607	3,735	7,500 x 1,630 x 3,400	-
SAB 273 L HP	3,600	2,206	3,476	4,980	7,600 x 1,630 x 3,400	-
SAB 407 S HP	3,600	5,435	8,561	12,582	8900 x 2000 x 4000	-
SAB 407 L HP	3,600	7,246	11,414	16,775	9200 x 2000 x 4000	-

Dimensions and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting  
plane and one metre distance from the compressor block.

Min./max. speed	R-717
SAB 193 S HP	1,000-3,600
SAB 233 S HP	1,000-3,600
SAB 273 S HP	1,000-3,600
SAB 273 L HP	1,000-3,600
SAB 407 S HP	1,000-3,600
SAB 407 L LP	1,000-3,600

## Options

- Variable-speed drive
- Demand oil pump – controlled by UniSAB systems controller
- Sensors and transmitters for control by external PLC systems
- Sabroe Vibration Monitoring system (SVM) for electrical motor







# Chillers



# Chillers based on Sabroe's core technologies

## Chillers meet the demand for indirect cooling

Many industrial and commercial processes and installations require indirect rather than direct cooling. This is normally provided by special chiller units, in which a compressor cools a secondary refrigerant that then provides the desired cooling effect.

The use of secondary refrigerants – water, glycol, brine, etc. – is rapidly increasing because of the demand for safer installations and an intense, continuous focus on energy efficiency.

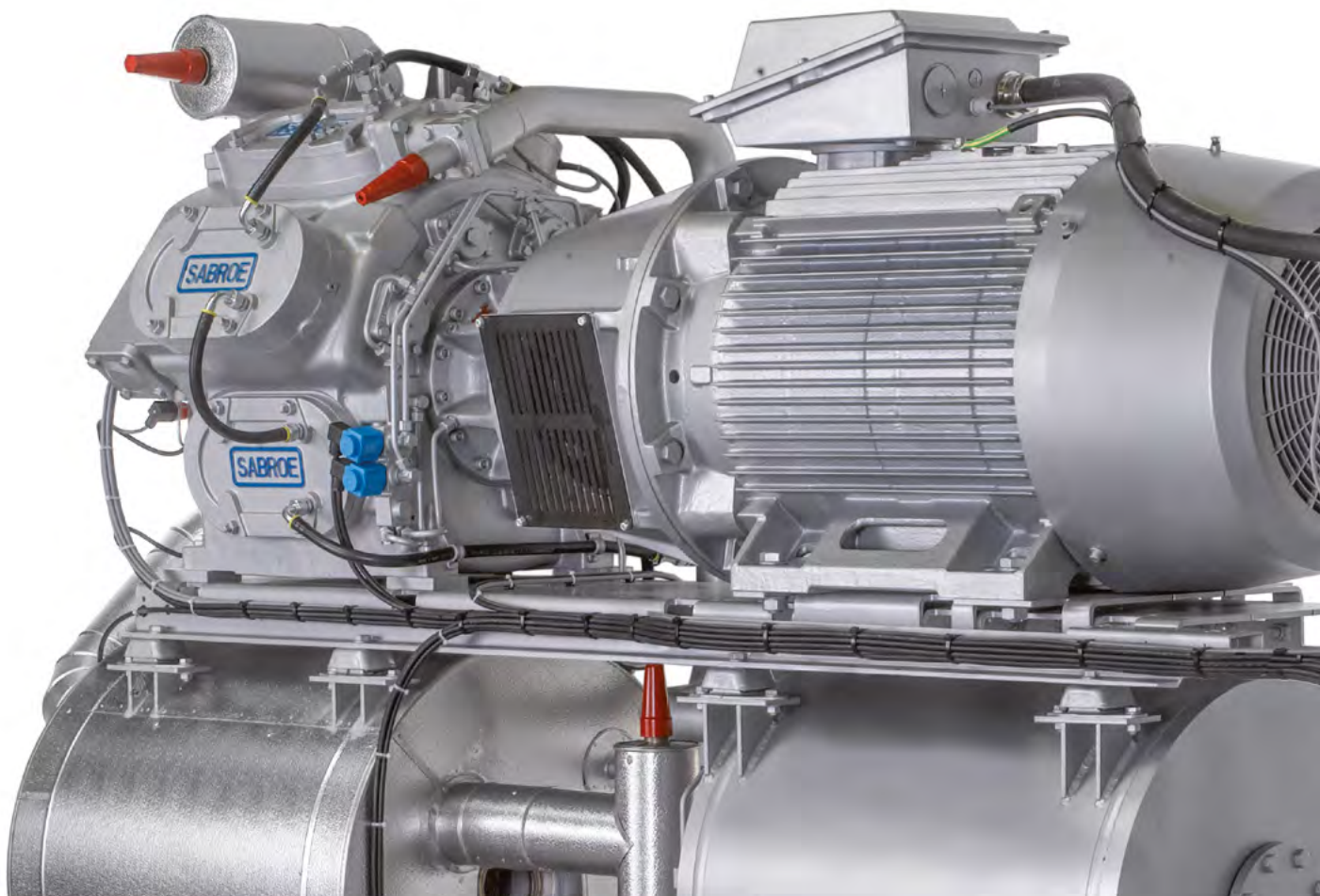
Another driver lies in both national and international legislation that requires the phasing-out of particular refrigerants because of their environmental impacts.

## Meeting the demand for chillers

Sabroe therefore provides a range of energy-efficient standardised packaged chiller configurations, all based on high-efficiency Sabroe reciprocating and screw compressors that are world-renowned for their reliability. As a result, Sabroe chillers are at the forefront of this rapidly developing specialist market.

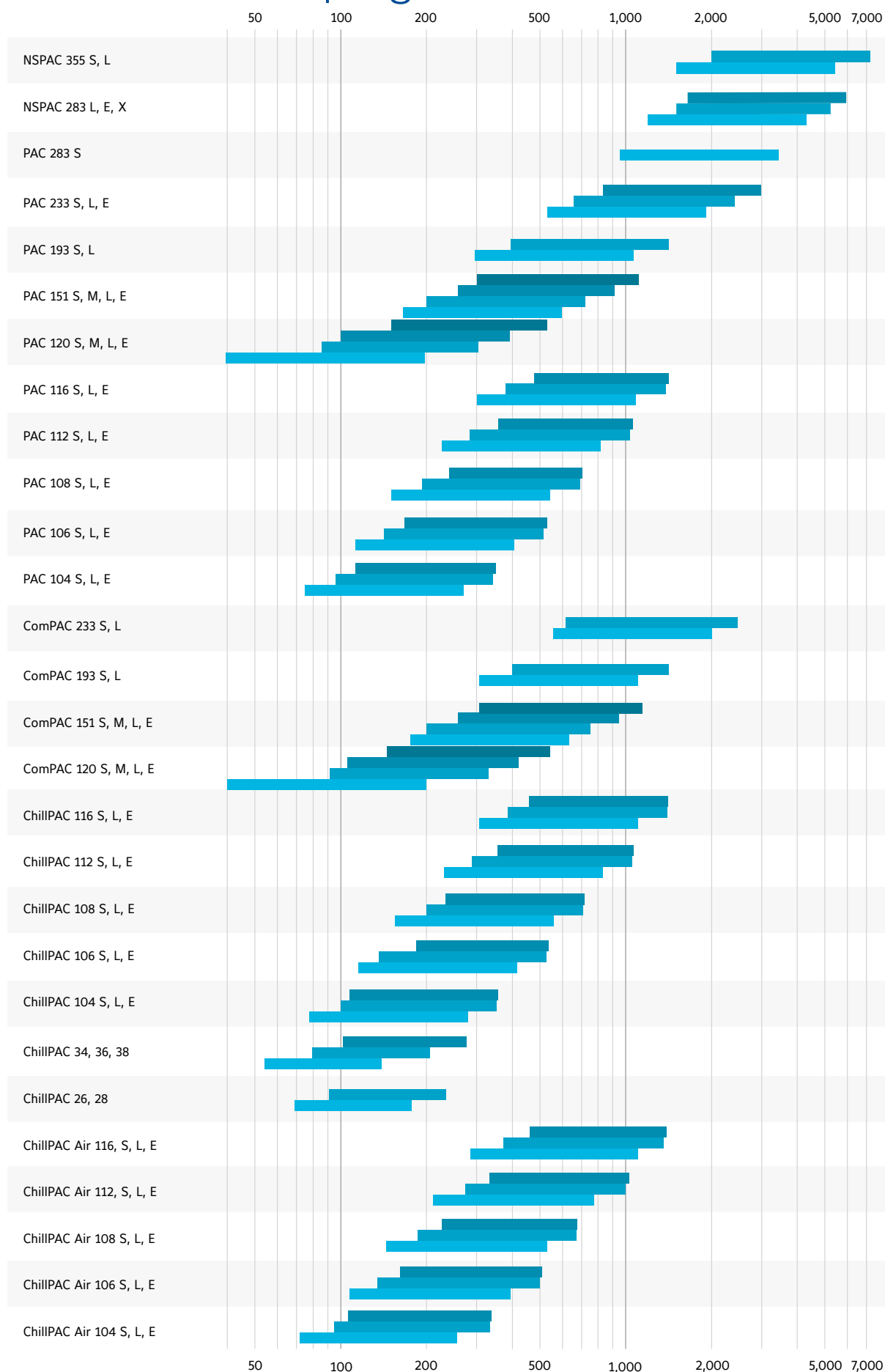
## Compliance

All Sabroe chiller units 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.





# Sabroe's chiller programme



Capacities in kW at 7/12°C (cold side) and 30/35°C (hot side) in maximum speed, ChillPAC Air: 35°C ambient temperature (reciprocating compressors at 50/60 Hz; screw compressors at 50/60/70/100 Hz)

Compressors

Chillers

Heat pumps

Controls

Heat exchangers

Customised

AfterMarket



## Sabroe ChillPAC chillers

Extremely compact packaged ammonia chillers based on reciprocating compressors, with a 60–1,400 kW capacity range

ChillPAC ammonia-based chillers feature an ultra-compact format so narrow that they can even pass through a normal doorway. This is achieved by having an extra-compact shell-and-plate evaporator/condenser, oil separator, and control system all built in and fully integrated into a unique vibration-resistant design.

This means ChillPAC units provide exceptional refrigeration capacity – taking full advantage of the many different models of ultra-reliable Sabroe reciprocating compressors – while only taking up a minimum of space. This makes ChillPAC units ideal in installations where space is limited and where there are restrictions on the refrigerant charge used.

ChillPAC chillers are most cost-effective when fitted with a variable-speed drive (VSD) that makes it easy to deal with changing circumstances and different operating requirements.

### Range

There are 21 different models in the standard ChillPAC range, with capacities ranging from 60 kW to 1,400 kW.

ChillPAC 108 with VSD panel and UniSAB as standard

Features	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. Factory acceptance test (FAT) available (optional)
Exceptionally compact design and fully integrated configuration result in less than half the footprint of bespoke chiller designs	Major savings on both weight and space, resulting in lower installation costs. Much less need for expensive separate machinery rooms
Indirect cooling and uncomplicated flooded evaporating system, using ammonia (R-717) only	Greater safety and outstanding reliability
Exceptional COP and outstanding part-load performance	Greater cooling effect from a smaller refrigerant charge, and optimum load structure over the entire capacity range
Refrigerant charge 50% smaller than conventional chillers, because of special condenser/evaporator design	Higher output per unit kW/kg refrigerant, lower unit costs and lower installation costs

### Options

- Variable-speed drive (VSD)
- Soft-starter or Y/D starter
- Desuperheater
- Subcooler
- External condenser
- Control panel mounted separately
- S and L models: 1800 rpm at 60 Hz or VSD
- Customer-witnessed factory acceptance test (FAT)
- Heater package for low-temperature heat pump operation
- Shunt solution for high-temperature difference
- Enclosure for outdoor installation



## Water: inlet 12 °C, outlet 7 °C

Type	Cooling capacity	E-motor	R-717 charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft cooling
	kW	kW	kg	kg	L	W	H	dB(A)	
ChillPAC 24 A	116	24	10	2,950	3,000	1,000	1,900	72	5.6
ChillPAC 34 A	137	30	10	4,200	3,000	1,000	1,900	72	5.6
ChillPAC 26 A	172	37	12	2,950	3,000	1,000	1,900	72	5.4
ChillPAC 36 A	200	45	13	4,200	3,000	1,000	1,900	73	5.3
ChillPAC 28 A	228	47	14	3,100	3,100	1,000	1,900	73	5.3
ChillPAC 38 A	268	61	16	4,550	3,100	1,000	1,900	74	5.3
ChillPAC 104 S-A	278	72	15	3,450	3,550	1,000	2,050	80	5.4
ChillPAC 104 L-A	353	74	21	3,750	3,650	1,000	2,050	83	5.5
ChillPAC 104 E-A *	359	73	19	3,750	3,650	1,000	2,050	80	5.2
ChillPAC 106 S-A	421	90	20	4,100	3,550	1,000	2,050	83	5.5
ChillPAC 106 L-A	534	108	27	4,400	3,550	1,000	2,050	79	5.6
ChillPAC 106 E-A *	540	110	27	4,400	3,850	1,000	2,050	81	5.3
ChillPAC 108 S-A	555	108	28	4,450	3,950	1,000	2,050	84	5.5
ChillPAC 108 L-A	709	142	31	4,700	4,000	1,000	2,050	85	5.5
ChillPAC 108 E-A *	719	164	34	4,900	4,000	1,000	2,050	84	5.3
ChillPAC 112 S-A	835	163	40	5,900	4,350	1,000	2,250	86	5.6
ChillPAC 112 L-A	1,056	204	46	6,600	4,750	1,000	2,350	86	5.6
ChillPAC 112 E-A *	1,074	222	50	6,750	4,750	1,000	2,350	84	5.3
ChillPAC 116 S-A	1,109	222	51	6,950	4,850	1,000	2,350	86	5.6
ChillPAC 116 L-A	1,405	303	53	7,650	5,250	1,000	2,500	87	5.6
ChillPAC 116 E-A *	1,422	290	53	7,650	5,250	1,000	2,500	85	5.3

## Ethylene glycol 30%: inlet -2 °C, outlet -8 °C

Type	Cooling capacity	E-motor	R-717 charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft cooling
	kW	kW	kg	kg	L	W	H	dB(A)	
ChillPAC 24 C	59	19	10	2,800	3,000	1,000	1,900	73	3.4
ChillPAC 34 C	69	24	10	3,000	3,000	1,000	1,900	73	3.3
ChillPAC 26 C	86	30	10	3,000	3,000	1,000	1,900	73	3.3
ChillPAC 36 C	100	37	10	3,000	3,000	1,000	1,900	73	3.2
ChillPAC 28 C	113	39	11	3,100	3,000	1,000	1,900	74	3.2
ChillPAC 38 C	131	45	12	3,100	3,100	1,000	1,900	74	3.2
ChillPAC 104 S-C	139	45	13	3,250	3,650	1,000	2,050	78	3.3
ChillPAC 104 L-C	179	61	15	3,700	3,650	1,000	2,050	79	3.3
ChillPAC 104 E-C *	183	61	15	3,700	3,650	1,000	2,050	79	3.3
ChillPAC 106 S-C	205	66	16	3,800	3,500	1,000	2,050	80	3.3
ChillPAC 106 L-C	264	90	20	4,050	3,500	1,000	2,050	80	3.3
ChillPAC 106 E-C *	274	90	22	4,100	3,600	1,000	2,050	80	3.3
ChillPAC 108 S-C	272	90	22	4,150	3,700	1,000	2,050	82	3.3
ChillPAC 108 L-C	355	117	26	4,550	4,000	1,000	2,050	82	3.3
ChillPAC 108 E-C *	363	117	26	4,550	4,000	1,000	2,050	82	3.3
ChillPAC 112 S-C	406	131	32	5,500	4,400	1,000	2,250	83	3.3
ChillPAC 112 L-C	527	177	37	5,800	4,400	1,000	2,250	83	3.3
ChillPAC 112 E-C *	545	174	38	6,400	4,700	1,000	2,350	83	3.3
ChillPAC 116 S-C	537	177	38	6,450	4,700	1,000	2,350	83	3.3
ChillPAC 116 L-C	702	222	47	6,850	4,800	1,000	2,350	83	3.4
ChillPAC 116 E-C *	729	264	46	6,950	5,000	1,000	2,350	83	3.3

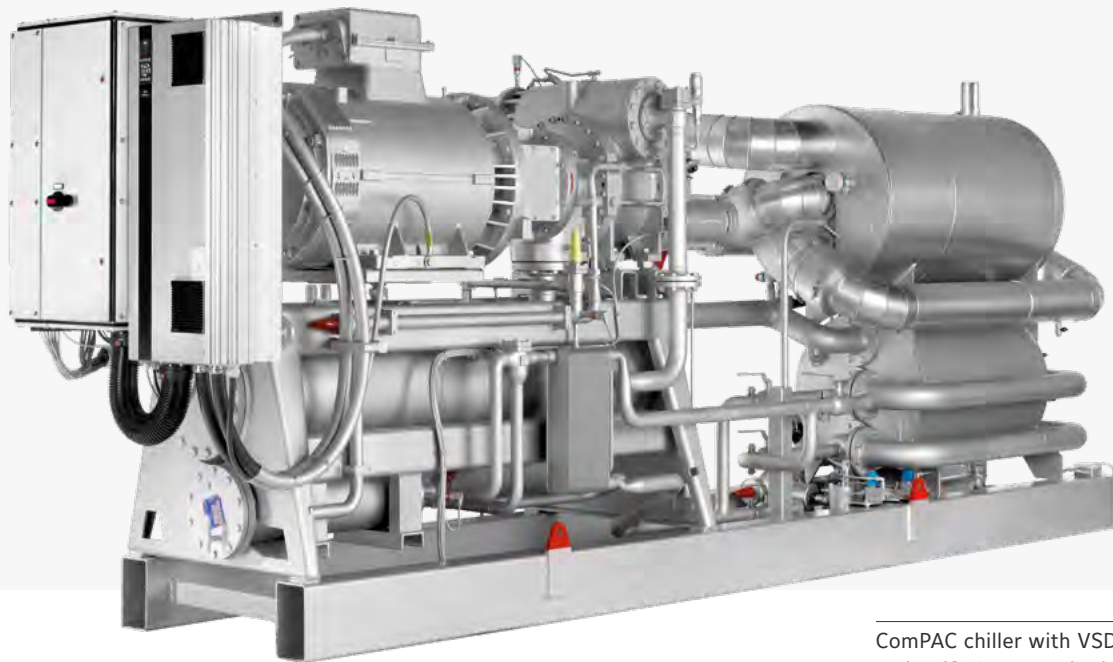
Dimensions, weight and sound pressure levels are calculated with a VSD unit.  
This data is to be used as a guideline only.

**Condenser:** water inlet 30°C, outlet 35°C. The above data is only valid for the stated temperatures and operating conditions.

Capacities are nominal at 1,800 rpm. \*Capacities are nominal at 1,500 rpm.

CMO and SMC S and L models, 60 Hz or VSD operation possible.

Our products within the scope of eco-design, implemented according to regulation No 2015/1095 for low (-25°C) and medium (-8°C) temperatures and No 2016/2281 for high temperatures (+7°C), are in compliance. The harmonised standards EN 14511 series and EN 14825 have been used for testing and calculation. Value tolerances for selection tools comply with EN 12900.



ComPAC chiller with VSD panel and UniSAB as standard

## Sabroe ComPAC Chillers

Packaged ammonia chillers based on screw compressors, with a 100–2,300 kW capacity range

Sabroe ComPAC ammonia chillers based on plate-and-shell heat exchangers and the comprehensive Sabroe screw compressor programme (SAB 120-151 to SAB 193-233) are distinctive for their compact design. Frequency converter and panel solutions are supplied as standard.

As standard, ComPAC chillers use ultra-compact and extremely low-charge Sabroe-patented plate-and-shell heat exchangers.

### Range

There are 13 different standard models in this range of ComPAC chillers – both high- and low-temperature versions.

A comprehensive range of equipment options are available to ensure the best possible performance and application versatility.

Features	Benefits
Factory-assembled, pre-tested packaged units based on renowned Sabroe screw compressors	Easy pre-commissioning makes installation and running-in both faster and cheaper. Factory acceptance test (FAT) available (optional)
Compact design with a very small footprint compared with bespoke chiller designs	Lower unit cost and lower installation costs
Indirect cooling and uncomplicated flooded evaporating system, using natural ammonia (R717) only	Major savings on both weight and space. Much less need for expensive separate machinery rooms
Exceptional COP and outstanding part-load performance	Greater safety and outstanding reliability
Small refrigerant charge, smaller than conventional chiller charges because of special condenser/evaporator design	Greater cooling effect from a smaller refrigerant charge, and optimum load structure over the entire capacity range

Water: inlet 12 °C, outlet 7 °C

Type	Cooling capacity	E-motor	R717 charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft cooling
	kW	kW	kg	kg	L	W	H	dB(A)	
ComPAC 120 S-A	185	55	21	3,600	4,600	1,200	2,300	85	4.4
ComPAC 120 M-A	316	78	26	3,800	4,700	1,200	2,300	86	4.8
ComPAC 120 L-A	400	93	29	4,000	4,800	1,200	2,300	87	4.9
ComPAC 120 E-A	541	140	36	5,200	5,000	1,200	2,300	89	4.9
ComPAC 151 S-A	614	140	38	5,500	5,000	1,200	2,300	91	5.0
ComPAC 151 M-A	735	175	44	5,800	5,100	1,200	2,300	92	5.0
ComPAC 151 L-A	929	217	51	5,900	5,300	1,200	2,300	92	5.1
ComPAC 151 E-A	1,111	269	59	6,300	5,600	1,200	2,300	93	5.0
ComPAC 193 S-A	1,063	269	57	7,100	5,600	1,500	2,400	85	5.2
ComPAC 193 L-A	1,447	327	159	7,400	6,100	1,500	2,400	85	5.4
ComPAC 233 S-A	1,933	410	238	13,000	7,000	1,500	2,400	86	5.5
ComPAC 233 L-A	2,314	536	297	15,000	7,100	1,500	2,400	86	5.2

Ethylene glycol 30%: inlet -2 °C, outlet -8 °C

Type	Cooling capacity	E-motor	R717 charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft cooling
	kW	kW	kg	kg	L	W	H	dB(A)	
ComPAC 120 S-C	108	55	21	3,600	4,500	1,200	2,300	85	2.7
ComPAC 120 M-C	177	78	26	3,800	4,600	1,200	2,300	86	2.9
ComPAC 120 L-C	224	93	29	4,000	4,700	1,200	2,300	87	2.9
ComPAC 120 E-C	297	114	36	5,200	4,900	1,200	2,300	89	2.9
ComPAC 151 S-C	344	140	38	5,500	4,900	1,200	2,300	91	3.1
ComPAC 151 M-C	408	175	44	5,800	5,000	1,200	2,300	92	3.1
ComPAC 151 L-C	515	217	51	5,900	5,200	1,200	2,300	92	3.1
ComPAC 151 E-C	617	269	59	6,300	5,500	1,200	2,300	93	3.1
ComPAC 193 S-C	594	217	57	7,100	5,500	1,500	2,400	85	3.2
ComPAC 193 L-C	795	327	71	7,400	6,000	1,500	2,400	85	3.2
ComPAC 233 S-C	1,052	410	75	13,000	6,900	1,500	2,400	86	3.4
ComPAC 233 L-C	1,361	536	225	15,000	7,000	1,500	2,400	86	3.4

**Condenser:** Water inlet 30 °C, outlet 35 °C.

All data and nominal capacities kW at 3,600 rpm, except for ComPAC 120 S at 1,470 rpm.

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the unit.

## Options

- Variable-speed drive (VSD)
- Soft-starter or Y/D starter
- External condenser
- Control panel mounted separately
- Economiser option for low-temperature brine
- Customer-witnessed factory acceptance test FAT)
- Heater package for low-temperature operation
- Shunt solution for high-temperature difference

Our products within the scope of eco-design, implemented according to regulation No 2015/1095 for low (-25°C) and medium (-8°C) temperatures and No 2016/2281 for high temperatures (+7°C), are in compliance. The harmonised standards EN 14511 series and EN 14825 have been used for testing and calculation. Value tolerances for selection tools comply with EN 12900.





PAC 116 chiller with UniSAB systems controller

## Sabroe PAC Chillers

Packaged ammonia chillers based on reciprocating compressors, with a 50–1,400 kW capacity range

PAC ammonia-based chillers are fully integrated packaged units, designed to take full advantage of the many different models of ultra-reliable Sabroe reciprocating compressors. They are popular because there is such a wide range of different standard sizes, and they are also particularly easy to customise to meet specific requirements.

The integrated design, with the plate evaporator/condenser, oil separator, and control system all built in, means PAC units provide exceptional refrigeration capacity while only taking up a minimum of space. They are ideal for use in indirect cooling setups and in installations where it is important to use future-compatible natural refrigerants, such as ammonia.

The advanced technology and the well-matched integration of the component systems make these chillers so energy efficient that their low operating costs make them the most economical choice over the lifetime of a refrigeration plant.

### Range

There are 21 different standard models in this range of packaged chillers, with capacities ranging from 50 kW to 1,400 kW.

Customised configurations are also available for use with remote air-cooled or evaporative condensers, and for twin or multi-packages, designed to provide particularly large cooling capacities.

Features	Benefits
Factory-assembled, pre-tested packaged units	Easy pre-commissioning makes installation and running-in both faster and cheaper. Factory acceptance test (FAT) available as an option
Comprehensive selection of compressor capacities, making it easier to match particular requirements	Avoid paying for greater capacity than needed
Very easy access for service	Improves safety, ensures maximum reliability and global sourcing of parts
Indirect cooling and uncomplicated flooded evaporating system, using ammonia (R717) only	Greater safety and outstanding reliability
Plate evaporator/condenser are easy to open and service	Routine checks/service can be carried out by operator's own staff

Water: inlet 12 °C, outlet 7 °C

Type	Cooling capacity	E-motor	R717 charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft cooling
	kW	kW	kg	kg	L	W	H	dB(A)	
PAC 104 S-A	272	61	48	3,100	33,00	1,850	2,300	77	5.2
PAC 104 L-A	346	74	49	3,250	3,300	1,850	2,300	77	5.3
PAC 104 E-A *	352	74	51	3,400	3,300	1,850	2,300	78	5.1
PAC 106 S-A	407	90	51	3,500	3,300	1,850	2,300	78	5.3
PAC 106 L-A	519	108	54	3,550	3,300	1,850	2,300	79	5.3
PAC 106 E-A *	528	113	57	3,700	3,550	1,850	2,300	79	5.1
PAC 108 S-A	543	117	54	3,700	3,300	1,850	2,300	79	5.3
PAC 108 L-A	692	142	58	3,900	3,550	1,850	2,300	80	5.3
PAC 108 E-A *	704	164	74	4,300	3,850	1,850	2,450	80	5.1
PAC 112 S-A	815	164	73	4,650	4,130	1,850	2,450	80	5.4
PAC 112 L-A	1,037	205	78	5,000	4,130	1,850	2,450	81	5.4
PAC 112 E-A *	1,055	222	84	5,300	4,550	1,850	2,450	81	5.2
PAC 116 S-A	1,086	222	79	5,350	4,130	1,850	2,450	81	5.4
PAC 116 L-A	1,383	279	98	5,650	4,900	1,850	2,450	82	5.4
PAC 116 E-A *	1,407	291	137	6,300	5,750	2,000	2,600	82	5.2

Ethylene glycol 30%: inlet -2 °C, outlet -8 °C

Type	Cooling capacity	E-motor	R717 charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft cooling
	kW	kW	kg	kg	L	W	H	dB(A)	
PAC 104 S-C	131	45	47	3,000	3,300	1,850	2,300	76	3.1
PAC 104 L-C	172	61	48	3,050	3,300	1,850	2,300	77	3.2
PAC 104 E-C *	177	61	49	3,200	3,300	1,850	2,300	77	3.2
PAC 106 S-C	197	66	50	3,250	3,300	1,850	2,300	78	3.2
PAC 106 L-C	257	90	53	3,450	3,300	1,850	2,300	79	3.2
PAC 106 E-C *	265	90	54	3,600	3,300	1,850	2,300	79	3.2
PAC 108 S-C	262	90	53	3,550	3,300	1,850	2,300	79	3.2
PAC 108 L-C	343	117	57	3,650	3,300	1,850	2,300	80	3.2
PAC 108 E-C *	354	117	71	4,100	3,600	1,850	2,450	80	3.2
PAC 112 S-C	393	131	71	4,400	4,130	1,850	2,450	80	3.2
PAC 112 L-C	515	177	78	4,600	4,130	1,850	2,450	81	3.3
PAC 112 E-C *	531	174	79	5,050	4,130	1,850	2,450	81	3.2
PAC 116 S-C	525	177	77	5,150	4,130	1,850	2,450	81	3.3
PAC 116 L-C	686	258	86	5,400	4,130	1,850	2,450	82	3.3
PAC 116 E-C *	708	258	128	6,000	4,550	2,000	2,600	83	3.3

**Condenser:** water inlet 30 °C, outlet 35 °C.

The above data are only valid for the stated temperatures and operating conditions.

Capacities are nominal at 1,800 rpm.

\* Capacities are nominal at 1,500 rpm.

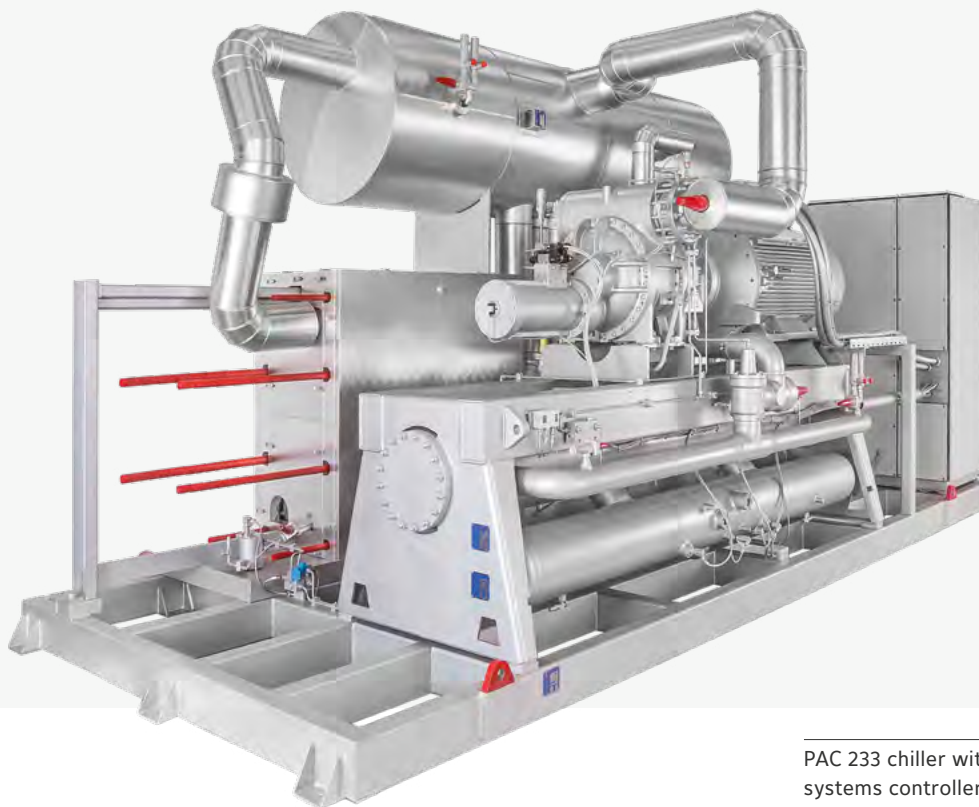
PAC S and L models, 60 Hz or VSD operation possible.

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the unit.

## Options

- Variable-speed drive (VSD)
- Soft-starter or Y/D starter
- Desuperheater
- Subcooler
- External condenser
- Control panel mounted separately
- Customer-witnessed factory acceptance test (FAT)

Our products within the scope of eco-design, implemented according to regulation No 2015/1095 for low (-25 °C) and medium (-8 °C) temperatures and No 2016/2281 for high temperatures (+7 °C), are in compliance. The harmonised standards EN 14511 series and EN 14825 have been used for testing and calculation. Value tolerances for selection tools comply with EN 12900.



PAC 233 chiller with UniSAB systems controller

## Sabroe PAC Chillers

Packaged ammonia chillers based on screw compressors, with a 100–7,200 kW capacity range

PAC ammonia-based chillers are fully integrated packaged units, designed to take full advantage of the many different models of ultra-reliable Sabroe screw compressors. They are popular because there is such a wide range of different standard sizes. They are also particularly easy to customise to meet specific requirements.

The integrated design, with the plate evaporator/condenser, oil separator, and control system all built in, means PAC units provide exceptional refrigeration capacity while only taking up a minimum of space. They are ideal for use in indirect cooling setups and in installations where it is important to use future-compatible natural refrigerants, such as ammonia.

The advanced technology and the well-matched integration of the component systems make these chillers so energy efficient that their low operating costs make them the most economical choice over the lifetime of a refrigeration plant.

### Range

There are 19 different standard models in this range of packaged chillers, with capacities ranging from approx. 100 kW to 7,200 kW.

Customised configurations are also available for use with remote air-cooled or evaporative condensers, and for twin- or multi-packages, designed to provide particularly large cooling capacities.

Features	Benefits
Factory-assembled, pre-tested packaged units	Easy pre-commissioning makes installation and running-in both faster and cheaper. Factory acceptance test (FAT) available as an option
Comprehensive selection of compressor capacities, making it easier to match particular requirements	Avoid paying for greater capacity than needed
Very easy access for service	Improves safety, ensures maximum reliability and global sourcing of parts
Indirect cooling and uncomplicated flooded evaporating system, using ammonia (R717) only	Greater safety and outstanding reliability
Plate evaporator/condenser are easy to open and service	Routine checks/service can be carried out by operator's own staff



Water: inlet 12 °C, outlet 7 °C

Type	Cooling capacity	E-motor	R717 charge	Operational weight	Unit dimensions in mm			Sound pressure level	COP shaft cooling
	kW	kW	kg	kg	L	W	H	dB(A)	
PAC 120 S-A	195	55	38	4,000	4,310	1,870	2,260	82	4.4
PAC 120 M-A	317	81	40	4,150	4,310	1,870	2,260	83	4.8
PAC 120 L-A	402	96	50	4,550	4,310	1,870	2,260	84	4.9
PAC 120 E-A	538	140	54	4,800	4,560	1,870	2,360	86	4.9
PAC 151 S-A	617	140	55	5,600	3,800	2,070	2,360	88	5.0
PAC 151 M-A	741	167	59	5,700	5,700	2,070	2,360	89	5.1
PAC 151 L-A	933	222	75	6,200	3,940	2,090	2,450	89	5.1
PAC 151 E-A	1,124	271	80	6,350	4,600	2,090	2,450	90	5.0
PAC 193 S-A	1,076	222	81	6,400	4,600	2,350	2,450	82	5.2
PAC 193 L-A	1,437	329	91	7,000	5,300	2,350	2,450	82	5.2
PAC 233 S-A	1,931	393	167	11,500	5,500	2,900	3,200	83	5.4
PAC 233 L-A	2,434	491	183	12,500	6,700	3,000	3,200	83	5.4
PAC 233 E-A	3,009	619	211	15,200	6,700	3,050	3,400	84	5.4
PAC 283 S-A	4,114	840	229	17,000	7,500	3,400	3,400	85	5.4
NSPAC 283 L-A	4,348	890	350	20,500	7,300	3,700	4,500	83	5.4
NSPAC 283 E-A	5,226	1,070	391	25,500	8,500	3,700	4,700	83	5.4
NSPAC 355 S-A	5,342	1,130	410	28,000	8,500	4,000	4,700	83	5.2
NSPAC 283 X-A	4,941	12,20	450	30,000	9,100	4,000	4,700	83	5.4
NSPAC 355 L-A	7,212	1,540	700	40,000	10,000	4,000	6,000	83	5.2

Ethylene glycol 30%: inlet -2 °C, outlet -8 °C

Type	Cooling capacity	E-motor	R717 charge	Operational weight	Unit dimensions in mm			Sound pressure level	COP shaft cooling
	kW	kW	kg	kg	L	W	H	dB(A)	
PAC 120 S-C	108	55	37	4,000	4,310	1,870	2,260	82	2.6
PAC 120 M-C	176	81	39	4,150	4,310	1,870	2,260	83	2.9
PAC 120 L-C	223	96	48	4,500	4,310	1,870	2,360	84	2.9
PAC 120 E-C	299	115	52	4,700	4,310	1,870	2,360	86	2.9
PAC 151 S-C	343	140	53	5,550	3,940	2,070	2,360	88	3.1
PAC 151 M-C	412	145	56	5,600	3,940	2,070	2,360	89	3.1
PAC 151 L-C	520	222	71	6,100	3,940	2,090	2,450	89	3.1
PAC 151 E-C	625	222	76	6,200	4,290	2,090	2,450	90	3.1
PAC 193 S-C	601	222	77	6,250	4,600	2,350	2,450	82	3.2
PAC 193 L-C	803	273	85	6,750	5,000	2,350	2,450	82	3.2
PAC 233 S-C	1,078	368	158	11,250	5,200	2,750	3,200	84	3.3
PAC 233 L-C	1,359	491	170	12,100	5,800	2,750	3,200	84	3.3
PAC 233 E-C	1,680	619	193	14,700	6,500	2,800	3,400	84	3.3
PAC 283 S-C	1,928	650	206	16,350	6,700	3,150	3,400	86	3.3
PAC 283 L-C	2,180	814	230	19,000	7,100	3,700	3,400	88	3.3
NSPAC 283 E-C	2,906	980	374	24,500	7,300	3,700	4,500	84	3.3
NSPAC 355 S-C	2,972	1,050	380	26,000	8,000	4,000	4,700	84	3.2
NSPAC 283 X-C	3,304	1,150	400	28,000	8,500	4,000	4,700	84	3.3
NSPAC 355 L-C	4,013	1,450	600	38,000	9,500	4,000	6,000	84	3.2

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the unit.

## Options

- Variable-speed drive (VSD)
- Soft-starter or Y/D starter
- Desuperheater
- Subcooler
- External condenser
- Control panel mounted separately
- 3600 rpm at 60 Hz or VSD
- Up to 3600 rpm using VSD
- Customer-witnessed factory acceptance test (FAT)

**Condenser:** Water inlet 30 °C, outlet 35 °C.

All data and nominal capacities kW at 3,600 rpm, except for:  
PAC 120 S at 1,470 rpm.

Our products within the scope of eco-design, implemented according to regulation No 2015/1095 for low (-25 °C) and medium (-8 °C) temperatures and No 2016/2281 for high temperatures (+7 °C), are in compliance. The harmonised standards EN 14511 series and EN 14825 have been used for testing and calculation. Value tolerances for selection tools comply with EN 12900.



ChillPAC Air - air-cooled ammonia chiller

# Sabroe ChillPAC Air Chillers

Air-cooled chillers for outdoor installation based on reciprocating compressors, with a capacity range between 300 and 1400 kW.

Sabroe ChillPAC Air uses ammonia as refrigerant and is a series of air-cooled chillers based on ultra-reliable Sabroe reciprocating compressors. It is a factory-assembled system for outdoor installation.

The chiller is made in a compact design, which is achieved by having an extra-compact shell-and-plate evaporator, an SMC compressor and double V-coil condensers to reduce the overall footprint. With the lowest possible refrigerant charge and superior efficiency, the chiller provides the customer with an attractive, economic and environmentally responsible air-cooled chiller product.

ChillPAC Air offers flexible and simple on-site installation for remote or local cooling needs, without any supplementary water-cooling assembly required.

ChillPAC Air is based on the popular, proven and well-known ChillPAC family philosophy, and it shares many components and benefits with the Sabroe ChillPAC chillers.

## Range

There are 15 different standard models in this range of air-cooled chillers, with capacities ranging from 300 to 1400 kW.

Features	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. Factory acceptance test (FAT) available (optional)
Outdoor installation in weatherproof enclosure	Cooling capacity can be added without needing to build/rebuild a machine room
Easy to mount, install and connect	Low installation costs and rapid commissioning
Natural refrigerant R717	Future-safe refrigerant supporting sustainability and ensuring high efficiency
Exceptional COP and outstanding part-load performance	Greater cooling effect from a smaller refrigerant charge, and optimum load structure over the entire capacity range

Water: inlet 12°, outlet 7°C

Type	Cooling capacity	E-motor	R717 charge	Dry weight	Unit dimensions in mm			Sound pressure level		COP shaft cooling
	kW	kW	kg	kg	L	W	H	Chiller	Condenser	
								dB(A)	dB(A)	
ChillPAC Air 104 S	264	72	43	6,900*	10,200	2,300	3,600	52	62**	4.42
ChillPAC Air 104 L	338	91	51	8,200*	11,500	2,300	3,600	53	62**	4.47
ChillPAC Air 104 E	344	91	51	8,200*	11,500	2,300	3,600	53	62**	4.35
ChillPAC Air 106 S	395	113	52	8,500*	11,500	2,300	3,600	53	62**	4.46
ChillPAC Air 106 L	508	136	62	9,500*	13,800	2,300	3,600	54	62**	4.52
ChillPAC Air 106 E	514	136	64	9,700*	13,800	2,300	3,600	55	62**	4.37
ChillPAC Air 108 S	521	136	60	9,700*	13,800	2,300	3,600	55	62**	4.45
ChillPAC Air 108 L	669	162	71	10,300*	15,000	2,300	3,600	55	62**	4.5
ChillPAC Air 108 E	681	200	76	10,900*	16,300	2,300	3,600	56	62**	4.36
ChillPAC Air 112 S	782	200	88	12,400*	17,500	2,300	3,600	56	62**	4.5
ChillPAC Air 112 L	1,003	245	101	13,600*	20,000	2,300	3,600	57	62**	4.53
ChillPAC Air 112 E	1,024	290	108	14,600*	21,000	2,300	3,600	57	62**	4.4
ChillPAC Air 116 S	1,033	303	106	14,800*	21,000	2,300	3,600	57	62**	4.48
ChillPAC Air 116 L	1,322	347	***	***	***	***	***	58	62**	4.5
ChillPAC Air 116 E	1,339	350	***	***	***	***	***	58	62**	4.34

\* Without condenser base frame

\*\* 55 dB option is also available

\*\*\* On request, depending on condenser configuration

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field. All sound measuring has been carried out according to ISO 9614-2 at a distance of 10 m.

Capacities are nominal and based on water temperature 12/7°C and ambient temperature 35°C

Capacities are nominal at 1,800 rpm (E models: 1,500 rpm)

## Options

- Low-noise condenser
- Condenser with water spray system
- Condenser with adiabatic pad system
- Condenser base frame
- Variable-speed drive (VSD) for optimum COP
- Winter packages for low ambient temperature locations
- Customer-witnessed factory acceptance test (FAT)
- Special requirements on request





Sabroe enclosure for outdoor installation

# Sabroe enclosure for chillers and heat pumps

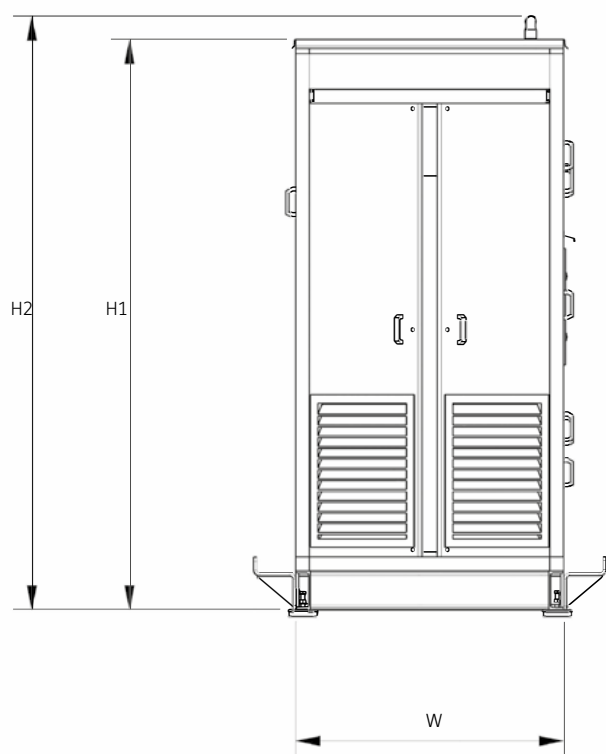
Add additional capacity to your existing cooling or heating system, without rebuilding your machine room.

The Sabroe enclosure is specifically developed for ChillPAC and HeatPAC units, and its design preserves the compact design that the two units are known for. The enclosure is equally suitable for outdoor installation and as sound enclosure in a machine room.

Outdoor installation of a ChillPAC or HeatPAC in the enclosure further provides great flexibility for remote cooling or heating – exactly where you need it.

**Sound reduction with enclosure: 17 dB(A)**  
(Tolerance of +/- 3 dB)

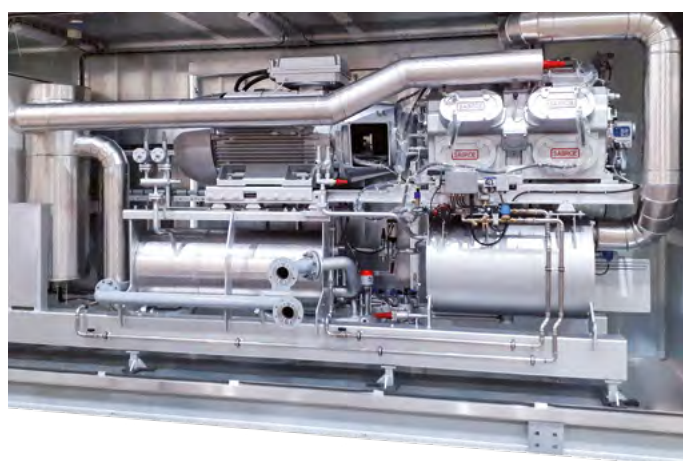
Features	Benefits
Easy to mount, install and connect	Low installation costs and rapid commissioning
Safety control panel included	Compliant electrical control with alarm levels, siren and alarm signals
Insulated wall panels, doors, floor and roof	Optimum indoor environment for the equipment
Heating and ventilation	Controlled temperature both during operation and at standstill
Sealed floor with drain and outside plates of aluzinc	Safe installation where controlled drainage is required, excellent corrosion resistance
Compliance with PED and DS/EN 378	Saves time and project costs



Ambient temperatures: -15°C to +40°C.

Model	Dimensions in mm			Weight
	L	W	H1/H2	Kg
Low	4,023	1,370*	2,661/2,778*	1,210
	5,011	1,370*	2,661/2,778*	1,360
	6,000	1,370*	2,661/2,778*	1,510
	6,988	1,370*	2,661/2,778*	1,760
High	4,023	1,370*	2,916/3,033*	1,250
	5,011	1,370*	2,916/3,033*	1,400
	6,000	1,370*	2,916/3,033*	1,550
	6,988	1,370*	2,916/3,033*	1,800

\* See the drawing above.



Note:

The enclosure is not defined as a machine room, because a person cannot stay inside it with the doors closed. Nevertheless, it fulfills machine room requirements for gas detection, ventilation and ATEX.



CAFP unit controlled and monitored by UniSAB systems controller

# Sabroe CAFP CO<sub>2</sub>/NH<sub>3</sub> Low-Temperature Chiller

Compact packaged freezer systems using reciprocating or screw compressors, with a 100–2,500 kW capacity range

The highly customisable Sabroe CAFP freezer systems are using CO<sub>2</sub> on the low-temperature side and NH<sub>3</sub> (ammonia) on the high-temperature side, giving you the best of both worlds.

CO<sub>2</sub> has its strength at low temperatures, and NH<sub>3</sub> at high temperatures. A combination of both provides the user with a system, which is working on natural refrigerants and at the same time ensuring high efficiency and safety. The ammonia charge has been reduced to an absolute minimum and, instead of ammonia, CO<sub>2</sub> is distributed to the user production area. CO<sub>2</sub> has a high volumetric cooling capacity and this goes hand in hand with high efficiency.

These packaged systems are built around Sabroe reciprocating compressors that use CO<sub>2</sub> as refrigerant, which gives them eight times greater cooling capacity than corresponding compressors using ammonia. This in turn makes the low-temperature compressor much smaller, and the whole package considerably more compact than traditional two-stage ammonia-based freezer systems. The compact design means the CAFP package can be installed even when space is limited.

Compared with other solutions for low temperatures, a CAFP unit uses significantly less power in the temperature range down to –54°C.

This results in energy savings of as much as 15 percent compared with traditional two-stage ammonia systems, and up to 45 percent compared with single-stage setups. Alternatively, the higher capacity can be used for a higher throughput on the freezer equipment.

## Range

There are six standard models in this range of freezer systems, with capacities ranging from 100 kW to 800 kW. On request, we offer units up to 2,500 kW. All CAFP units are operationally tested with refrigerant before dispatch. Factory acceptance test (FAT) available.

Features	Benefits
Compact design and technology that require small footprint	Big savings on installation costs
High COP and extremely low power consumption, even at part load	Low operating costs
Use of CO <sub>2</sub> as low-temperature refrigerant reduces piping complexity	Reduces installation costs
Very small ammonia charge, located on the unit itself	No risk of ammonia leaks in production areas, cold stores and working areas
CO <sub>2</sub> is a simple, inexpensive natural refrigerant	Low operating costs



## Technical data

Model	Evaporation temperature	Cooling capacity	Power consumption	Compressors R744/R717	Minimum R717 charge (approx.)	Minimum R744 charge (approx.)	Unit dimensions in mm	Weight	Sound pressure level	COP shaft cooling
	°C	kW	kW		kg	l	L x W x H	kg	dB(A)	
CAFP 80	-50	84	64	HPO 24 / SMC 104 S	120	300	5,500 x 2,400 x 3,000	7,000	78	1.3
CAFP 80	-45	108	74	HPO 24 / SMC 104 L					80	1.5
CAFP 80	-40	138	84	HPO 24 / SMC 104 E					79	1.7
CAFP 80	-35	159	87	HPO 24 / SMC 106 S					79	1.8
CAFP 120	-50	125	95	HPO 26 / SMC 106 S	120	350	5,700 x 3,200 x 3,300	10,000	80	1.3
CAFP 120	-45	162	110	HPO 26 / SMC 106 L					80	1.5
CAFP 120	-40	203	126	HPO 26 / SMC 106 E					80	1.6
CAFP 120	-35	246	134	HPO 26 / SMC 108 L					82	1.8
CAFP 160	-50	166	127	HPO 28 / SMC 108 S	120	350	5,900 x 2,900 x 3,300	11,000	80	1.3
CAFP 160	-45	214	147	HPO 28 / SMC 108 L					82	1.5
CAFP 160	-40	271	167	HPO 28 / SMC 108 E					82	1.6
CAFP 160	-35	337	183	HPO 28 / SMC 112 L					83	1.9
CAFP 200	-50	196	150	HPC 104 / SMC 106 E	180	350	5,900 x 3,100 x 3,800	14,000	80	1.3
CAFP 200	-45	255	174	HPC 104 / SMC 108 E					82	1.5
CAFP 200	-40	321	193	HPC 104 / SMC 112 L					82	1.7
CAFP 200	-35	379	206	HPC 104 / SMC 112 L					83	1.8
CAFP 300	-50	300	222	HPC 106 / SMC 112 L	300	800	6,300 x 3,200 x 3,900	16,000	82	1.4
CAFP 300	-45	381	258	HPC 106 / SMC 112 E					82	1.5
CAFP 300	-40	468	279	HPC 106 / SMC 116 L					83	1.7
CAFP 300	-35	553	299	HPC 106 / SMC 116 L					83	1.9
CAFP 400	-50	392	293	HPC 108 / SMC 112 E	400	800	6,500 x 3,700 x 4,000	19,000	82	1.3
CAFP 400	-45	484	324	HPC 108 / SMC 116 L					83	1.5
CAFP 400	-40	616	370	HPC 108 / SMC 116 E					83	1.7
CAFP 400	-35	729	395	HPC 108 / SMC 116 E					83	1.9

**Condenser:** water inlet 25°C, outlet 30°C.

Capacities are nominal, 1,500 rpm at 50 Hz.

Power consumption applies to compressors only.

Refrigerant charge depends on application.

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the unit.

## Options

- Variable-speed drive
- Titanium plates in condenser
- Oversized CO<sub>2</sub> pump separator for high CO<sub>2</sub> evaporator volume
- Oversized CO<sub>2</sub> pumps for higher circulation rate
- Oversized ammonia condenser for higher cooling water temperature
- Fully welded shell-and-tube cascade cooler
- External interstage load, including a brine cooler on the R717 side of the cascade cooler
- Special version for use with remote condenser
- Configurations for use with HFC refrigerants instead of ammonia on high-pressure side

## Standard equipment

- Double control panel including UniSAB systems controller
- CO<sub>2</sub> pump separator including two pumps (one standby)
- Shell-and-tube cascade cooler with double-tube sheet to minimise any risk of CO<sub>2</sub> and ammonia mixing
- Standstill cooling unit, with separate control panel and power supply to limit CO<sub>2</sub> pressure
- Automatic oil recovery system in both circuits
- Water-cooled condenser (plate heat exchanger type) on ammonia side
- Insulation of all cold parts

# Reducing emissions, recovering heat

Times are changing, expectations are pivoting and Sabroe compressor capabilities are at the forefront of paving the way to new capabilities and levels of energy efficiency.

## Increasing global demand for industrial heat pumps

There is now widespread demand for industrial heat pumps all over the world. One of the key drivers for this lies in legislative pressures as well as good-governance ESG decisions determined to reduce CO<sub>2</sub> emissions. One big source of these emissions is equipment such as boilers and furnaces that produce the large volumes of steam and warm water essential for countless industrial processes.

## The potential of recovering heat on site

Decision-makers and technical experts everywhere are beginning to fully appreciate the potential of recovering thermal energy and exploiting temperature differences, reducing energy consumption by getting more out of valuable heat that's "already paid for" and on site.

## Why heat pumps work

Heat pumps can quickly and effectively collect a lot of thermal energy that would otherwise simply be discharged into the surrounding air – and therefore wasted.

As just one example, many industries use compressed air in their production setups, and in some industries as much as a third of overall energy consumption is associated with the equipment needed to provide this compressed air. Once it has been compressed, the air is normally cooled and dehumidified. Heat pumps can be used to recover the considerable amounts of valuable thermal energy released by doing all this – and the same applies to the heat from any refrigeration and cooling equipment used.



### Exploit waste heat from other processes

Another example lies in the many installations used for food processing and production. Here, waste heat from other processes can be recovered and put to effective use to meet requirements for high temperatures, in an inexpensive way with only limited environmental impacts.

### Reduce CO<sub>2</sub> emissions while saving money with Sabroe heat pumps

Sabroe heat pumps can be used to supply a wide range of different temperatures and in this way help owners and operators save money while reducing CO<sub>2</sub> emissions and limiting the financial penalties now increasingly associated with these emissions.









# Heat pumps

# Sabroe Heat Pumps

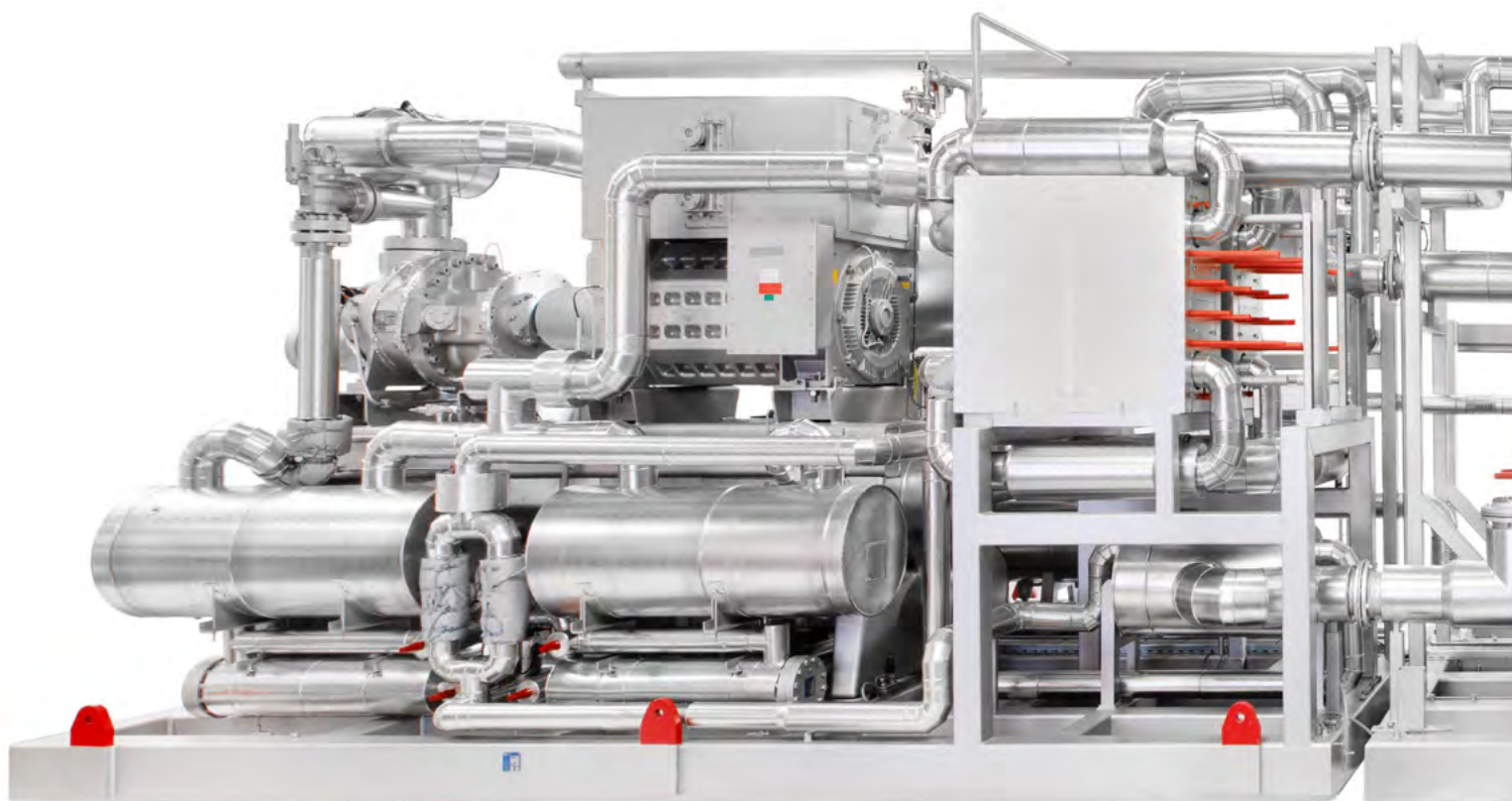
## – the heart of your green energy system

Heat pumps are essential for any business with high demand for elevated temperatures, high capacities and improved efficiency.

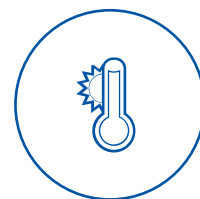
Built to run with natural and environmentally friendly refrigerants, all Sabroe heat pump series provide green technology that paves the way for the carbon-neutral operations.

### Temperature range with Sabroe heat pump portfolio

Sabroe heat pumps are the ideal solution for effectively exploiting low/medium/high-temperature waste heat and turning it into hot water (up to 120°C) using only a minimum of electrical energy.







## Natural refrigerants

Sabroe industrial heat pumps use natural refrigerants. Each unit is tailored for a specific use and a particular installation, making sure that a minimum of thermal energy is used to provide maximum effect.

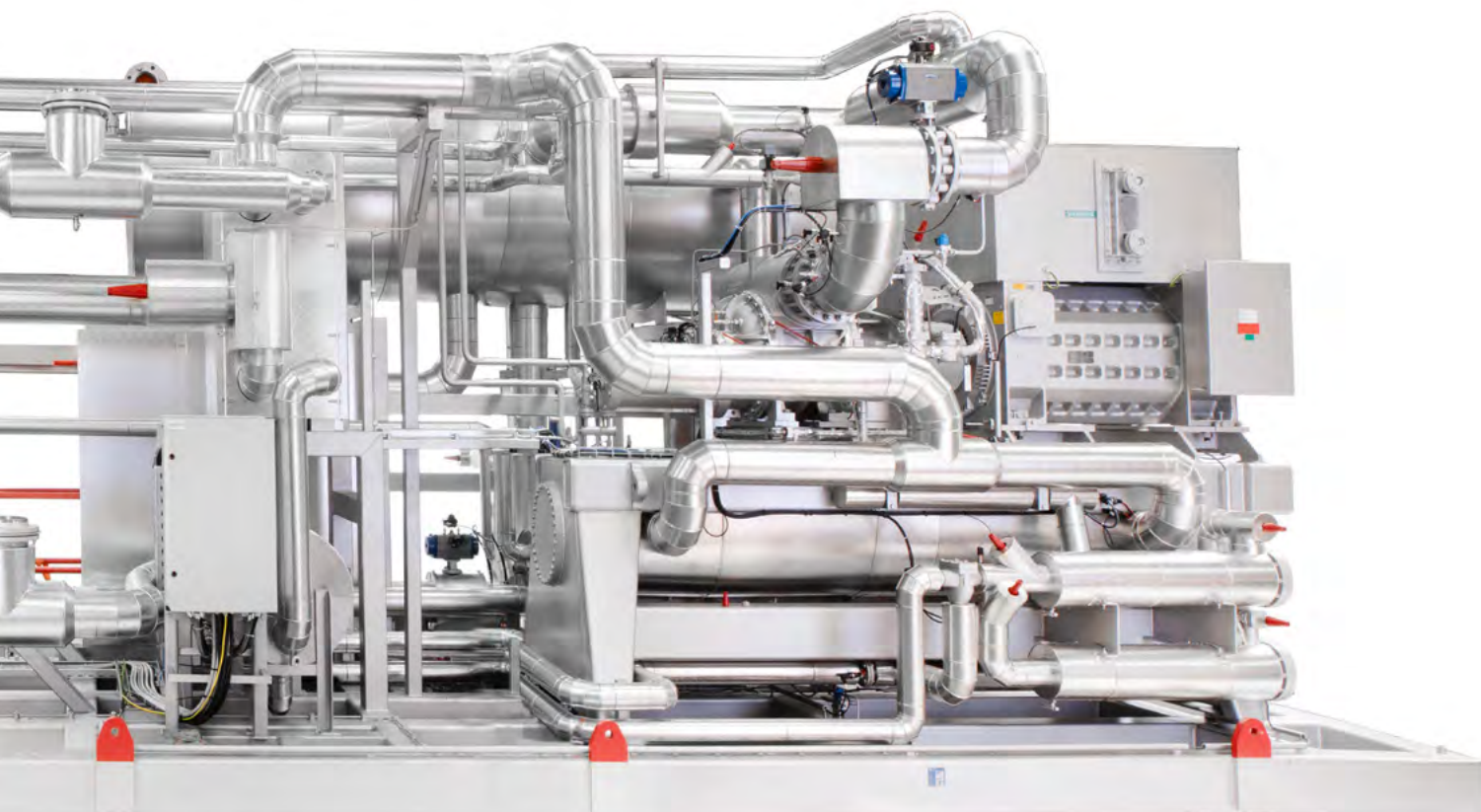
## Compliance

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

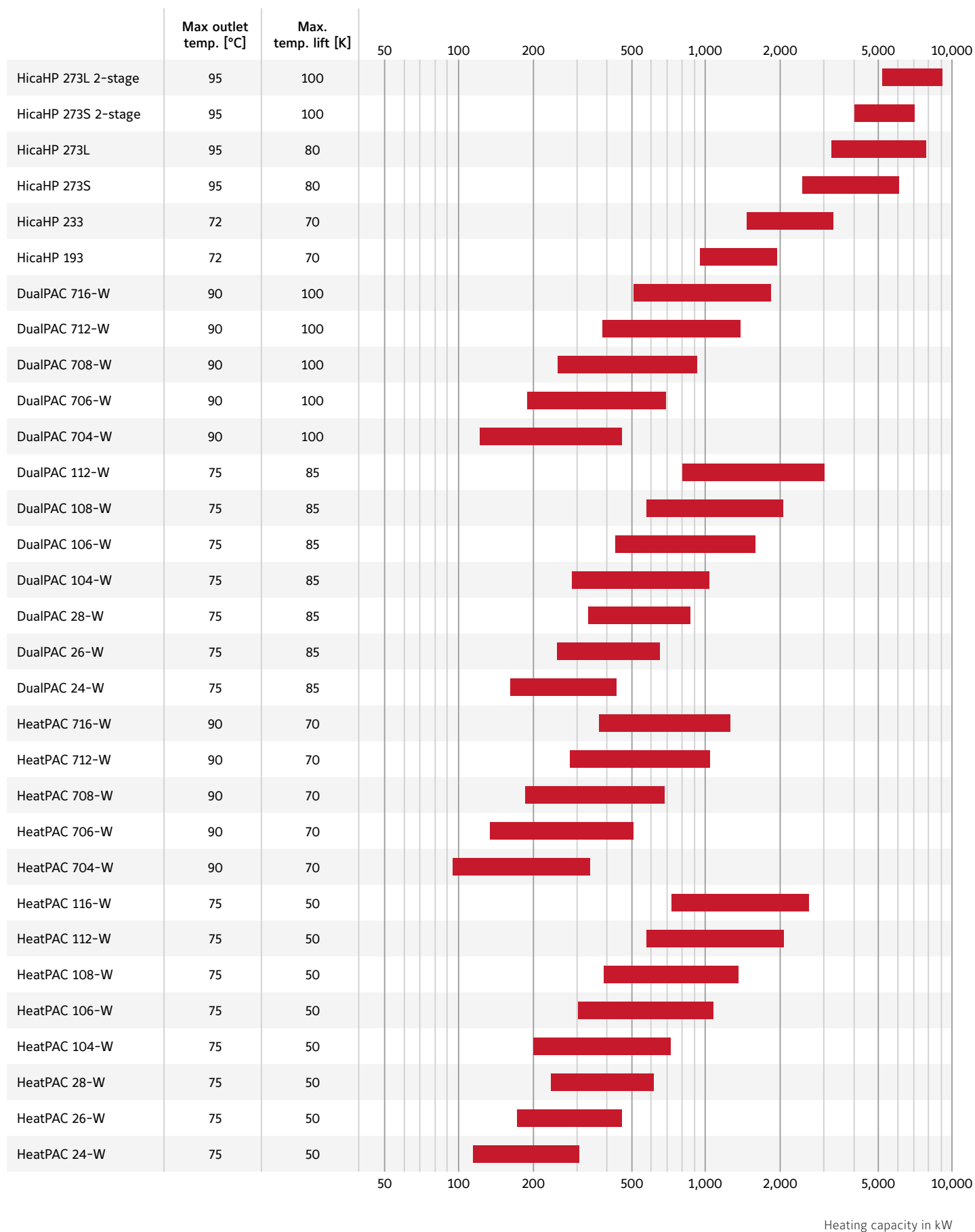
## Temperatures from 0-125°C

The Sabroe heat pump portfolio covers needs for temperatures from below 0-130°C.

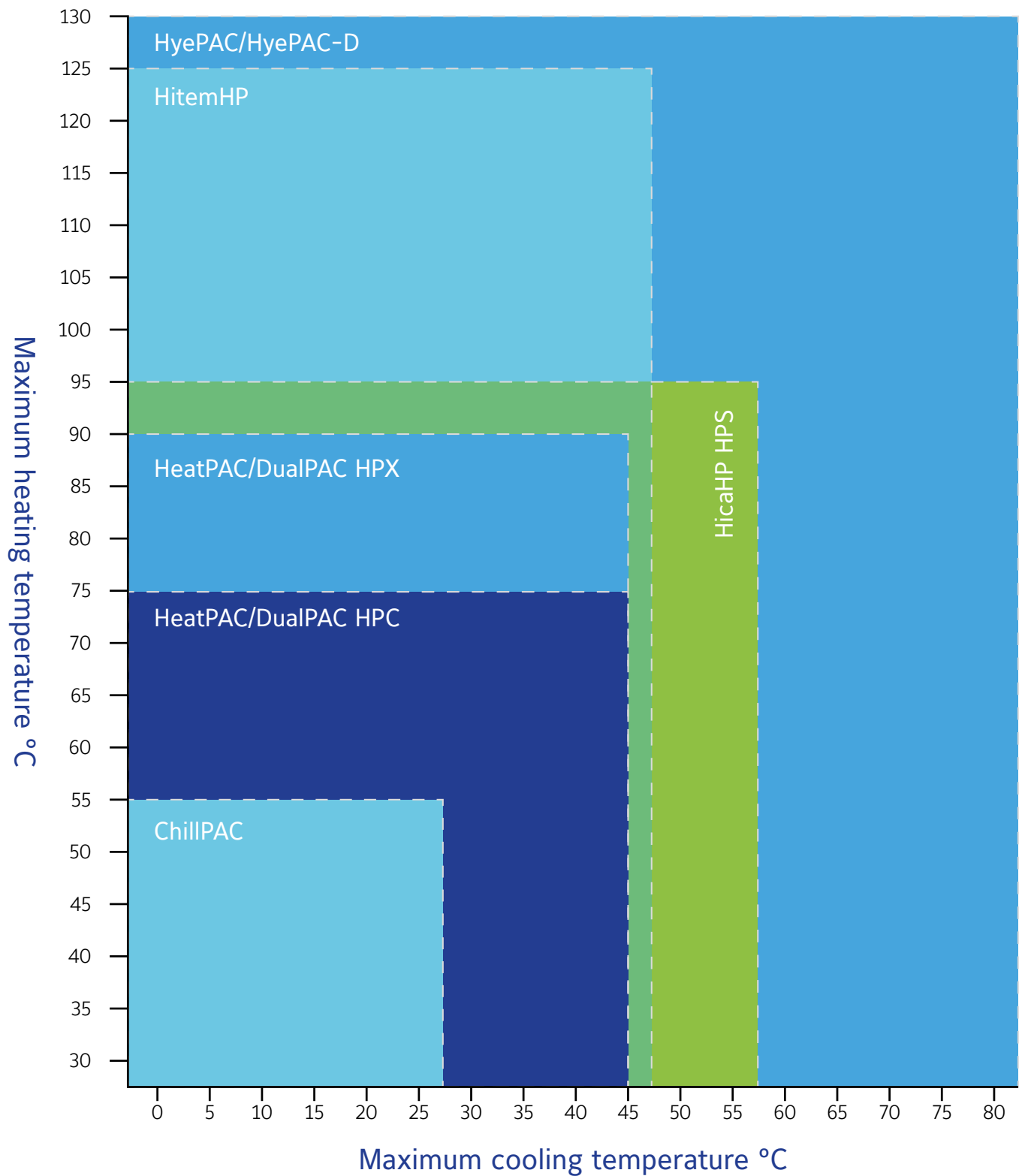
To find the heat pumps you need for your specific requirements, please see the charts below.



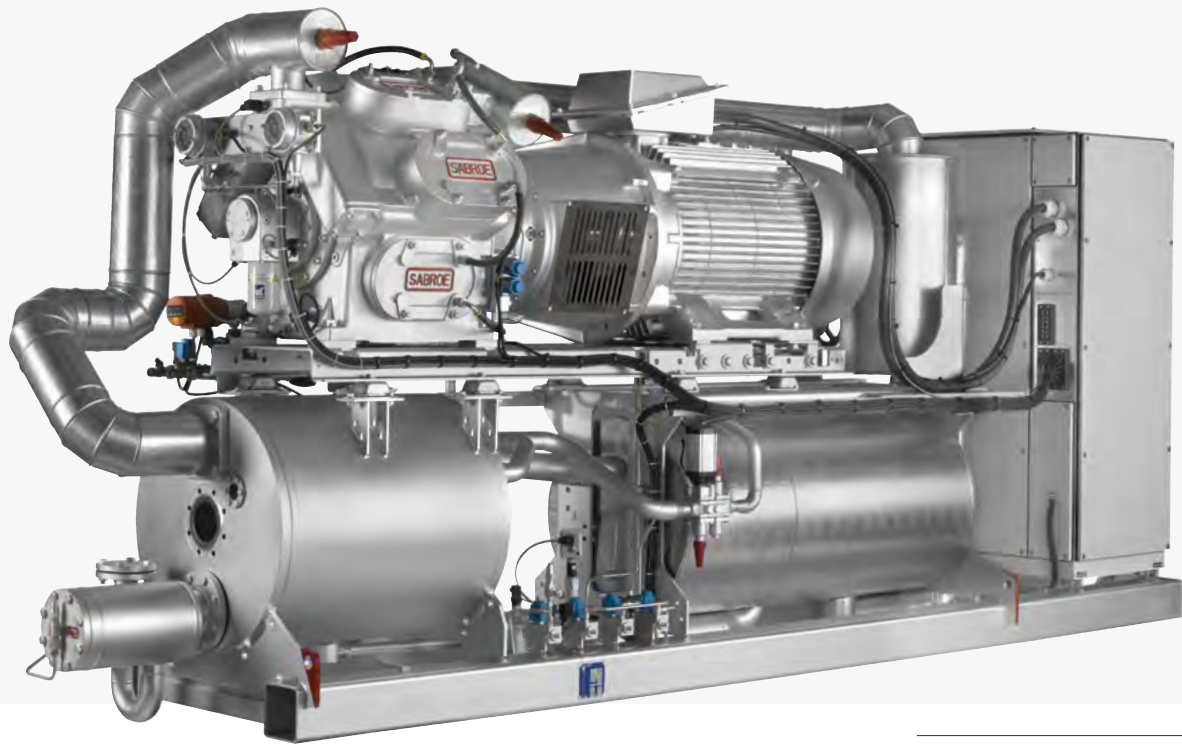
# Sabroe's heat pump programme



# Sabroe's heat pump temperature ranges







HeatPAC HPX with panel-mounted  
UniSAB systems controller

## Sabroe HeatPAC Heat Pumps

Single-stage high-pressure ammonia-based heat pumps, using a reciprocating compressor, with a 300–2,700 kW capacity range

HeatPAC units are extremely compact heat pumps based on ultra-reliable Sabroe HPO/HPC/HPX high-pressure reciprocating compressors achieving up to 40 bar differential pressures and up to 60 bar design pressures. Using ammonia as refrigerant, Sabroe HeatPACs provide a low-cost supply of hot water at up to 90°C, ideal for sterilisation, pasteurisation, and many other heating processes.

These highly customisable integrated units are based on a unique vibration-resistant design, featuring an uncomplicated flooded evaporating system. With the uniquely combined desuperheater, condenser, and subcooler design, Sabroe HeatPACs offer superior efficiency. The units 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 90°C) using only a minimum of electrical energy.

These units are designed to provide a cost-effective way to tackle the need for cooling and heating at the same time, providing an extremely high coefficient of performance (COP).

### Range

There are thirteen standard models in this range of heat pump systems, with capacities ranging from 300 kW to 2,700 kW.

Features	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
Compact single-stage configuration weighs less and takes up less space than bespoke and/or two-stage heat pump designs	Low installation cost. Easy to mount even in confined spaces or unconventional locations
Exceptional COP and outstanding part-load performance	High energy-efficiency, low operating costs
Service and maintenance based on load-based service schedules	Improved reliability, longer service intervals, minimal downtime, low cost of ownership
Variable-speed drive (VSD) and UniSAB compressor package controller as standard	Outstanding part-load performance and maximum operating flexibility

## Water condenser inlet 60 °C, outlet 70 °C and evaporator inlet 39 °C, outlet 34 °C

Type	Heating capacity	Cooling capacity	E-motor	Power consumption (shaft)	R717 charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft heating
	kW	kW	kW	kW	kg	kg	L	W	H	dB(A)	
HeatPAC 24-W	307	260	55	47	38	3100	3,900	1,000	2,000	76	6.5
HeatPAC 26-W	461	391	79	71	48	3,900	4,100	1,000	2,000	78	6.5
HeatPAC 28-W	615	521	114	95	55	4,200	4,300	1,000	2,000	79	6.5
HeatPAC 104-W	725	611	136	112	73	5,100	4,500	1,000	2,000	82	6.5
HeatPAC 106-W	1,087	916	207	168	87	5,600	4,900	1,000	2,000	83	6.5
HeatPAC 108-W	1,432	1,206	253	224	104	6,200	5,300	1,000	2,000	84	6.4
HeatPAC 112-W	2,078	1,742	399	338	121	8,800	5,700	1,000	2,100	85	6.2
HeatPAC 116-W	2,663	2,224	487	444	130	9,800	6,000	1,000	2,100	85	6.0

## Water condenser inlet 70 °C, outlet 90 °C and evaporator inlet 39 °C, outlet 34 °C

Type	Heating capacity	Cooling capacity	E-motor	Power consumption (shaft)	R717 charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft heating
	kW	kW	kW	kW	kg	kg	L	W	H	dB(A)	
HeatPAC 704-W	341	269	97	77	35	3,500	3,800	1,000	2,100	83	4.4
HeatPAC 706-W	511	403	136	116	44	4,200	4,000	1,000	2,100	84	4.4
HeatPAC 708-W	682	537	172	154	54	5,000	4,400	1,000	2,100	85	4.4
HeatPAC 712-W	1,023	805	271	232	73	6,250	5,200	1,000	2,100	86	4.4
HeatPAC 716-W	1,346	1,059	347	308	88	7,000	6,000	1,000	2,100	86	4.4

W = Heat pump unit water/water.

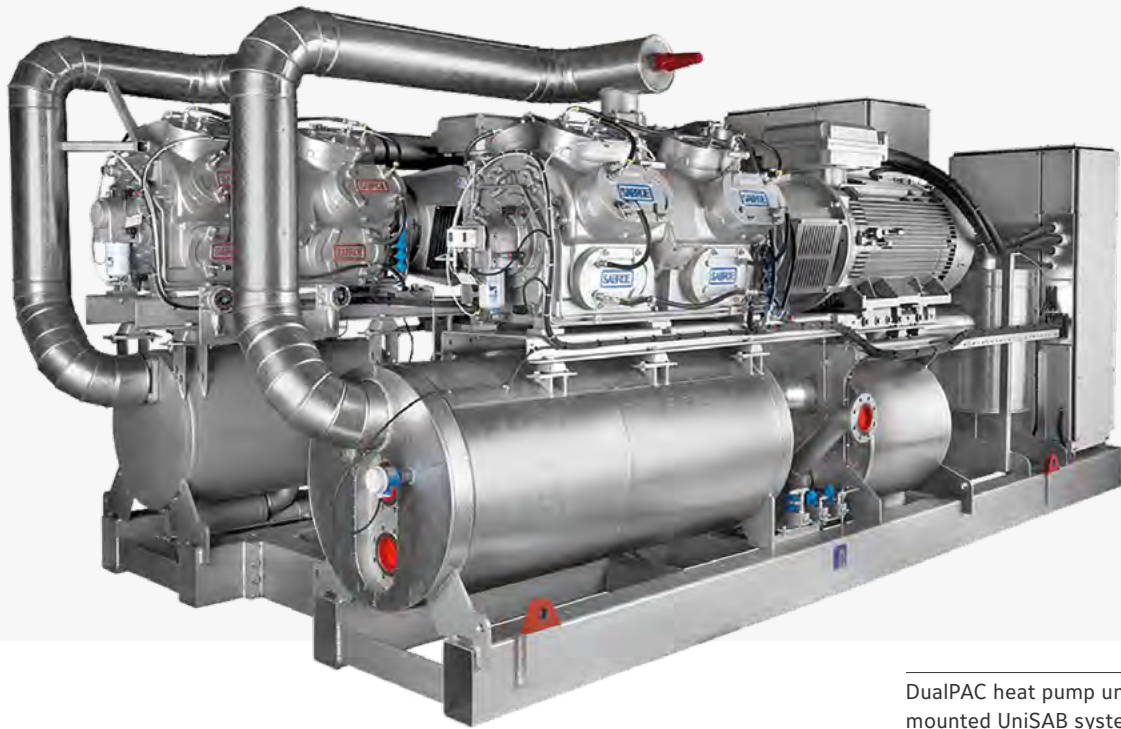
All data and nominal capacities kW at 1,800 rpm.

All HeatPACs: 60 Hz or VSD operation possible.

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the unit.

### Options

- Cascade evaporator
- Desuperheater
- Subcooler
- Variable-speed drive (VSD)
- Soft-starter or Y/D starter
- Control panel mounted separately
- Customer-witnessed factory acceptance test (FAT)
- Enclosure for outdoor installation



DualPAC heat pump unit with panel-mounted UniSAB systems controllers

# Sabroe DualPAC Heat Pumps

Two-stage ammonia-based heat pumps with capacities of up to 3,000 kW

Sabroe DualPAC heat pumps combine ChillPAC and HeatPAC 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 configuration is optimised for use in district heating and ground-source cooling.

The DualPAC is a two-stage high-temperature heat pump configuration that uses ammonia as refrigerant. It is designed with the aim of providing the best possible performance and versatile operating conditions. This unique setup ensures maximum flexibility in both configuration and capabilities, because all standard ChillPAC and HeatPAC models can be used.

DualPAC is an exceptional heat pump for utilising low source temperatures and supplying high temperatures at high capacity. The unique heat exchangers and vessels ensure minimum refrigerant charge as well as the highest possible efficiency.

## Range

There are seventeen different models in the range of DualPAC heat pumps, with capacities ranging from 400 kW to 3,000 kW.

Features	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 purpose-designed open inter-stage cooler	Ultra-low refrigerant charge and small footprint
Space-saving footprint, with fewer moving parts and very low vibration	Exceptional reliability and low maintenance costs
Service and maintenance based on load-based service schedules	Improved reliability, longer service intervals, minimal downtime, low cost of ownership



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

Type	Heating capacity	Cooling capacity	Power consumption (shaft)	R717 charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft heating
	kW	kW	kW	kg	kg	L	W	H	dB(A)	
DualPAC 24-W	434	345	90	53	5,800	3,500	3,000	2,000	82	4.8
DualPAC 26-W	652	519	134	60	6,200	3,700	3,000	2,000	83	4.9
DualPAC 28-W	869	692	178	71	6,500	3,750	3,000	2,000	84	4.9
DualPAC 104-W	1,039	827	213	78	7,500	5,000	3,000	2,000	84	4.9
DualPAC 106-W	1,557	1,232	325	103	9,200	5,500	3,000	2,000	85	4.8
DualPAC 108-W	2,075	1,625	450	119	12,500	6,000	3,000	2,200	86	4.6
DualPAC 112-W	2,895	2,266	628	132	16,000	7,500	3,000	2,200	86	4.6
DualPAC 704-W	498	395	102	53	7,000	4,200	3,000	2,100	86	4.9
DualPAC 706-W	747	594	153	64	8,500	4,500	3,000	2,100	86	4.9
DualPAC 708-W	996	789	206	78	10,000	5,000	3,000	2,100	87	4.8
DualPAC 712-W	1,494	1,180	312	106	13,500	5,500	3,000	2,100	88	4.8
DualPAC 716-W	1,991	1,559	433	118	16,500	6,100	3,000	2,100	89	4.6

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

Type	Heating capacity	Cooling capacity	Power consumption (shaft)	R717 charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft heating
	kW	kW	kW	kg	kg	L	W	H	dB(A)	
DualPAC 704-W	460	318	150	57	7,000	4,200	3,000	2,100	86	3.1
DualPAC 706-W	690	476	223	65	8,500	4,500	3,000	2,100	86	3.1
DualPAC 708-W	920	623	298	75	10,000	5,000	3,000	2,100	87	3.1
DualPAC 712-W	1,381	940	445	102	13,500	5,500	3,000	2,100	88	3.1
DualPAC 716-W	1,841	1,243	608	114	16,500	6,100	3,000	2,100	89	3

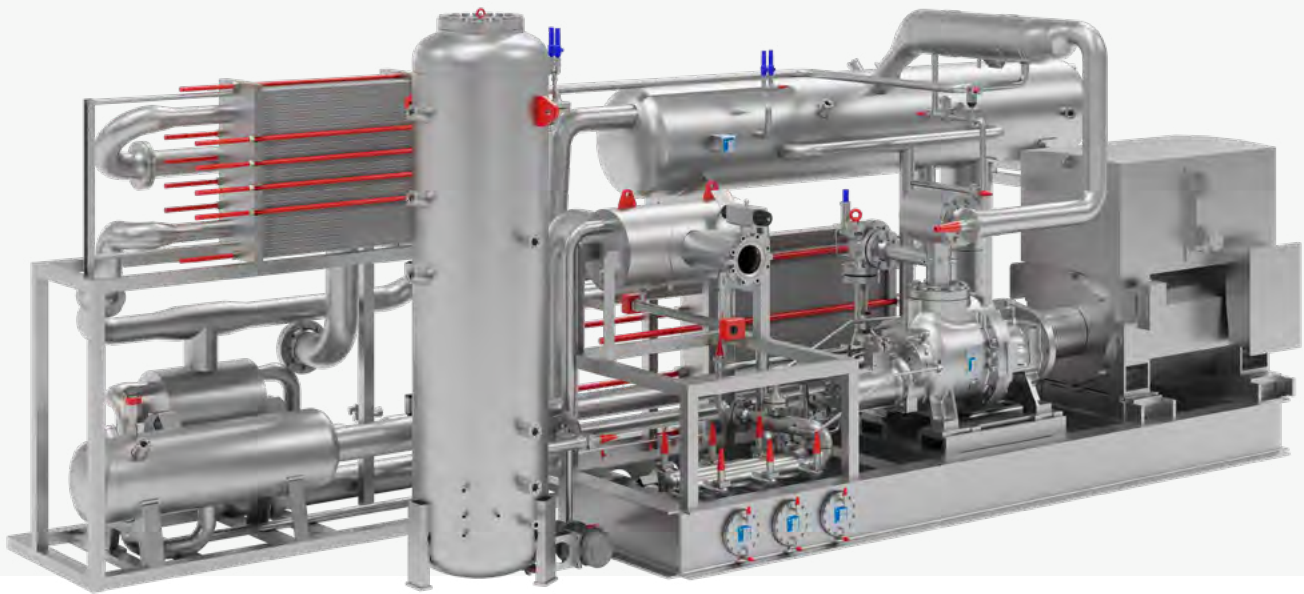
W = Heat pump unit water/water

Please contact your Sabroe representative for availability.

Dimensions, weight and sound pressure levels are guidelines only.  
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the unit.

## Options

- Variable-speed drive (VSD)
- Soft-starter or Y/D starter
- Desuperheater
- Subcooler
- Control panel mounted separately
- Shunt solution for high-temperature difference
- Customer-witnessed factory acceptance test (FAT)



## Sabroe HicaHP Heat Pumps

Sabroe HicaHP 273 S

Ammonia-based heat pumps using screw compressors with capacities ranging from 2 MW to 9 MW, delivering up to 95°C

Sabroe HicaHP (high capacity heat pumps) are compact heat pumps optimised to enable large-scale heat pump installations to support your path to net zero.

By using the environmentally-friendly natural refrigerant ammonia, HicaHP can deliver high water temperatures of up to 95°C at a high capacity yet with minimum energy needed to operate the compressor.

HicaHP heat pumps are optimised at 40 bar or 63 bar design pressure, enabling a supply temperature up to 72°C or 95°C respectively, offering an optimal solution for various temperature needs.

To achieve 95°C supply, HicaHP uses a unique high-pressure compressor developed and designed specifically for high-pressure heat pump applications. These compressors have optimised rotor profiles in a design that ensures exceptional reliability, low deflection, high efficiency and long service life.

### Range

There are four different models in the range of HicaHP heat pumps, with capacities ranging from 2 MW to 9 MW.

Features	Benefits
Factory-assembled, pre-tested packaged units, including capacity test	Easy pre-commissioning makes installation and running-in both faster and cheaper
Newly developed, short and robust rotor profile, specifically for heat pump operation	Increased lifetime and service intervals, minimising total life cycle costs
Based on solutions to reduce vibrations and supply a compact and flexible design	Increased reliability and uptime resulting in low life cycle costs
Small, space-saving footprint, with fewer moving parts and very low vibration level	Exceptional reliability, low maintenance costs and very easy access for service
Condition-based service schedules, which help improve safety and ensure maximum reliability	Optimised service/maintenance intervals, minimal unscheduled downtime

## Single-stage HicaHP

Model	Hot side In/out	Cold side In/out	Cooling capacity	Heating capacity	Line power consumption	Sound pressure level	COP line heating
	°C	°C	kW	kW	kW	db(A)	
HicaHP 193S	50/72	20/12	1,266	1,656	424	84	3.9
HicaHP 233S	50/72	20/12	2,281	2,960	740	86	4
HicaHP 273S	65/95	40/30	2,917	4,001	1,164	84.3	3.4
HicaHP 273L	65/95	40/30	3,896	5,337	1,548	85.9	3.4
HicaHP 273S	65/95	50/40	4,016	5,166	1,236	84.3	4.2
HicaHP 273L	65/95	50/40	5,362	6,891	1,642	85.9	4.2

## Two-stage HicaHP

Model	Hot side In/out	Cold side In/out	Cooling capacity	Heating capacity	Line power consumption	Sound pressure level	COP line heating
	°C	°C	kW	kW	kW	db(A)	
HicaHP 273S/283L	65/95	20-10	4,548	6,741	2,345	86.4	2.8
HicaHP 273L/355S	65/95	20-10	5,680	8,508	3,016	87.5	2.8

Sound pressure levels are guidelines only.

## Options

- Different oil cooler layouts based on customer needs
- High-voltage motors
- Customer-witnessed factory acceptance test (FAT)





# Sabroe High-Temperature Heat Pumps

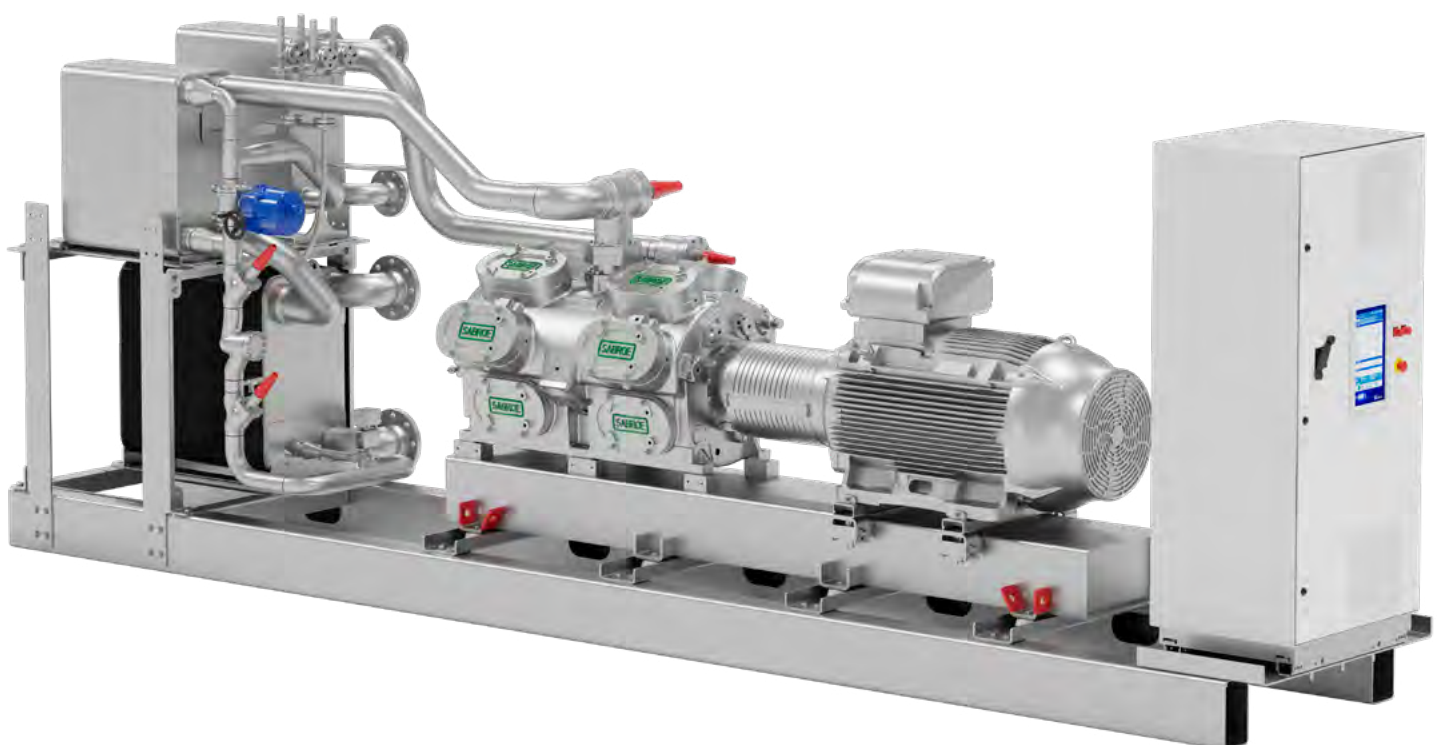
Higher degrees and higher efficiency  
applying Sabroe green technology  
– increased competitiveness

Heat pumps are designed to transfer heat, rather than generate it, enabling a much higher conversion of electricity to useful process heat. At Sabroe, we have decades of experience developing industrial heat pumps based on the principles of industrial refrigeration.

Our most recent accomplishments  
– up to 120-130°C

We have designed and developed two new series of high temperature heat pumps.

- The HyePAC (hybrid high-temperature ammonia-water heat pump) – up to 130°C.
- The HitemHP reaches temperatures of up to 125°C – utilizing hydro-carbon refrigerants such as butane or Iso-butane.



# Sabroe's high temperature heat pump programme





Sabroe HyePAC-D 112

# Sabroe HyePAC Heat Pumps

Ammonia-water heat pumps using reciprocating compressors with capacity range of 500 kW to 2,300 kW, delivering temperatures up to 130°C.

Sabroe HyePAC is a series of highly efficient heat pumps using hybrid absorption compression to generate high temperatures with low operating pressures.

By using the natural refrigerants ammonia and water, HyePAC can deliver water temperatures up to 130°C with minimal power consumption needed.

This green technology paves the way for carbon-neutral operations, ensuring environmentally friendly production for virtually every enterprise.

## Based on SMC and HPC compressors

HyePAC heat pumps use the renowned SMC and HPC compressor series, which is particularly effective under part-load conditions and offers a reliable solution with long service life.

The operating flexibility of the compressors and the technology is ideal for current market requirements. They can operate with medium or high-temperature sources as either a one-stage or two-stage heat pump.

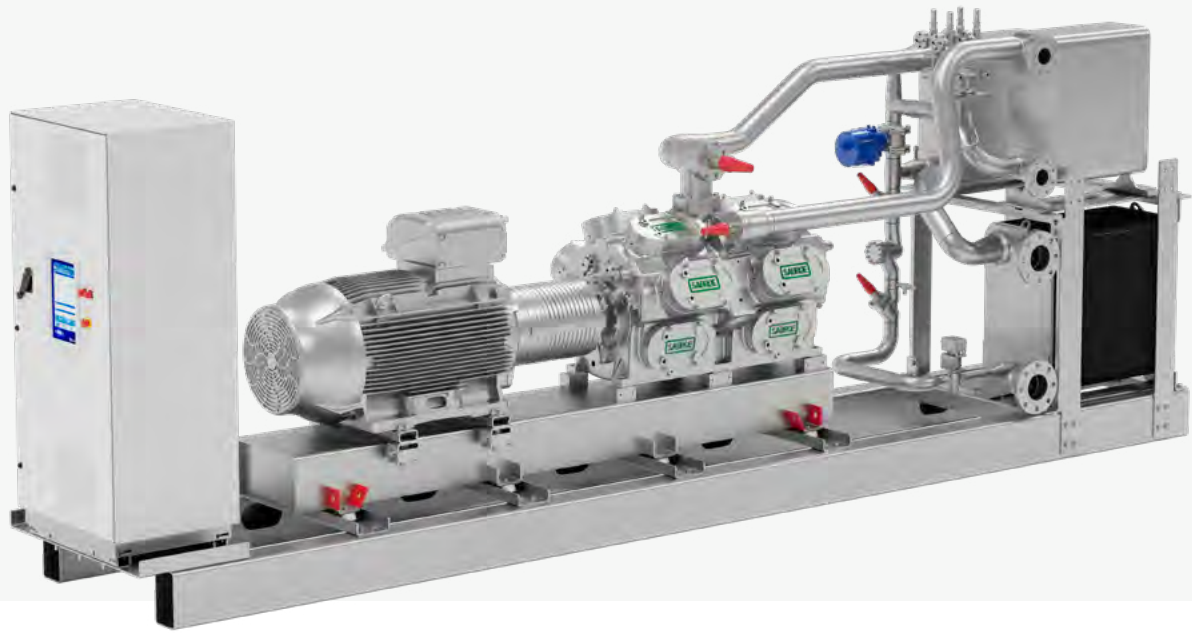
## Range

HyePAC is available as a single-stage and two-stage heat pump (HyePAC-D). There are multiple different models with both single and twin compressors to cover a large capacity range from 500 kW to 2,300 kW.

Features	Benefits
Factory-assembled, pre-tested packaged units, including capacity test	Easy pre-commissioning makes installation and running-in faster and cheaper
Low operating pressure to supply high temperature	Increased lifetime and service intervals, minimising total life cycle cost
High coefficient of performance (COP) due to low pressure difference and temperature glide	Fast return on investment and low operating costs
Variable-speed drive and UniSAB compressor package controller as standard	Outstanding part-load performance and maximum operating flexibility
Control algorithm to adjust water/ammonia ratio based on operating conditions	Optimal performance in case of changing operating conditions, ensuring high COP in multiple conditions



HyePAC – single-stage heat pumps							Compressors
Model	Cold side In/Out	Hot side In/Out	Heating capacity	Cooling capacity	Power consumption (shaft)	COP shaft heating	
	°C	°C	kW	kW	kW		
HyePAC 104L	80/65	85/115	501	428	96	5.2	Chillers
HyePAC 106L	80/65	85/115	752	642	144	5.2	
HyePAC 108L	80/65	85/115	1,002	856	192	5.2	
HyePAC 112L	80/65	85/115	1,504	1,284	288	5.2	
HyePAC 116L	80/65	85/115	2,004	1,712	384	5.2	
HyePAC 104L	70/55	85/110	426	358	93	4.6	
HyePAC 106L	70/55	85/110	639	537	140	4.6	
HyePAC 108L	70/55	85/110	852	716	186	4.6	
HyePAC 112L	70/55	85/110	1,278	1,074	280	4.6	
HyePAC 116L	70/55	85/110	1,704	1,432	372	4.6	
HyePAC 104L	65/45	85/105	356	293	89	4	Heat pumps
HyePAC 106L	65/45	85/105	534	440	134	4	
HyePAC 108L	65/45	85/105	712	586	178	4	
HyePAC 112L	65/45	85/105	1,068	879	267	4	
HyePAC 116L	65/45	85/105	1,424	1,172	356	4	
HyePAC-D – two-stage heat pumps							Controls
Model	Cold side In/Out	Hot side In/Out	Heating capacity	Cooling capacity	Power consumption (shaft)	COP shaft heating	
	°C	°C	kW	kW	kW		
HyePAC-D 104	80/65	100/130	833	676	209	4	Heat exchangers
HyePAC-D 106	80/65	100/130	1,249	1,014	314	4	
HyePAC-D 108	80/65	100/130	1,666	1,352	418	4	
HyePAC-D 112	80/65	100/130	2,300	1,868	570	4	
HyePAC-D 104	70/55	100/125	824	654	228	3.6	
HyePAC-D 106	70/55	100/125	1,236	981	342	3.6	
HyePAC-D 108	70/55	100/125	1,648	1,308	456	3.6	
HyePAC-D 112	70/55	100/125	2,300	1,826	636	3.6	
HyePAC-D 104	65/45	100/120	810	625	256	3.2	
HyePAC-D 106	65/45	100/120	1,215	938	384	3.2	
HyePAC-D 108	65/45	100/120	1,620	1,250	512	3.2	Customised
HyePAC-D 112	65/45	100/120	2,300	1,775	727	3.2	
Options							AfterMarket
<div><div><div>• Heat exchanger design (to handle different temperatures down to 7K)</div><div>• Twin version (for high capacity at low source temperature)</div></div><div><div>• Customer-witnessed factory acceptance test (FAT)</div><div>• Control panel mounted separately</div></div></div>							



Sabroe HitemHP

# Sabroe HitemHP Heat Pumps

Single-stage, low-pressure, hydrocarbon-based heat pumps with capacity range of 150 kW to 1,200 kW and temperatures up to 125°C

The Sabroe HitemHP heat pump series uses the excellent thermodynamic properties of hydrocarbon as refrigerant.

We replaced traditional boilers with green refrigeration technology based on two natural refrigerants – iso-Butane and Butane – that allow customers to meet market temperature demands.

This series is suitable for indirect steam production and for industries such as food and beverage that require processes like pasteurisation or sterilisation.

Based on Sabroe’s renowned reciprocating compressor technology, the series reaches temperatures up to 125°C. Customers can select the right refrigerant for each application to secure the highest level of efficiency.

Each refrigerant has different maximum outlet temperatures; 110°C (iso-Butane), and 125°C (Butane). With these refrigerants, the heat pump runs at a low-pressure configuration (below 28 barG).

## Range

The HitemHP is available in an enclosure by first release. For future reference the HitemHP can be delivered as a standalone heat pump unit. The heat pump series will cover 10 standard models, with capacities ranging from 150 kW to 1,200 kW.

Features	Benefits
Factory-assembled, pre-tested package units based on Sabroe reciprocating compressors world renowned for their reliability	Easy pre-commissioning makes installation and running-in both faster and more cost-efficient
Compact single-stage configuration weighs less and takes up less space than bespoke and/or two-stage heat pump design	Easy to mount even in confined spaces
Exceptional COP and outstanding part-load performance	High energy-efficiency, low operating costs
Based on direct dry expansion system	Lower refrigerant charge for lower risk
Based on low-pressure refrigerant. Same platform for both refrigerants	The customer gets the lowest first cost no matter what their temperature requirements are

Water-cooled condenser inlet 100°C, outlet 120°C and evaporator inlet 50°C, outlet 45°C

Type	Heating capacity	Cooling capacity	E-motor	Power consumption (shaft)	Ref. charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft heating
	kW	kW	kW	kW	kg	kg	L	W	H	dB(A)	-
HitemHP 104 S	155	107	52	48	10	5,360	5,350	1,250	2,250	85.1	3.2
HitemHP 104 L *	159	111	52	48	11	5,380	5,400	1,250	2,250	85.7	3.3
HitemHP 106 S	233	161	76	72	16	5,545	5,750	1,250	2,250	86.5	3.2
HitemHP 106 L *	240	168	76	72	16	5,565	5,750	1,250	2,250	87.1	3.3
HitemHP 108 S	308	215	99	93	21	5,760	5,750	1,250	2,250	87.6	3.3
HitemHP 108 L *	318	224	100	94	21	5,795	5,750	1,250	2,250	88.2	3.4
HitemHP 112 S	460	322	146	138	31	6,420	6,500	1,250	2,250	88.4	3.3
HitemHP 112 L *	476	336	148	140	32	6,445	6,500	1,250	2,250	89.1	3.4
HitemHP 116 S	613	430	194	183	41	6,670	6,500	1,250	2,250	89.6	3.3
HitemHP 116 L *	636	450	196	186	43	6,700	6,500	1,250	2,250	90.2	3.4

Water cooled condenser inlet 65°C, outlet 105°C and evaporator inlet 52°C, outlet 47°C

Type	Heating capacity	Cooling capacity	E-motor	Power consumption (shaft)	Ref. charge	Dry weight	Unit dimensions in mm			Sound pressure level	COP shaft heating
	kW	kW	kW	kW	kg	kg	L	W	H	dB(A)	-
HitemHP 104 S	298	239	62	59	20	5,360	5,350	1,250	2,250	85.1	5.1
HitemHP 104 L *	298	239	63	59	20	5,380	5,400	1,250	2,250	85.7	5.1
HitemHP 106 S	449	361	94	88	30	5,545	5,750	1,250	2,250	86.5	5.1
HitemHP 106 L *	464	375	93	89	31	5,565	5,750	1,250	2,250	87.1	5.2
HitemHP 108 S	596	480	122	116	40	5,760	5,750	1,250	2,250	87.6	5.1
HitemHP 108 L *	617	500	125	117	41	5,795	5,750	1,250	2,250	88.2	5.3
HitemHP 112 S	884	711	183	173	59	6,420	6,500	1,250	2,250	88.4	5.1
HitemHP 112 L *	919	744	185	175	61	6,445	6,500	1,250	2,250	89.1	5.3
HitemHP 116 S	1,184	955	241	229	79	6,670	6,500	1,250	2,250	89.6	5.2
HitemHP 116 L *	1,226	993	245	233	82	6,700	6,500	1,250	2,250	90.2	5.3

Capacities are nominal at 1,800 rpm

\* Capacities are nominal at 1,500 rpm

Dimensions, weight and sound pressure levels are guidelines only.

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

## Options

- Variable-speed drive (VSD)
- Control panel mounted separately
- Customer-witnessed factory acceptance test (FAT)

Min./max. speed	R600A / R600
SMC S	500-1,800 rpm
SMC L	500-1,500 rpm







# Sabroe Controls





SABROE UniSAB4

Home

Operating values

MultiSAB++

Compressor operating values

Suction	Pressure	Temperature	Superheat
Discharge	2.0 bar	5.4 °C	14.7 °C
Oil	14.0 bar	50.0 °C	41.4 °C
Oil-filter differential		11.0 bar	55.0 °C
Oil-separator			5.0 bar
Compressor		Speed	Slide capacity
		1000 rpm	-27.0 %
			Capacity
			0.0 %

Package operating values

Process Out	
User 1 Input	20.0 °C
Capacity Slide Position	0.0
VI slide position	3.0 %
Lubrication pressure	5.1 %
Main oil pressure	10.7 bar
Oil circuit pressure	9.5 bar
Pressure ratio	1.0 bar
VSD reference output	0.0 bar
	0.0 %

Mode:

Control:

State:

Active timer:

Auto

Suction pressure

Running

Slide down

Actual process value:

Process setpoint:

Capacity:

Logged in as:

2.0 bar

1.5 bar

0.0 %

superheat



UniSAB® 4





# Control systems for every requirement

## Matching operations to conditions

One of the most effective ways to improve the overall efficiency of your refrigeration setup is to make sure your processes and operations are always in tune with constantly changing operating parameters and equipment status, as well as unpredictable weather and climate conditions.

Sabroe control solutions and monitoring systems combine to leverage the effectiveness and operational reliability of all kinds of industrial refrigeration and heat pump applications, as well as the efficiency of the industrial processes of which they are a part.

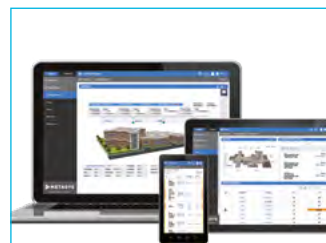
These systems enable you to take fully informed decisions when dealing with changes in – and changes to – operating conditions. Reliable, easy-to-use features help you improve the energy efficiency of your operations, reduce your operating costs and boost your return on investment.

Sabroe control and monitoring solutions combined with Johnson Controls' OpenBlue suite of connected solutions make it easy to harvest, collate and apply operating data to service solutions, such as remote diagnostics, predictive maintenance, advanced risk assessment and more.

Efficiency  
Uptime  
Best practices  
Connectivity  
Compliance



UniSAB



Web



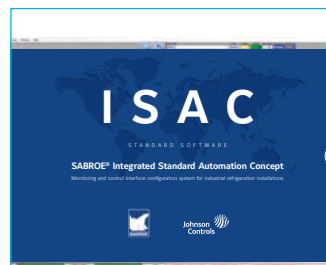
Chiller and Heat Pump Plant  
Controller



Condensing Pressure Optimiser  
(CP Optimiser)



Sabroe panels



Integrated Standard  
Automation Concept (ISAC)



Released: Juli 2024

## UniSAB 4

The new UniSAB controller generation for industrial refrigeration compressors, heat pumps and chillers. It's Sabroe, naturally.

After many years in service, the time has come to say thank you to UniSAB III and pass on its legacy to UniSAB 4.

Sabroe UniSABs are cutting edge and industry leading on asset protection and the ability to limit the total cost of equipment ownership. The UniSAB offers proven reliability for the compressor as well as the controller itself, and wins indisputably on all the parameters most important to owners of IR equipment – highest possible plant uptime, yield accuracy, lowest possible total cost of equipment ownership and, not least, cost effectiveness.

UniSAB 4 is 125 years of expertise packaged in new powerful hardware, with IoT connectivity capabilities and a 10" colour touchscreen for quick, intuitive on-screen navigation. Novel, yet already reputable with its acknowledged compact design inherited from its distinguished predecessor, the UniSAB III.

### Selected UniSAB 4 highlights

- New powerful hardware with more inputs and outputs
- Same footprint and cable-wire plug configuration as UniSAB III
- 10" colour touchscreen
- Embedded web browser
- User screens as mobile-friendly responsive web pages
- Secure internet connection
- Flexible and user configurable Multisab++ sequencing system
- Industrial communication protocols.  
Modbus TCP and Profibus DP (compatible with UniSAB III)
- Available for retrofit. Release for sale: January 2025
- UniSAB 4 is fully integrated with Johnson Controls OpenBlue services

**UniSAB 4. More capable. More flexible. More efficient.**

## Technical data

Enclosure:	IP55 box version, IP55 panel version
Ambient temperature:	0-55°C box version
Ambient humidity:	10-90% non-condensing
Power supply:	100-240 VAC, 50-60 Hz
Dimensions (H x W x D):	380*300*210 mm
Max. own consumption:	20 VA
Max. supply fuse:	10 A
Weight:	6.5 kg
Cable entry:	Flanges included
Compliance:	CE
Approvals:	Marine DNV UL, cUL

## System information

Operating system:	Linux
Graphical user interface:	10.1" colour touchscreen. Web server, embedded web browser, cyber secure IoT connectivity.
Communication protocols:	Modbus TCP via on-board Ethernet interface. Profibus DP via optional serial interface card. Profinet (future).
Inputs/outputs:	18 digital in, 25 digital out, 25 analogue in, 5 analogue out.

## Application support

Compressors supported:	Fixed and variable speed reciprocating compressors, with or without solenoid activated unloading system.  Fixed and variable speed screw compressors, with or without automatic capacity slide and VI-slide system.
Applications supported:	Industrial chiller applications.  Industrial heat pump applications.  Pump circulation and self-circulation refrigerant systems.  DX systems.
Refrigerants:	12 preloaded refrigerant tables, e.g. R717, R600, R290, R744 and a universal.
Languages:	19 preloaded languages, e.g. English, Danish, French, German, Spanish.
Main features:	Advanced compressor protection and limiter system.  Dynamic service interval computations.  Smart, efficient capacity regulation systems for automatic control of capacity steps, capacity slide, VI-ratio and motor speed, curbing the wear of parts, securing the yield accuracy and optimising performance of the single package.  Special heat pump compressor protective features.  Built-in Multisab++ sequencing system for effective load distribution among multiple UniSAB 4s and UniSAB IIs on compressors in a refrigerant pressure system or water temperature system, curbing wear, optimising performance, securing maximum plant uptime and yield accuracy of the total machine room compressor base.  Remote control of capacity, remote setpoint, remote process sensor, outdoor compensation sensor.  Automatic switching of parameter sets via digital inputs or communication interface (e.g. for seasonal switching between cold and hot side control of chillers/heat pumps) (future function).  Condenser capacity control signal (future function).  Control of pumps and valves on hot and cold side of heat pumps (for control of source/sink water energy and temperatures) (future function).





SVM system

# Sabroe Vibration Monitoring system (SVM)

Automatic vibration monitoring system for Sabroe screw compressors

SVM provides accurate, continuous monitoring of the bearing vibration levels in Sabroe screw compressor packages, adding significant extra safety margins and potentially extending the service life of these crucial compressor components. Planning service life can now be based on the real condition of these bearings, rather than on mere projections.

SVM offers on-screen trending and inspection of vibration levels, commissioning tool for determination of the vibration level threshold values (for alarm and shutdown), remote monitoring opportunities, and it is also Johnson Controls OpenBlue ready.

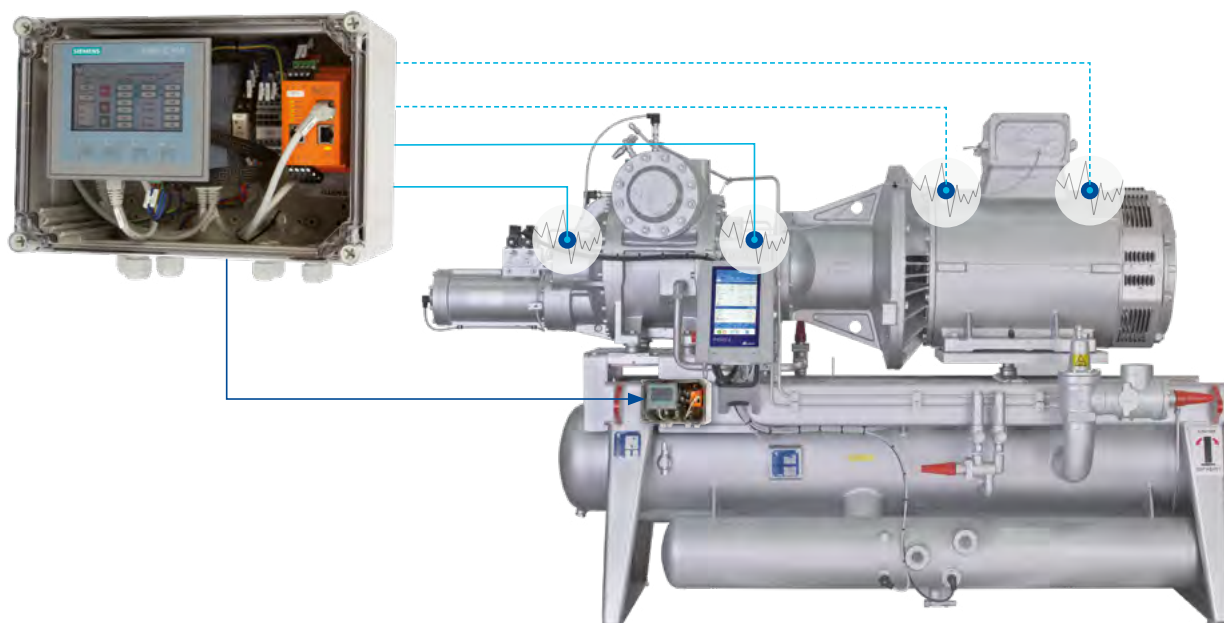
With the connected speed feedback signal and preprogrammed bandwidth for broadband monitoring, SVM can filter away the harmless lobe passing frequencies that might give misleading signal levels and focus only on the frequency ranges that give the best early indications of bearing fatigue. With the 1X rotational speed function, SVM may also be able to capture sudden imbalance (e.g. in the coupling), giving SVM a chance to stop the compressor before it causes a major breakdown.

SVM's potential free contact output for protective machine shutdown is connected to the safety circuit in the UniSAB III, but the generic signal design enables conventional hardwired integration with any design of electrical starter circuits.

The SVM package includes two factory-mounted accelerometers for the compressor, but it is also possible to add two additional accelerometers for compressor motor bearing monitoring.

With the SVM system, the conventional 6-month vibration analysis – normally recommended to make sure the screw compressor components comply with expected vibration levels, based on the full-spectrum baseline established at start-up – is no longer required.

Advantages	Benefits
SVM receives motor speed data from the variable-speed drive (VSD), enabling SVM to ignore normal lobe passing frequencies and detect only for damaging frequencies	Suppresses misleading signals and therefore avoids false alarms and shutdowns
Constant monitoring of bearing vibration development ensures the best possible preventive monitoring of bearing conditions	The standard recommended 6-month vibration analysis, using the Sabroe VibraGuard tool, is no longer required
Early warning of any increasing bearing fatigue	Paves the way to effective repair planning that avoids costly disruption of plant operations
UniSAB III systems controller automatically shuts down the compressor before any vibration level reaches a critical threshold	Less risk of severe equipment damage



## Installation and operation

SVM is available as a factory-mounted option only.

For installation in hazardous areas, please contact your Johnson Controls sales representative.

Technical data		Ordering information	
<b>Main component</b>	IFM VSE153 vibration analysis module Siemens PLC type S7-1200 Siemens touch panel type KTP400 Basic 4"	<b>SAB-Vib01</b>	SVM kit, including 2 accelerometers for the compressor, 1 SVM box, mounting and cable installation on the compressor unit
<b>Power supply</b>	24V DC, min. 800mA	<b>SAB-Vib02</b>	Danfoss MCB101 I/O expansion module (required for Danfoss VSD)
<b>Dimensions HxWxD</b>	300 x 200 x 186 mm	<b>SAB-Vib03</b>	Two accelerometers for the motor (optional)
<b>Ingress protection</b>	IP55	<b>SAB-Vib04</b>	Addition to box for support of a second compressor, including vibration sensors for the compressor. Vibration sensors for no. 2 motor and I/O module for no. 2 Danfoss VSD is not included and must be added separately
<b>Compliance</b>	CE		
<b>Enclosure</b>	Plastic – Ensto OABP302018T		
<b>Cable connections</b>	4 x M16, 3 x M20		
<b>Ambient temperature</b>	-40°C to 70°C		



Sabroe VSD panel

## Sabroe VSD Panel

Electrical panel solution for refrigeration compressor units with variable-speed drive (VSD)

Sabroe VSD (variable-speed drive) panel solutions are the ideal way to integrate the unique Sabroe combination of refrigeration compressor unit know-how with electrical and controls experience and technologies. This paves the way to optimising the operation of refrigeration compressor units, and thus bring down here-and-now operating costs as well as longer-perspective lifecycle costs for the owner.

Sabroe VSD panels are integrated electrical panel solutions with a built-in frequency inverter and additional control equipment that together make them very easy to integrate into your overall power supply and control system.

Adding an optional UniSAB systems controller makes the VSD panel a complete plug-and-play controls and motor drive solution, ready to ensure your compressor package delivers maximum cooling power with minimum lifecycle costs.

Factory-mounted units provide the best value for money, because delivering complete pre-vetted units ensures trouble-free operation and an electrical installation in full accordance with relevant standards and best practice. It also ensures end-users big savings on the man-hours required for configuring the overall equipment setup.

Features	Benefits
Competitively priced electrical panel solution for variable-speed drive of compressors, chillers and heat pumps	Easy to opt in for the Sabroe VSD panels, which will save you additional shop-stops
The optimised compact design fits the Sabroe small footprint package philosophy	Saves valuable space and leaves room for other important purposes
Pre-vetted, documented and intelligently engineered solutions, containing everything needed for easy, compliant integration	Saves a lot of time on electrical engineering, design, documentation, installation and commissioning
Can be combined with UniSAB III systems controller, making an efficient and flexible integrated compressor control and speed-drive solution	An extremely low life cycle cost of the compressor package



The VSD panels are available for the Sabroe compressor, chiller and heat pump units specified below. These panels are available as standard for power configurations up to 450 kW. Configurations up to 1,000 kW are available on request.

### Factory-mounted

- ChillPAC chillers
- PAC chillers
- HeatPAC heat pumps

### Separate delivery for site mounting

- ChillPAC chillers
- PAC chillers
- HeatPAC heat pumps
- Screw compressors (all VSD-enabled)
- Reciprocating compressors (all VSD-enabled)

### Retrofit

Sabroe VSD panels are also ideal for retrofit of the existing electrical starter systems. Sabroe VSD panels are mounted in a standardised painted-steel cabinet, and include the following equipment:

- Electrical engineering, documentation and parameter settings list for the frequency inverter
- Danfoss FC102 frequency inverter, including RFI filter
- High-frequency common mode filter for bearing current suppression
- UniSAB controller for panel mounting (optional – must be selected separately)
- Main circuit breaker
- Control voltage transformer
- Emergency stop and emergency stop safety relay
- Motor protection
- Current feedback signal to UniSAB
- Relays for signals to UniSAB
- Hour counter
- Terminals for interlock with pumps, etc.
- MCB for control voltage to panel
- MCB for control voltage to UniSAB
- MCB for power to immersion heater in oil separator
- Cable inlet/outlet in panel bottom.

Technical data			
Nominal output	Dimensions in mm		
kW/amp	W	H	D
22/44	816	1,434	624
30/61	816	1,434	624
37/73	816	1,434	624
45/90	816	1,434	624
55/106	816	1,434	624
75/147	816	1,434	624
90/177	816	1,434	624
110/212	816	1,626	624
132/260	816	1,626	624
160/315	816	1,818	624
200/395	816	1,818	624
250/480	816	1,818	624
315/600	816	1,818	624
355/658	1,200	2,202	816
400/745	1,200	2,202	816
450/800	1,200	2,202	816

Technical data	
Power supply:	3x400 V, 50/60 Hz, +/-10%
Earthing/supply system:	TN-S
Partitioning:	Form 1
Colour:	Light grey
Ingress protection class:	IP54
Compliance:	CE



Sabroe A-frame VSD panel

## Sabroe A-Frame VSD Panel

Electrical panel solution for refrigeration screw compressors with variable-speed drive (VSD)

Sabroe panel solutions for screw compressor units fitted with variable-speed drive are the ideal way to integrate the unique Sabroe combination of refrigeration compressor know-how with electrical and controls experience and technologies. This paves the way to optimising the operation of refrigeration compressor units, and thus bring down here-and-now operating costs as well as longer-perspective life cycle costs for the owner.

The Sabroe A-frame VSD solution for screw compressors is a compact split solution with a separate panel and VSD. The panel includes a UniSAB systems controller as standard.

The A-frame VSD solution is mainly intended for applications where both the inverter and panel are mounted directly onto the compressor unit, or where the inverter is positioned in a different place than the control panel.

Factory-mounted units provide the best value for money, because delivering complete pre-vetted units ensures trouble-free operation and an electrical installation in full accordance with relevant standards and best practice. It also ensures end-users big savings on the man-hours required for configuring the overall equipment setup.

Features	Benefits
Competitively priced solution for variable-speed drive of A-frame screw compressors	Easy to opt in for the Sabroe A-frame VSD solution, which will save you additional shop-stops
The optimised compact design fits the Sabroe small footprint package philosophy	Saves valuable space and leaves room for other important purposes
Pre-vetted, documented and intelligently engineered solutions, containing everything needed for easy, compliant integration	Saves you a lot of time on electrical engineering, design, documentation, installation and commissioning
The combination of a UniSAB III systems controller and VSD makes an efficient and flexible integrated compressor control and speed-drive solution	An extremely low life cycle cost of the compressor package

The A-frame VSD solution is available for the Sabroe screw compressor units specified below. These panels are available as standard for power configurations from 90 kW to 315 kW.

### Factory-mounted (90–315 kW)

- SAB 120–151 series
- SAB 193 S
- ComPAC

### Separate delivery for site mounting

- SAB 120–151 series
- SAB 193 S

### Retrofit

Sabroe A-frame VSD panels are also ideal for the retrofit of existing electrical starter systems.

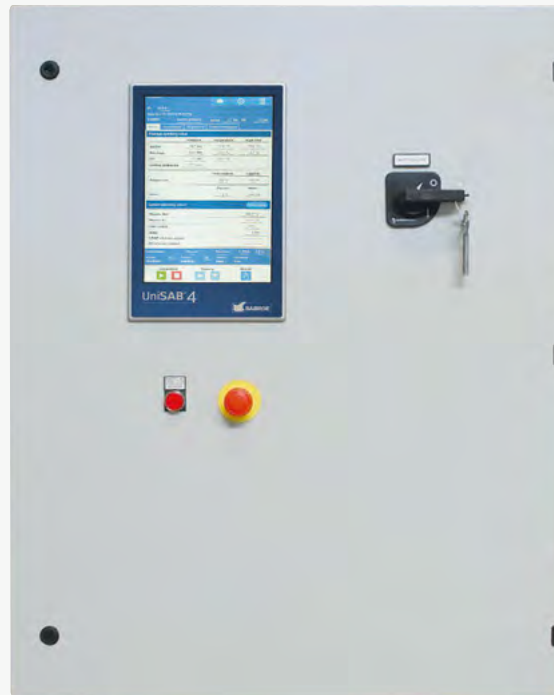
Sabroe A-frame VSD panel solutions comprise a frequency inverter and a control panel in a standardised painted-steel cabinet containing the following equipment:

- Electrical engineering, documentation, and parameter settings list for the frequency inverter
- UniSAB controller
- Main circuit breaker
- Control voltage transformer
- High-frequency common mode filter for bearing current suppression
- Emergency stop and emergency stop safety relay
- Motor protection
- Current feedback signal to UniSAB
- Relays for signals to UniSAB
- Hour counter
- MCB for control voltage to panel
- MCB for control voltage to UniSAB
- MCB for power to immersion heater in oil separator
- Cable inlet/outlet in panel bottom

Technical data - panel	
Power supply:	3x400 V, 50/60 Hz, +/-10 %
Earthing/supply system:	TN-S
Partitioning:	Form 1
Colour:	Light grey
Ingress protection class:	IP54
Compliance:	CE
Dimensions in mm:	W 600 x H 950 x D 400

Technical data - frequency inverter	
Type:	Danfoss FC102
Filter included:	RFI/EMI and common mode
Ingress protection class:	IP54
Dimensions in mm:	W x H x D
90 kW:	370 x 770 x 330
110–160 kW:	325 x 901 x 378
200–315 kW:	420 x 1,060 x 378





Sabroe Y/D Starter Panel

## Sabroe Y/D Starter FSD Panel

Electrical panel solution for refrigeration compressors with fixed-speed drive (FSD)

Sabroe panel solutions for compressor units fitted with fixed-speed motors are the ideal way to integrate the unique Sabroe combination of refrigeration compressor know-how with electrical and controls experience and technologies. This paves the way to optimising the operation of fixed-speed refrigeration compressor units and thus bring down here-and-now operating costs as well as longer-perspective lifecycle cost for the owner.

Sabroe Y/D starter panels are integrated electrical panel solutions with conventional Y/D starters and additional control equipment that together make them very easy to integrate into your overall power supply and control system.

Adding the optional UniSAB systems controller to the panel makes the Y/D starter panel a complete plug-and-play controls and motor starter solution, ready to supply the motor and ensure that the fixed-speed compressor package delivers maximum cooling power at a minimum life cycle cost.

Factory-mounted units provide the best value for money, because delivering complete units ensures trouble-free operation and an electrical installation in full accordance with relevant standards and best practice. It also ensures end-users big savings on the man-hours required for configuring the overall equipment setup.

Features	Benefits
Competitively priced electrical panel solution for fixed-speed drive of compressors, chillers and heat pumps	Easy to opt for the Sabroe Y/D starter FSD panels, which will save you additional shop stops
The optimised compact design fits the Sabroe small footprint package philosophy	Saves valuable space and leaves room for other important purposes
Pre-vetted, documented and intelligently engineered solutions, containing everything needed for easy, compliant integration	Saves you a lot of time on electrical engineering, design, documentation, installation, and commissioning
Can be combined with UniSAB III systems controller, making an efficient and flexible integrated compressor control and motor start solution	A very low life cycle cost of the compressor package

Y/D starter FSD panels are available for the Sabroe compressor, chiller and heat pump units specified below. These panels are available as standard for power configurations up to 560 kW. Configurations above this are available on request.

## Factory-mounted

- ChillPAC chillers
- PAC chillers
- HeatPAC heat pumps
- ComPAC

## Separate delivery for site mounting, all on request

- ChillPAC chillers
- PAC chillers
- HeatPAC heat pumps
- All screw compressors
- All reciprocating compressors

## Retrofit

Sabroe Y/D starter FSD panels are also ideal for the retrofit of existing electrical starter systems.

Sabroe Y/D starter FSD panels are mounted in a standardised painted-steel cabinet and include the following equipment:

- Electrical engineering and documentation
- Y/D starter
- UniSAB controller for panel mounting (optional – must be selected separately)
- Main circuit breaker
- Control voltage transformer
- Emergency stop and emergency stop safety relay
- Thermal overload motor protection
- Current feedback signal to UniSAB
- Relays for signals to UniSAB
- Hour counter
- Terminals for interlock with pumps, etc.
- MCB for control voltage to panel
- MCB for control voltage to UniSAB
- MCB for power to immersion heater in oil separator
- Power inlet in panel top

Technical data	
Power supply:	3 x 400 V, 50/60 Hz, +/-10 %
Earthing/supply system:	TN-S
Partitioning:	Form 1
Colour:	Light grey
Ingress protection class:	IP54
Compliance:	EN60 204-1

Technical data			
Nominal output	Dimensions in mm		
kW	W	H	D
15	600	600	200
22	600	600	200
30	600	600	200
37	600	800	300
45	600	800	300
55	600	800	300
75	800	1,000	300
90	800	1,000	300
110	800	1,000	300
132	800	1,000	300
160	800	1,200	300
200	1,000	1,400	300
250	1,000	1,400	300
315	1,000	1,400	300
355	1,000	1,800	400
400	1,000	1,800	400
450	1,000	1,800	400
500	1,000	1,800	400
560	1,000	1,800	400



# Sabroe Chiller and Heat Pump Plant Controller

The shortcut to obtain full control of uptime, efficiency and life cycle cost

With the Sabroe Chiller and Heat Pump Plant Controller (CHPPC), the parameters to maximise uptime and efficiency and minimise the lifecycle cost of the equipment is available at your fingertips.

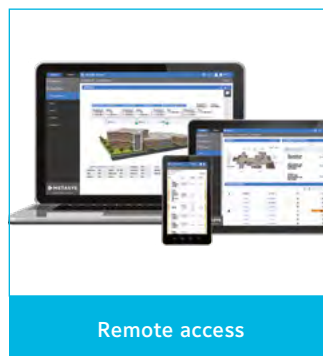
Decades of experience with total integration and daily operation of chiller plants is reflected in the advanced, comprehensive, user-friendly and configurable library of automation functions serving to provide control of the parameters that are paramount to optimisation of the chiller plant as a whole, and not limited to the single chiller.

The CHPPC has been extended to include advanced heat pump plant functions developed to secure a stable and efficient heat pump plant with maximum uptime and the lowest possible lifecycle cost.

Chiller and heat pump plant types now supported by the CHPPC:

- Pure chiller plants with a conventional heat rejection side
- Pure water-to-water heat pump plants
- Combination plants where the heat pumps are also serving cooling purposes on the cold side

The CHPPC functions are brought to life with industrial PLC hardware and a 12" colour touch panel for intuitive and quick customisation to fit the actual plant design and daily operation, all built into a control panel for wall mount.



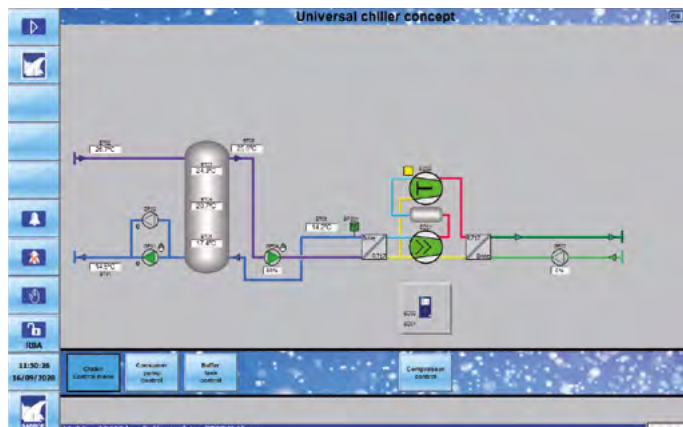
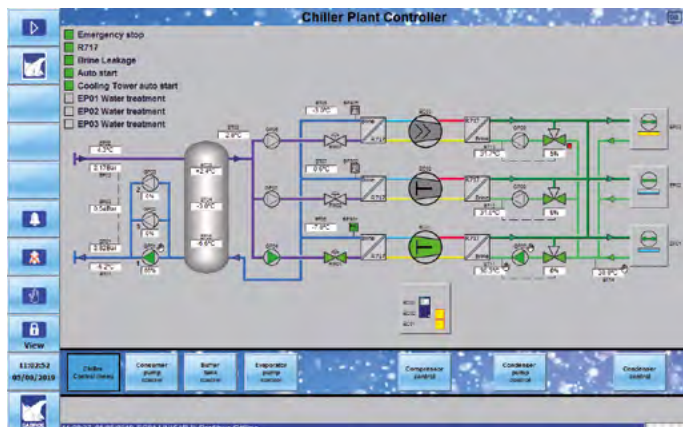
Remote access



Chiller and heat pump plant

Features	Benefits
Advanced and intuitive on-screen configuration	Instant customisation to fit the actual plant design
Pre-engineered, pre-programmed, pre-tested and fully documented electrical control panel with all inputs and outputs internally wired and connected to user-terminals	Provides a huge saving on time and cost related to designing, programming, documenting, installing and commissioning bespoke plants
Advanced functions with a wealth of user features for fully informed decisions, limp mode operation and quick faultfinding	Reduces the time spent on daily inspection routines and interventions to a minimum
Remote connection ready	Peace of mind with remote diagnosis and operation





Chillers and heat pumps are controlled by UniSAB

Cold side	The chiller and heat pump units	Hot side
Distribution pumps (up to three) incl. diff. pressure control	Remote monitoring of UniSAB IIIs on up to four compressors, distributed in four 1-stage or two 2-stage chillers/heat pumps	Fan speed and pump control for air-cooled and evaporative condensers and for dry coolers and cooling towers
Evaporator pumps and shut-off valve (up to four)	Any mix of screw and reciprocating compressors	Shut-off valves in glycol systems
Monitoring of temperatures and pressures in water system	Control signals from CHPPC to UniSABs	Condensing pressure optimisation
Monitoring of temperatures and level switch in buffer tank	Historical data, trends and event analysis of UniSAB III data on central touch panel	Noise reduction with week calendar (fan speed reduction)
Remote start/stop of chillers from buffer tank temperature	Bearing vibration monitoring	Rapid mixing of make-up water during standstill
Monitoring of the functioning of switches, motors and valves	Motor winding and bearing temperature monitoring	Monitoring of the functioning of switches, motors and valves
Leak detection signal from glycol sensor	Leak detection signal from NH <sub>3</sub> gas detector	Low-temperature protection of condenser circuit
Unique to for heat pumps		
Temperature and flow stabilisation with shunt pumps, shunt valves, in-line pumps or recycle pumps	COP optimisation through dynamic intermediate pressure in 2-stage heat pumps	Temperature control with shunt pumps, shunt valves or in-line pumps
Cooling power calculation	Superheat control	Heating power calculation
Common utilities		
Remote connection ready (Internet, LAN). Can be delivered with wireless internet modem on request.		
Profinet, Modbus TCP and OPC-UA protocols supported as standard. Others on request.		
Rich data monitoring of VSD pumps with external VSD through Profinet communication (Danfoss and ABB VSDs with Profinet interface supported).		

#### Control panel specifications

<b>Cabinet</b>	1,200 x 800 x 300 mm (H x W x D) painted steel plate, IP44
<b>Connectivity</b>	Touch panel: Ethernet interface for remote monitoring and operation PLC: Ethernet/Profinet interface for software service and connectivity to VSDs
<b>Main components</b>	Main switch, 24V DC power supply, relays and terminals, Siemens S7-1500SP PLC, and 12-inch Siemens Comfort touch panel



## Sabroe CP Optimiser

Automatic device for balancing R717 condensing pressure against compressor efficiency

Many refrigeration systems that use R717 (ammonia) as refrigerant and feature an evaporative condenser are operated using a fixed set point to maintain a constant condensing pressure. This is rarely ideal, as the energy consumption of the compressors typically increases by 3 percent for every degree Celsius the condensing pressure rises. Shaft power consumption is directly influenced by condensing pressure. This impacts overall operating costs and plant efficiency.

Reducing condensing pressure improves compressor efficiency, but doing so also requires energy. Maximum overall efficiency stems from the best possible balance between compressor energy consumption and the energy required to reduce condensing pressure. The figure below indicates the sum total displacement of the energy consumption, if the condensing pressure deviates from optimum.

The CP Optimiser automatically calculates this energy balance, taking into account changing loads and conditions. This paves the way to considerable savings on energy bills, which means the CP Optimiser normally pays for itself within a matter of months.

Features	Benefits
Automatic operation based on inputs from just two sensors – temperature and humidity	Substantial reduction in compressor energy consumption, resulting in lower operating costs
Output signal can be connected directly to PLCs and frequency converters	Easy to integrate with modern monitoring and control systems to ensure maximum efficiency
No time-consuming programming or complicated technical setup required	Easy to commission and operate, and helps eliminate human error
No manual intervention or special operator skills required	Virtually no maintenance, calibration or attention necessary after commissioning
No special requirements for integration into new or existing R717-based refrigeration setups	Straightforward, inexpensive way to boost operating efficiency and reduce running costs

## Where it is used

The CP Optimiser is highly recommended for inclusion in all new installations.

Installing the CP Optimiser in existing installations provides immediate savings on electricity costs.

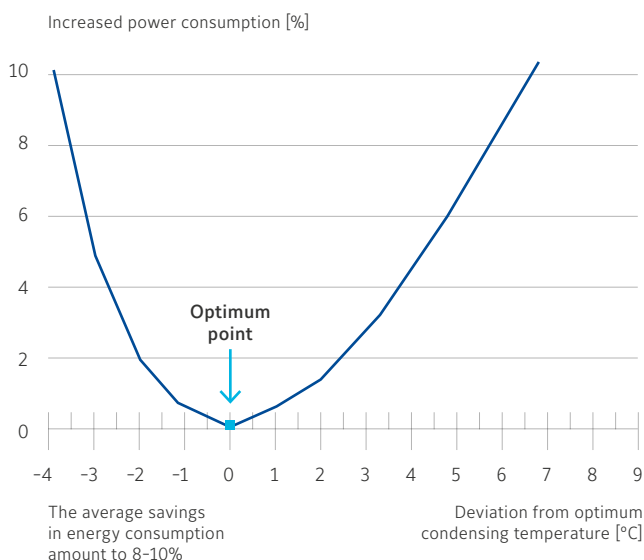
The CP Optimiser works with the following equipment:

- Evaporative condensers
- Air-cooled condensers
- Dry cooler
- Open cooling towers

## Mounting

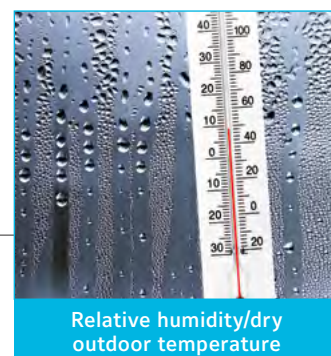
The CP Optimiser unit is a small box of electronics that is easy to mount in virtually any convenient location, either indoors or outdoors.

The unit only requires a 24-volt DC power supply and data from appropriate sensors for measuring temperature and relative humidity.

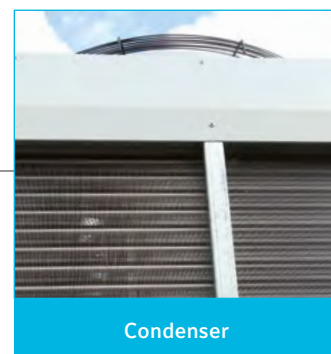


## Integrating the CP Optimiser

Technical data	
Supply voltage:	24-volt DC
Inputs:	Temperature 4–20 mA/0–50°C
Relative humidity:	4–20 mA/0–100% RH
Outputs:	Set point signals configurable to 4–20 mA or 0–10 volt DC
Dimensions (H x W x D):	115 x 90 x 55 mm
Enclosure:	IP54
Cable connections:	4 x PG7



Optimal set point



Temperature and relative humidity sensors are not included with the Sabroe CP Optimiser, but are available as optional equipment. Controller (PLC) not included.





# Integrated Standard Automation Concept (ISAC)

Monitoring and control interface configuration system  
for industrial refrigeration installations

ISAC is unique Johnson Controls software that provides a toolbox for designing and configuring refrigeration control and monitoring setups of virtually all kinds. It provides an effective way to integrate SCADA graphics with PLC functionality to ensure effective, reliable monitoring and control of both large and small industrial refrigeration installations.

ISAC modules provide standardised, pre-vetted solutions for almost any installation, based on consistent, industry-standard data inputs and outputs that ensure seamless, glitch-free exchanges of data between many different kinds of equipment, regardless of capacity, configuration or manufacturer.

Features	Benefits
Extensive Sabroe practical experience is embedded in all ISAC modules	Ensures rapid, cost-effective application of best practice
All modules are designed as modular building blocks and based on standardised interfaces and data exchange configurations	Minimises the time required for design, planning, configuration and service
Each module designed and tested individually to eliminate technical incompatibilities	Greater safety, greater reliability and lower operating costs
Supports a wide range of standard configurations, ranging from single touch screens to multiple workstations	Easy to scale to the exact functionality required
Based on standardised components with a very high degree of documentation, for maximum consistency and efficiency	High saving potential on commissioning, running in and system optimisation, as well as on energy consumption

## Where and how ISAC can be used

The ISAC system is easily scalable to meet a broad spectrum of refrigeration plant configurations. It provides advanced, flexible control functions with intuitive user features designed for the best match with the performance and technical requirements of each installation.

The ISAC system toolbox is designed to enable controls application engineers with only basic PLC and SCADA programming skills to build advanced, structured, and error-free program applications.

Once engineers are familiar with the toolbox and how to use it, ISAC makes it possible to build applications much faster than with conventional programming methods.

Extensive field and factory testing of the ISAC toolbox ensures error-free modules and paves the way to smooth, effective commissioning without the usual subsequent adjustments and fault corrections.

Access to the ISAC toolbox requires membership of the ISAC user community, and the ISAC community administrators provide new members with free training courses.

ISAC is easily applicable to both new and existing refrigeration setups, including extension schemes and retrofits of complete refrigeration plants.

## Standard features

- Defrost queue, automatic temperature-controlled defrost time, multiple room temperature control setups, etc.
- Automatic equalisation of running hours in installations with multiple pumps and fans
- Differential pressure control of NH<sub>3</sub> pumps
- Manual control possibility of all motors, valves and other actuators
- Hour counters for all motors
- Historical trending
- Alarm and shutdown monitoring

ISAC is based on – and completely compatible with – industry-standard Siemens S7 hardware and GE IFIX Proficy SCADA software.



Web/devices



ISAC PLC/SCADA



ISAC PC



Compressor applications



Process application









# Heat exchangers and vessels



# Heat exchangers and pressure vessels based on Sabroe's core knowledge

Sabroe has +125 years of experience designing and supplying components for refrigeration and heat pump systems. A heat exchanger is a key component in both systems, and we offer an extensive range of Sabroe heat exchangers and pressure vessels for both land-based and marine-based installations.

## Dedicated factory and design department

In 2016, Johnson Controls acquired the Hungarian manufacturing plant FMF, which has now become our dedicated heat exchanger and vessel production facility. Together with our inhouse construction team, they can provide approvals and documentation for the following: PED, EAC, DNV, LRS, BV, ABS, MOM, DOSH, KGS and KR. Other approvals can be supplied on request.

The approvals and documentation packages are made in accordance with the following codes: CODAP, EN 13445, AD 2000, PD 5500, ASME and BSERR 20-037.

## Sabroe's product programme

By combining the standard range of heat exchangers and vessels with the Sabroe compressor portfolio, all the key functions in a refrigeration cycle can be covered by Sabroe products.

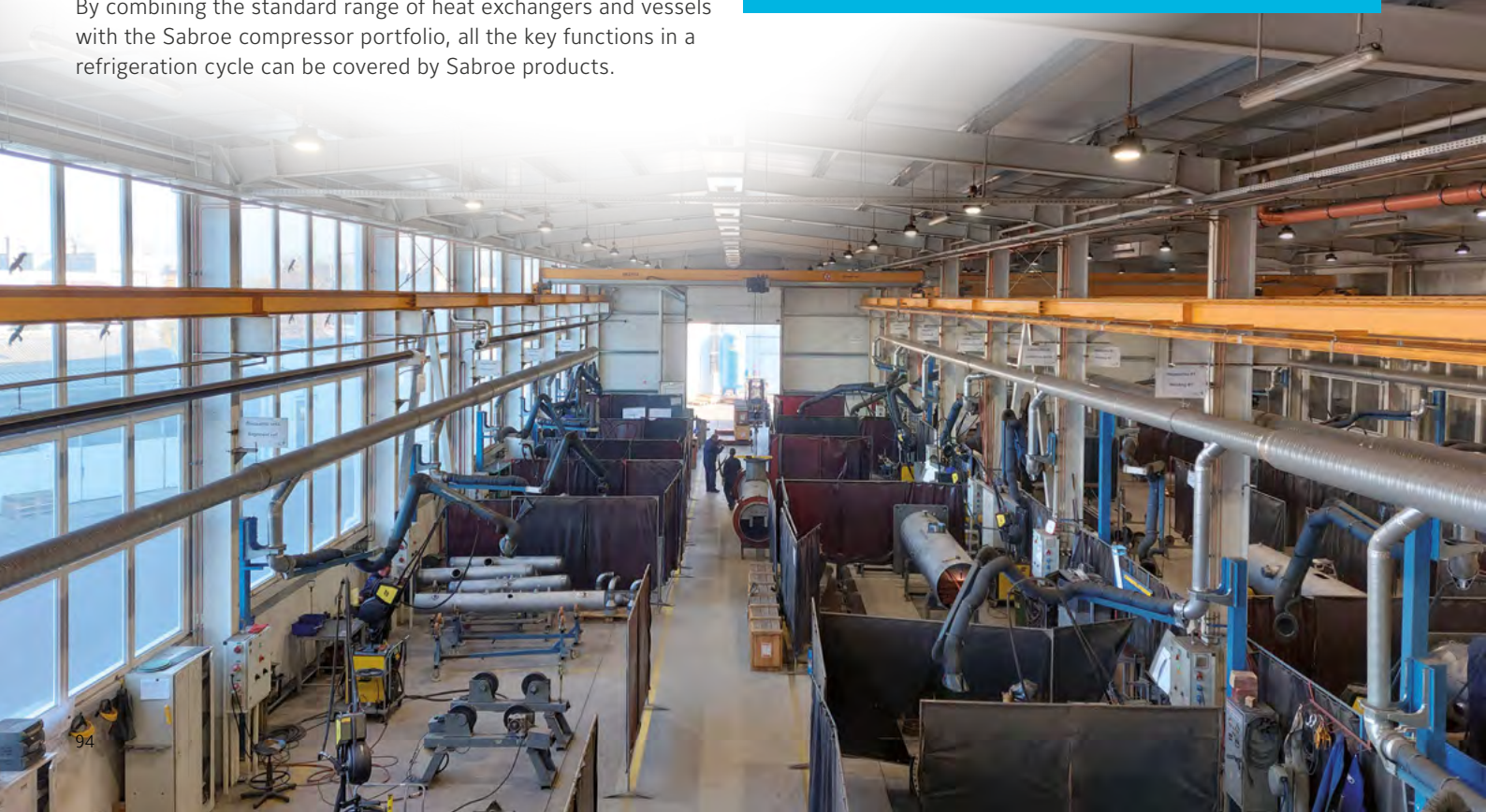
The Sabroe heat exchanger product range covers:

- Evaporators
- Condensers
- Oil coolers
- Suction gas superheaters
- Desuperheaters
- Closed economisers
- Cascade units

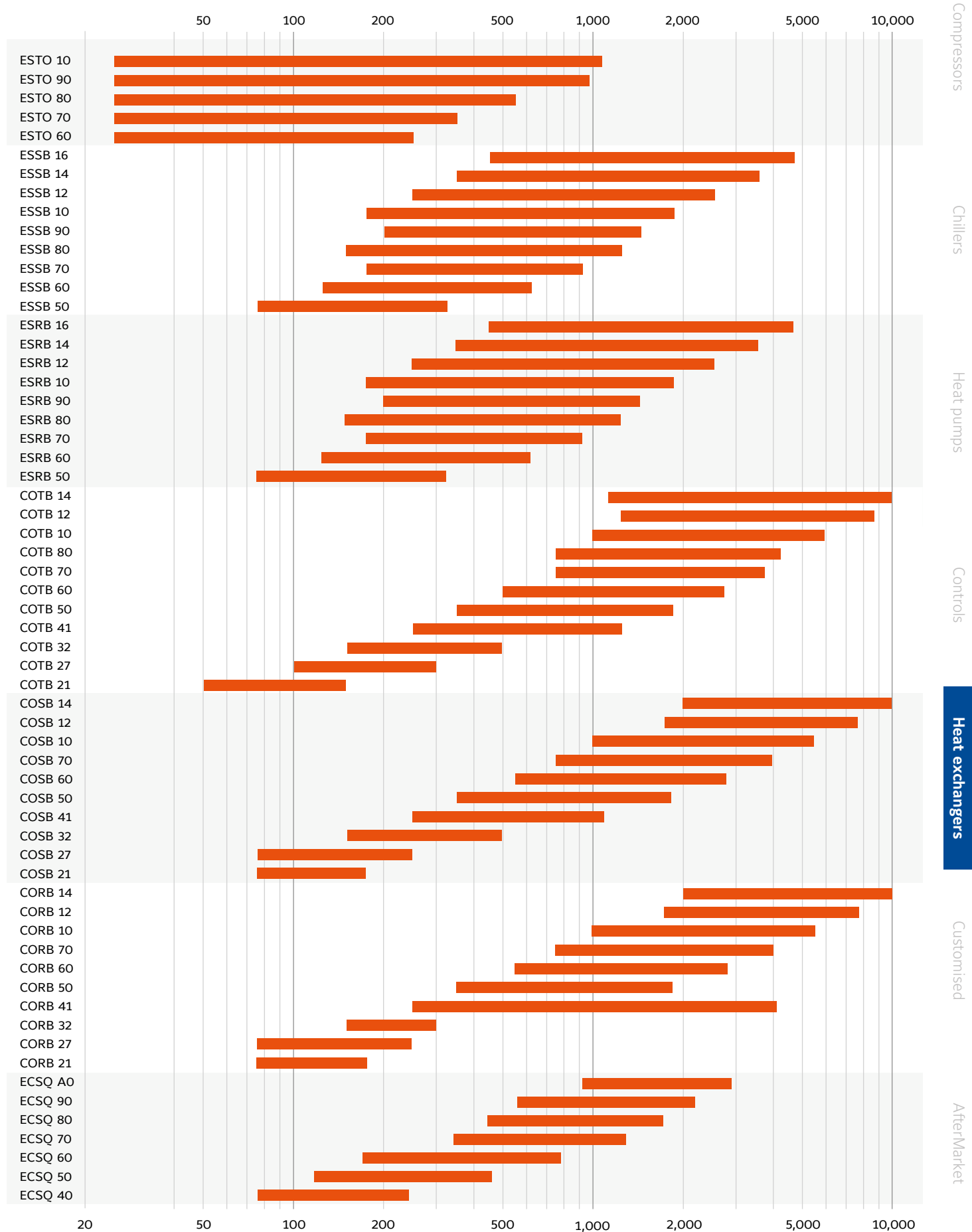
The entire Sabroe heat exchanger range is based on shell-and-tube technology. The shell-and-tube platform allows for a wide range of different configurations to ensure an excellent fit between capacity and brine flow. All designs have a proven track record and have been thoroughly tested in the Sabroe test centre.

In addition to the heat exchanger portfolio, the following types of pressure vessels are available:

- Liquid receivers
- Oil drain vessels
- Open economisers for screw units

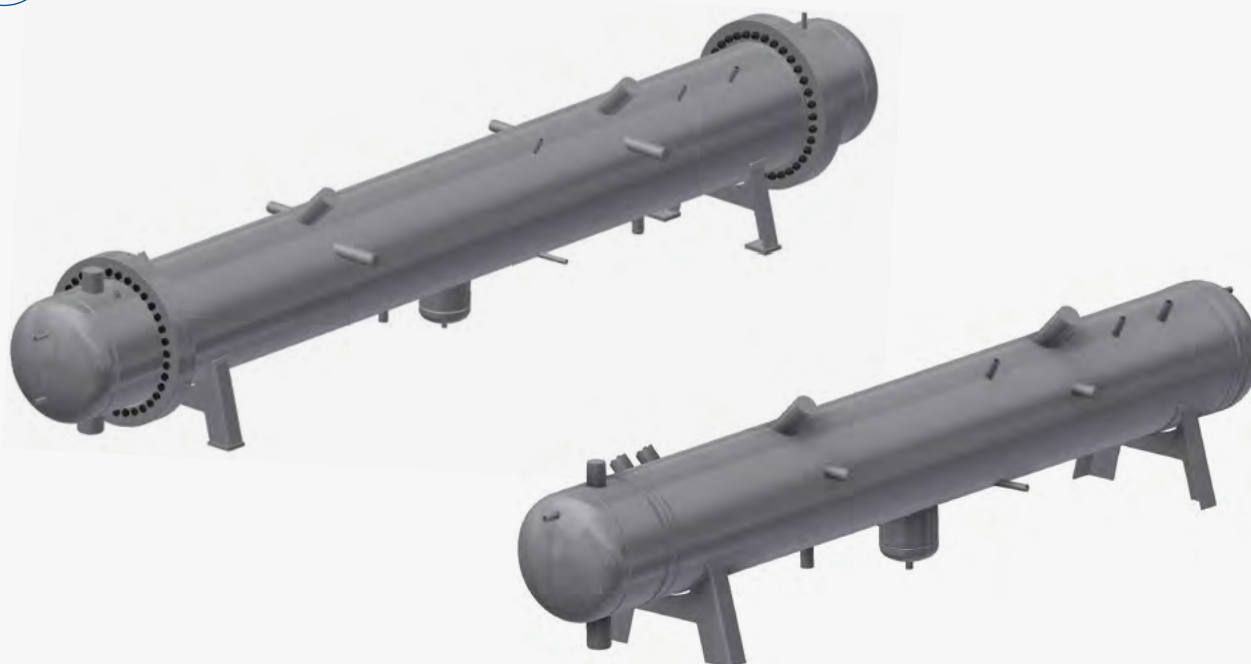


# Sabroe's heat exchanger programme



Calculations are based on a 5K temperature change on the secondary side  
and a maximum temperature difference between secondary outlet and refrigerant of 5K





ECSQ cascade coolers shown with welded and flanged end covers

## Sabroe ECSQ Shell-And-Tube Cascade Cooler

ECSQ is designed for R717/R744 operation. It has an integrated liquid separator and a capacity range between 60 kW and 6,000 kW.

The ECSQ series combines Sabroe's smart boiling and condensing heat transfer technology using a horizontal shell-and-tube heat exchanger for in-tube condensing and boiling on the shell side.

The exchanger is primarily designed to condense R744 on the tube side and evaporate R717 on the shell side. However, there is full compatibility with other refrigerants that comply with the materials.

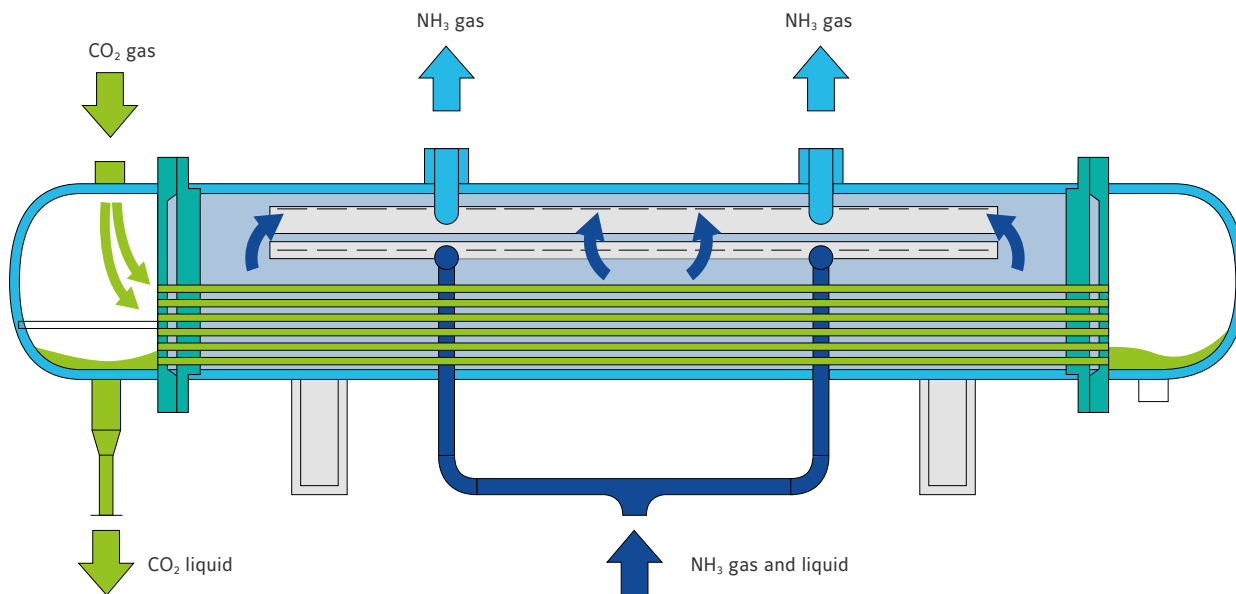
### Range

The ECSQ cascade heat exchanger is available in more than 100 different configurations. The configuration of the series is based on 125 years of unrivalled experience in the supply of refrigeration components and systems.

The ECSQ cascade heat exchanger is approved for operation between 50°C and -40°C and 21/-1 barg on the shell side, and between 100°C and -40°C and 40/-1 barg on the tube side.

Features	Benefits
Integrated liquid separator on the evaporating shell side	It eliminates the need for a conventional liquid separator and reduces the overall footprint of the installation
Ø 10 mm pipes and internal flow guides	There is minimal refrigerant charge and highly efficient heat transfer on the shell side in contrast to conventional shell-and-tube designs
Calculation and product selection via COMP1	Simplified product selection and evaluation of thermal performance in part-load conditions

## ECSQ working principle



ECSQ – capacity and product range

Type	Shell diameter	Shell length*	Tube side passes	Shell side inlet		Shell side outlet		Tube side inlet		Tube side outlet		Capacity range**
	mm	m		Size	Count	Size	Count	Size	Count	Size	Count	
4020A1	390	2/3	1/2	DN25-DN32	1	DN40-DN50	1	DN25-DN40	1	DN50-DN26	1	75-165
5020A1	492	2/3/4	1/2	DN32-DN40	1	DN65-DN0	1	DN40-DN65	1	DN65-DN100	1	100-350
6020A1	594	2/3/4/5	1/2	DN32-DN65	1	DN65-DN100	1	DN40-DN80	1	DN65-DN125	1	175-600
7030A1	684	2/3/4/5/6	1/2	DN40-DN65	2	DN80-DN125	2	DN65-DN100	1	DN100-DN150	1	350-975
8030A1	793	2/3/4/5/6	1/2	DN50-DN80	2	DN80-DN125	2	DN80-125	1	DN100-DN150	1	450-975
9030A1	890	2/3/4/5/6	1/2	DN50-DN100	2	DN100-DN150	2	DN80-DN150	1	DN125-DN200	1	450-1,275
A040A1	992	4/5/6	1/2	DN65-DN100	2	DN125-DN150	2	DN100-DN150	1	DN125-200	1	900-2,000

\* Unit length (excluding end covers)

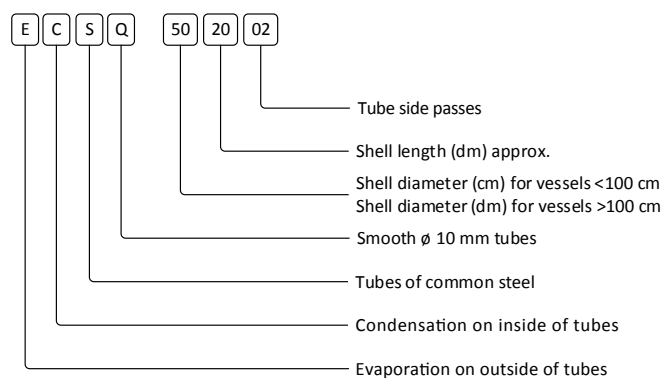
\*\* Capacity range: R717 shell side evaporation at -10°C,  
R744 tube side condensation at -5°C.

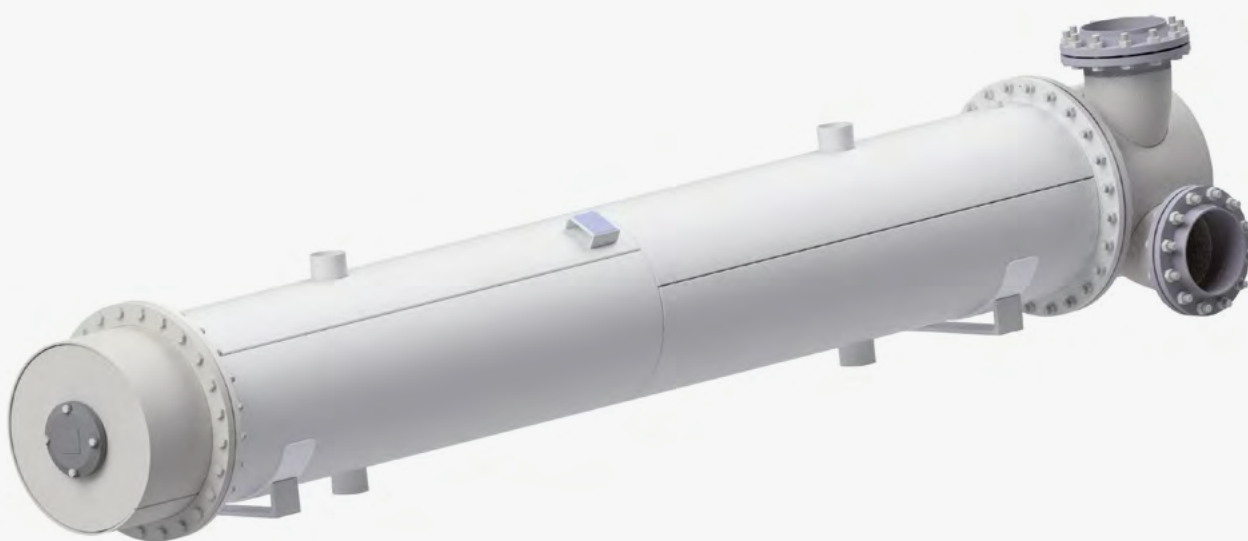
Standards: PED (DNV, LRS as options).

### Options

- Double tube-plate for leakage protection and leakage detection
- Flanged or fully welded end covers
- Non-PED approvals on request (DNV, LRS, etc.)
- Oil drain or oil sump for oil return

All Sabroe Shell-And-Tube Heat Exchangers follow a standard key for naming and identification. For the ECSQ product line, the name of a given configuration can be identified by the key below.





## Sabroe CORB, COSB and COTB Shell-and-Tube Condensers

CORB, COSB, COTB condenser with flanged end covers

We designed these specifically for condensation outside tubes on the shell side and heating a secondary fluid on the tube side.

These condensers come in various configurations and can be customised to suit your specific application requirements. These heat exchangers can be configured with single or multiple passes and can match your capacity demand and secondary flow. All connections, except one pass, are equipped with counter flanges. The reversing covers are equipped with connections for drain and air purging.

Our CORB and COSB heat exchangers are designed for heating secondary fluids like water, ethylene, propylene glycol and other noncorrosive mediums.

COTB is the same design but is optimal for heating corrosive mediums like brackish water and is ideal for heat pumps and offshore applications.

### Features and benefits

- Capacity range between 50kW and 10,000kW
- One to six passes on the secondary side – various configurations of tube patterns accommodate different flow and capacity ratios
- Calculation and product selection via COMP1 and evaluation of thermal performance in part-load conditions

- **COTB:** Titanium tube material allows operation with corrosive brines and working mediums
- **COSB:** Common steel tube material is a cost-effective option for systems without corrosive elements in the brine
- **CORB:** Stainless-steel tube material can withstand operation with standard brines and operate with all natural refrigerants

### Operating conditions

	Shell Side	Tube Side
<b>CORB</b>	-10°C to 100°C -1 bar(g) to 40 bar(g)	0°C to 100°C 0 bar(g) to 10 bar(g)
<b>COSB</b>	-10°C to 150°C -1 bar(g) to 40 bar(g)	0°C to 80°C 0 bar(g) to 10 bar(g)
<b>COTB</b>	0°C to 120°C -1 bar(g) to 40 bar(g)	0°C to 100°C -1 bar(g) to 10 bar(g)

### Options

- Single or double connections on the refrigerant/shell side
- Single or double connections on the brine/tube side
- **CORB:** Brine connections from DN80 to DN300
- **COSB:** Extensive range of brine connection sizes
- **COTB:** Brine connections from DN100 to DN350



## CORB/COSB – capacity and product range

Type	Shell diameter	Shell length	Tube-side passes	Shell-side inlet		Shell-side outlet		Tube-side inlet		Tube-side outlet		Capacity range*
	mm	m		Size	Count	Size	Count	Size	Count	Size	Count	kW
21XXYY	207	1.5/2/2.5	1/2/4	DN40	1/2	DN32	1/2	DN80/DN125	1	DN80/DN125	1	75-100
27XXYY	260	2/2.5/3	1/2/4	DN40/DN50	1/2	DN32/DN40	1/2	DN100-DN150	1	DN100-DN150	1	75-175
32XXYY	311	2/2.5/3/4	1/2/4	DN50/DN65	1/2	DN40/DN50	1/2	DN125-DN200	1	DN125-DN200	1	150-350
41XXYY	403	2/2.5/3/4/5	1/2/4	DN65-DN80	1/2	DN50-DN80	1/2	DN150-DN250	1	DN150-DN250	1	250-850
50XXYY	492	2.5/3/4/5/6	1/2/4	DN80-DN100	1/2	DN 65-DN100	1/2	DN200-DN300	1	DN200-DN300	1	350-1,500
60XXYY	594	2.5/3/4/5/6	1/2/4	DN100-DN125	1/2	DN80-DN100	1/2	DN250-DN400	1	DN250-DN400	1	550-2,250
70XXYY	684	3/4/5/6	1/2/4	DN125-DN150	1/2	DN100-DN125	1/2	DN300-DN500	1	DN300-DN500	1	750-3,250
10XXYY	992	3/4/5/6	1/2/4/6	DN150-DN200	1/2	DN100-DN150	2	DN500-DN700	1	DN500-DN700	1	1,000-4,500
12XXYY	1,190	4/5/6	1/2/4/6	DN200-DN250	2	DN150-DN200	2	DN600-DN800	1	DN600-DN800	1	1,750-6,000
14XXYY	1,384	4/5/6	1/2/4/6	DN250-DN300	2	DN200	2	DN700-DN900	1	DN700-DN900	1	2,000-10,000

## COTB – capacity and product range

Type	Shell diameter	Shell length	Tube-side passes	Shell-side inlet		Shell-side outlet		Tube-side inlet		Tube-side outlet		Capacity range*
	mm	m		Size	Count	Size	Count	Size	Count	Size	Count	kW
21XXYY	207	1.5/2/2.5/3/3.5	1/2/4	DN50	1	DN40	1	DN80/DN125	1	DN80/DN125	1	50-100
27XXYY	260	2/2.5/3/3.5	1/2/4	DN32/DN40	1	DN 25/DN32	2	DN100-DN150	1	DN100-DN150	1	100-200
32XXYY	312	2/2.5/3/3.5	1/2/4	DN50	1	DN32/DN40	2	DN125/DN200	1	DN125/DN200	1	150-350
41XXYY	403	2/2.5/3,4/5	1/2/4	DN65	1	DN32/DN40/DN50	2	DN150/DN250	1	DN150/DN250	1	250-1,000
50XXYY	493	2/2.5/3/4/5/6	1/2/4	DN65/DN80	1	D50-DN80	2	DN200-DN300	1	DN200-DN300	1	350-1,500
60XXYY	594	2/2.5/3/4/5/6	1/2/4	DN80-DN100	1	DN65-DN80	2	DN250-DN400	1	DN250-DN400	1	500-2,250
70XXYY	684	3/4/5/6	1/2/4	DN100-DN125	1	DN80-DN100	2	DN200-DN350	1	DN200-DN350	1	750-3,000
80XXYY	793	3/4/5/6	1/2/4	DN125-DN150	1	DN100	2	DN200-DN350	1	DN200-DN350	1	750-3,500
10XXYY	992	3/4/5/6	1/2/4	DN150	1	DN100-DN150	2	DN200-DN350	1	DN200-DN350	1	1,000-5,000
12XXYY	1,190	4/5/6	1/2/4/6	DN200	1	DN150	2	DN200-DN350	1	DN200-DN350	1	1,250-7,500
14XXYY	1,384	4/5/6	1/2/4/6	DN200	1	DN200	2	DN200-DN350	1	DN200-DN350	1	1,750-10,000

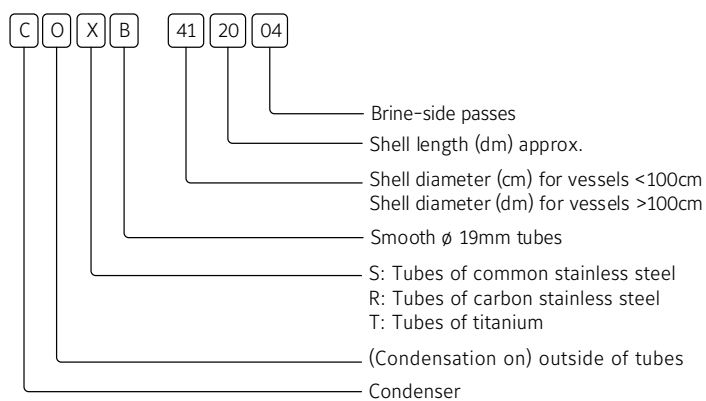
\* Calculations are based on a 5K temperature change on the secondary side and a maximum temperature difference between secondary outlet and refrigerant of 5K.

## Type designation for COXB

All Sabroe shell-and-tube heat exchangers follow a standard key for naming and identification. For the COXB product line, the name of a given configuration can be identified by the key below.

### Options

- Single or double connections on the refrigerant/shell side
- Single or double connections on the brine/tube side
- Brine connections from DN80 to DN300



Compressors

Chillers

Heat pumps

Controls

Heat exchangers

Customised

AfterMarket



ESRB evaporator shown with oil collection pot



ESSB evaporator shown with oil collection pot



ESTO titanium evaporator with integrated liquid separator

## Sabroe ESRB, ESSB and ESTO Shell-and-Tube Evaporators

We designed these evaporators for flooded evaporation of refrigerant outside the tubes and cooling of a secondary fluid on the tube side.

ESRB and ESSB heat exchangers cool secondary fluids like water, ethylene, propylene glycol and other noncorrosive mediums. The integrated liquid separator reduces the overall footprint of the installation and ensures a high heat transfer coefficient, while protecting the compressor from any liquid slugging.

ESTO heat exchangers has the same design construction as described above and are ideal for cooling sea or brackish water for heat pumps and offshore applications. These evaporators come in various configurations that can be customised to suit your specific application requirements.

### Features and benefits

- Capacity range between 100kW and 6,500kW
- No need for an external liquid separator; reduced footprint
- Calculation and product selection via COMP1 and evaluation of thermal performance in part-load conditions

#### ESRB

- Stainless-steel tube material can withstand operation with standard brines and operate with all natural refrigerants
- Four different tube patterns to accommodate different system designs. A - models have the lowest tube count. D - models have the highest number of tubes per diameter

#### ESSB

- Common steel tube material is a cost-effective option for systems without corrosive elements in the brine
- Four different tube patterns to accommodate different system designs

#### ESTO

- Titanium tube material allows operation with corrosive brines and working mediums
- Two different tube patterns to accommodate different system designs and sensitivity in case of overcharging

### Operating conditions

	Shell Side	Tube Side
<b>ESRB</b>	-40°C to 50°C -1 bar(g) to 29 bar(g)	-30°C to 50°C 0 bar(g) to 10 bar(g)
<b>ESSB</b>	-30°C to 50°C -1 bar(g) to 24 bar(g)	-30°C to 50°C -1 bar(g) to 10 bar(g)
<b>ESTO</b>	-40°C to 80°C -1 bar(g) to 29 bar(g)	-30°C to 80°C 0 bar(g) to 10 bar(g)

### Options

#### ESRB/ESSB

- Single or double connections on the refrigerant/shell side
- Single or double connections on the brine/tube side
- Brine connections from DN100 to DN450

#### ESTO

- Brine connections from DN100 to DN300
- Coated end covers

## ESRB/ESSB – capacity and product range

Type	Shell diameter	Shell length	Tube-side passes	Shell-side inlet		Shell-side outlet		Tube-side inlet		Tube-side outlet		Capacity range*
	mm	m		Size	Count	Size	Count	Size	Count	Size	Count	kW
50YXX	500	2/3/4/5/6	1/2/3/4	DN32	1/2	DN65	1/2	DN100-DN200	1	DN100-DN200	1	75-250
60YXX	600	3/4/5/6	1/2/3/4	DN40	1/2	DN80	1/2	DN100-DN250	1	DN100-DN250	1	125-500
60YXX	680	3/4/5/6	1/2/3/4	DN50	1/2	DN100	1/2	DN100-DN300	1	DN100-DN300	1	175-750
80YXX	793	3/4/5/6	1/2/3/4	DN50	1/2	DN100	1/2	DN100-DN350	1	DN100-DN350	1	150-1,100
90YXX	890	3/4/5/6	1/2/3/4	DN65	1/2	DN125	1/2	DN100-DN400	1	DN100-DN400	1	200-1,250
10YXX	992	3/4/5/6	1/2/3/4/6/8	DN65	1/2	DN125	1/2	DN100-DN450	1	DN100-DN450	1	175-1,700
12YXX	1,190	3/4/5/6	1/2/3/4/6/8	DN80	1/2	DN150	1/2	DN100-DN450	1	DN100-DN450	1	250-2,300
14YXX	1,348	3/4/5/6	1/2/3/4/6/8	DN100	1/2	DN200	1/2	DN100-DN450	1	DN100-DN450	1	350-3,250
16YXX	1,584	5/6	1/2/3/4/6/8	DN100	2	DN200	2	DN200-DN450	1	DN200-DN450	1	450-4,250

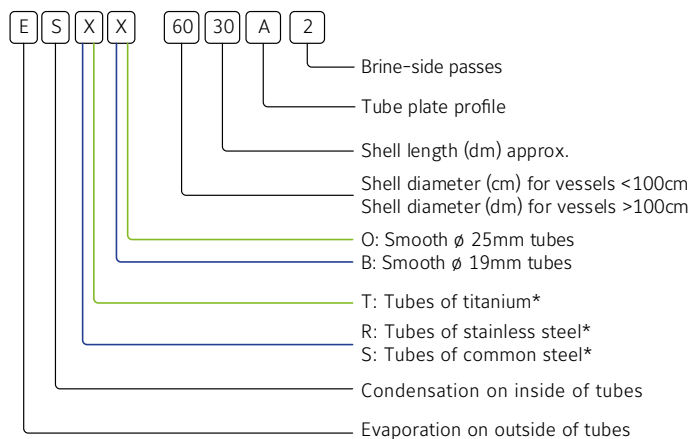
## ESTO – capacity and product range

Type	Shell diameter	Shell length	Tube-side passes	Shell-side inlet		Shell-side outlet		Tube-side inlet		Tube-side outlet		Capacity range*
	mm	M		Size	Count	Size	Count	Size	Count	Size	Count	kW
6030A2	600	3	2	DN25	1	DN65	1	DN150	1	DN150	1	25-50
6030B2	600	3	2	DN32	1	DN80	1	DN150	1	DN150	1	25-225
7030A2	700	3	2	DN40	1	DN100	1	DN200	1	DN200	1	25-325
7035B2	700	4	2	DN40	1	DN100	1	DN200	1	DN200	1	25-325
8035A2	800	4	2	DN50	1	DN125	1	DN250	1	DN250	1	25-425
8035A4	800	4	4	DN40	1	DN125	1	DN250	1	DN250	1	25-525
8040B2	800	4	2	DN50	1	DN150	1	DN250	1	DN250	1	25-950
8040B4	800	4	4	DN65	1	DN200	1	DN300	1	DN300	1	25-950
9040A2	900	4	2	DN65	1	DN200	1	DN300	1	DN300	1	25-950
1040A1	1,000	4	1	DN65	1	DN200	1	DN350	1	DN350	1	25-1,050
1040A2	1,000	4	2	DN65	1	DN200	1	DN350	1	DN350	1	25-1,050

\* Calculations are based on a 5K temperature change on the secondary side and a maximum temperature difference between secondary outlet and refrigerant of 5K.

## Type designation for ESXX

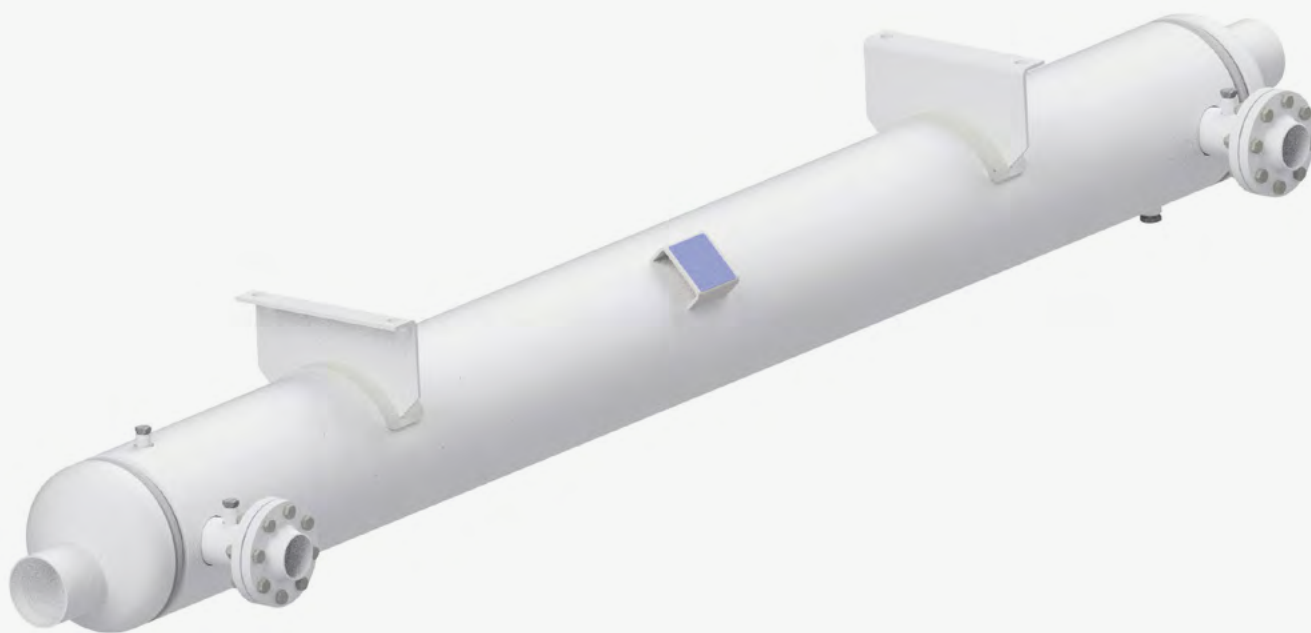
All Sabroe shell-and-tube heat exchangers follow a standard key for naming and identification. For the ESXX product line, the name of a given configuration can be identified by the keys below.



\* T (titanium) is always followed by O (25mm tubes).

R/S (stainless/common steel) are always followed by B (19mm tubes).





DISS desuperheater

## Sabroe DISS Shell-And-Tube Desuperheater

DISS is designed for desuperheating of discharge gas inside the tubes on the tube side and heating of a secondary fluid or refrigerant on the shell side. The capacity range is between 50 kW and 10,000 kW.

The desuperheater is a horizontal, closed shell-and-tube heat exchanger, designed to heat water in a closed circuit on the outside of straight steel tubes by cooling high-pressure gas inside tubes with star insert. The desuperheater can be built into the pressure gas line between the compressor and the condenser in cooling and heat pump units.

### Range

The DISS evaporator is available in five different configurations. It is configured with common steel pipes with a star insert for optimal heat transfer.

The DISS exchanger is approved for operation between 120°C and 0°C and 40/-1 barg on the shell side, and between 100°C and 0°C and 10/-1 barg on the tube side.

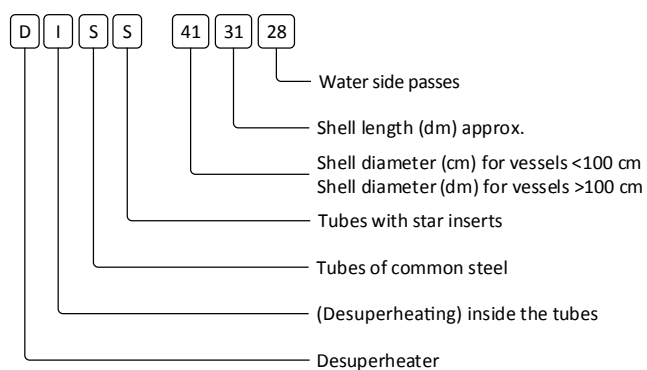
Features	Benefits
Low pressure drop on the refrigerant side	Less required compressor work compared to a plate-and-plate solution
Calculation and product selection via COMP1	Simplified product selection and evaluation of thermal performance in part-load conditions
Star insert	High heat transfer from discharge gas to cooling media

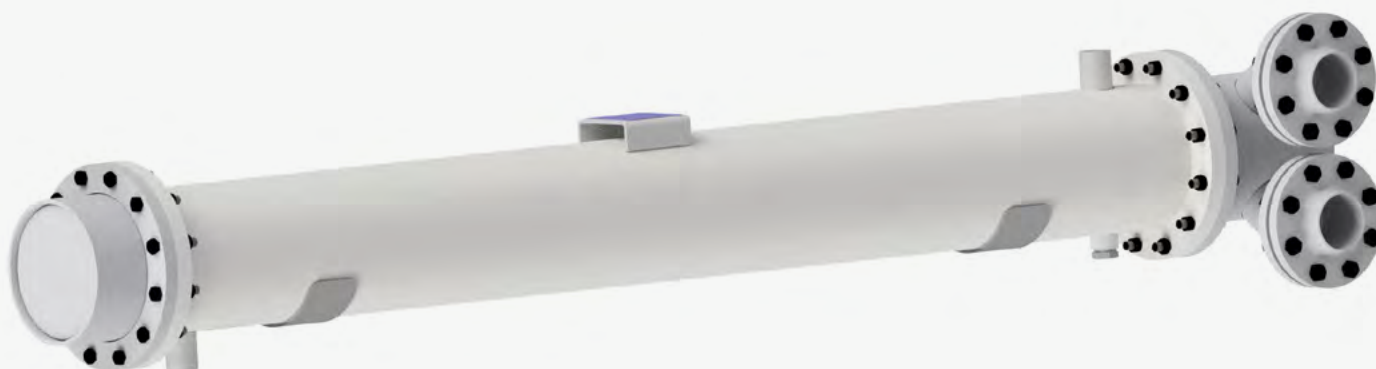
## DISS – capacity and product range

Type	Shell diameter	Shell length	Tube side passes	Shell side inlet		Shell side outlet		Tube side inlet		Tube side outlet	
	mm	m		Size	Count	Size	Count	Size	Count	Size	Count
163160	159	3.181	60	DN50	1	DN50	1	DN65	1	DN65	1
213146	207	3.181	46	DN65	1	DN65	1	DN100	1	DN100	1
273140	260	3.181	40	DN80	1	DN80	1	DN125	1	DN125	1
323128	312	3.181	28	DN100	1	DN100	1	DN150	1	DN150	1
413122	407	3.181	22	DN125	1	DN125	1	DN200	1	DN200	1

## Type designation for DISS

All Sabroe shell-and-tube heat exchangers follow a standard key for naming and identification. For the DISS product line, the name of a given configuration can be identified by the key below.





OWSG oil cooler

## Sabroe OWSG Shell-And-Tube Oil Cooler

The OWSG heat exchanger is designed for cooling of oil in screw compressor applications. The capacity range is tailored to fit the Sabroe screw compressors.

In addition to oil cooling, the OWSG desuperheater is also suitable for installation as a subcooler or a liquid cooler, if needed.

### Range

The OWSG oil cooler is available in more than 100 different configurations. It is configured with common steel pipes, which are suitable for systems incorporating anti-corrosion and anti-scaling measures.

The OWSG oil cooler is approved for operation between 120°C and 0°C and 26/-1 barg on the shell side, and between 65°C and 0°C and 10/0 barg on the tube side.

Features	Benefits
Low pressure drop	Less power needed to circulate cooling water
Calculation and product selection via COMP1	Simplified product selection and evaluation of thermal performance in part-load conditions
Oil on either shell or tube side	Extended range of configurations and connection points

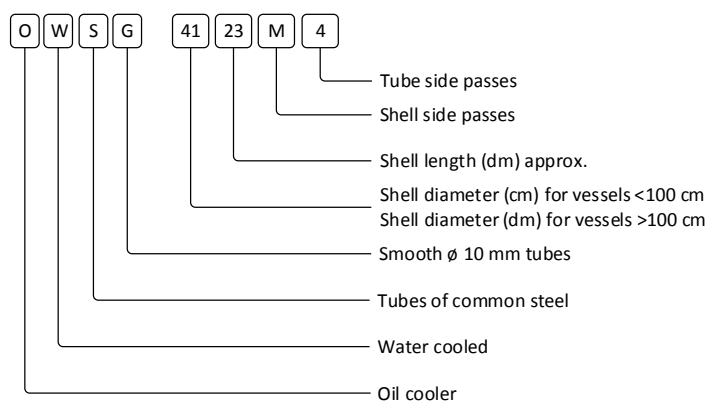


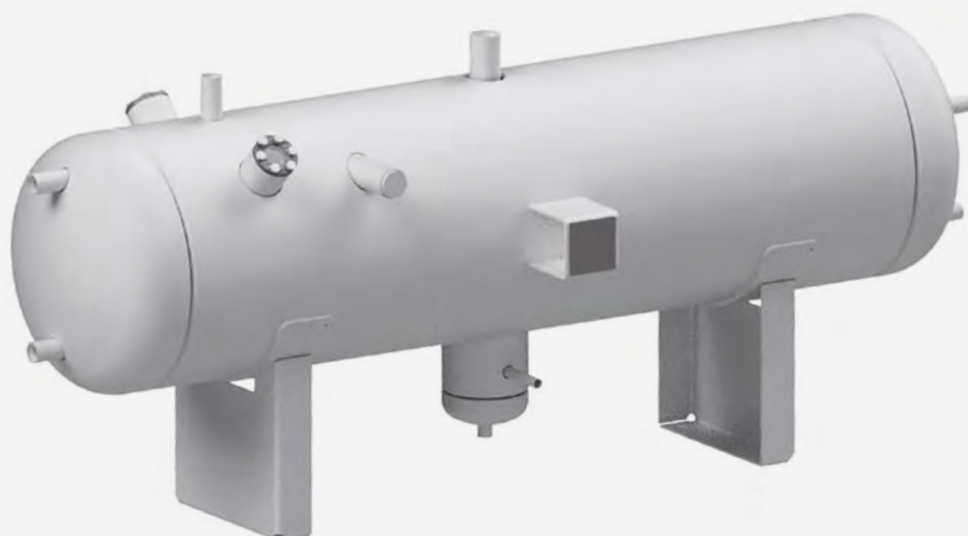
## OWSG – capacity and product range

Type	Shell diameter	Shell length	Shell side passes	Tube side passes	Shell side inlet		Shell side outlet		Tube side inlet		Tube side outlet	
	mm	m			Size	Count	Size	Count	Size	Count	Size	Count
1115YY	107	1.582	25-55	2	DN32	1	DN32	1	DN32	1	DN32	1
1315YY	132	1.582	21-47	2	DN32	1	DN32	1	DN40	1	DN40	1
1615YY	159	1.582	13-41	2/4	DN20	1	DN20	1	DN50	1	DN50	1
1619YY	159	1.962	17-53	2/4	DN32	1	DN32	1	DN50	1	DN50	1
1623YY	159	2.342	21-43	2/4	DN50	1	DN50	1	DN50	1	DN50	1
2115YY	207	1.582	9-19	2/4	DN20	1	DN20	1	DN80	1	DN80	1
2119YY	207	1.962	19-33	2/4	DN32	1	DN32	1	DN80	1	DN80	1
2123YY	207	2.342	19-39	2/4	DN50	1	DN50	1	DN80	1	DN80	1
2719YY	260	1.962	13-31	2/4	DN32	1	DN32	1	DN100	1	DN100	1
2723YY	260	2.342	15-39	2/4	DN50	1	DN50	1	DN100	1	DN100	1
3219YY	312	1.962	13-25	2/4	DN50	1	DN50	1	DN125	1	DN125	1
3223YY	312	2.342	15-29	2/4	DN50	1	DN50	1	DN125	1	DN125	1
4119YY	403	1.962	11-21	2/4	DN50	1	DN50	1	DN150	1	DN150	1
4123YY	403	2.342	13-27	2/4	DN50	1	DN50	1	DN150	1	DN150	1

## OWSG type designation

All Sabroe shell-and-tube heat exchangers follow a standard key for naming and identification. For the OWSG product line, the name of a given configuration can be identified by the key below.





EOSE economiser shown with feet for easy on site installation

## Sabroe EOSE Spiral Flash Economiser

EOSE is a closed flash economiser with an integrated separator, designed for operation with ammonia. The capacity range is tailored to fit the Sabroe screw compressor range.

The economiser is a horizontal, closed shell-and-spiral heat exchanger, which subcools the liquid from the condenser before expansion, and thus improves the overall system efficiency.

### Range

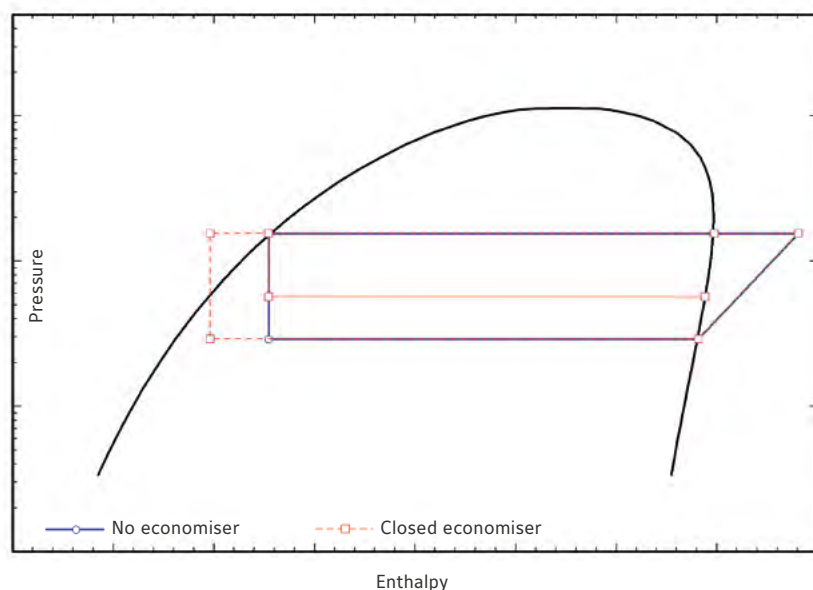
The EOSE closed flash economiser is available in five different configurations. The five standard configurations are designed to match the Sabroe screw compressor product range.

The EOSE unit is approved for operation between 50°C and -40°C and 26/-1 barg on the shell side, and between 50°C and -40°C and 26/-1 barg in the cooling spiral.

Features	Benefits
Subcooling of condenser liquid	Increased cooling capacity with the same amount of compressor work
Calculation and product selection via COMP1	Simplified product selection and evaluation of thermal performance in part-load conditions
Integrated liquid separator	As an external liquid separator is not needed, the overall footprint of the installation is reduced

## EOSE – capacity and product range

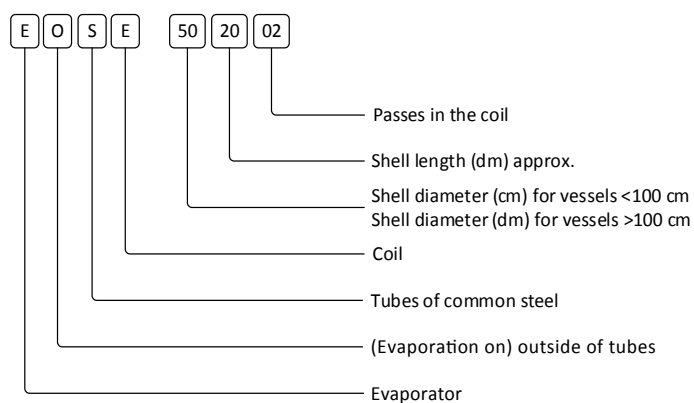
Type	Shell diameter	Shell length	Shell side inlet		Shell side outlet		Tube side inlet		Tube side outlet	
	mm	m	Size	Count	Size	Count	Size	Count	Size	Count
41601	403	1.788	DN32	1	DN50	1	DN15	1	DN15	1
51601	492	1.818	DN50	1	DN65	1	DN20	1	DN20	1
61602	594	1.819	DN25	1	DN65	1	DN32	1	DN32	1
62002	594	2.175	DN25	1	DN65	1	DN32	1	DN32	1
82002	793	2.219	DN25	1	DN65	1	DN65	1	DN65	1



The figure illustrates the impact of installing a closed economiser. Subcooling the liquid out of the condenser increases the cooling capacity of the system.

## EOSE type designation

All Sabroe shell-and-tube heat exchangers follow a standard key for naming and identification. For the EOSE product line, the name of a given configuration can be identified by the key below.







Sabroe HXSG

# Sabroe HXSG Suction Gas Superheater

The Sabroe HXSG Suction Gas Superheater is specifically designed for chiller and heat pump applications. It superheats the gas from the evaporator to decrease the possibility of liquid or liquid formation in the compressor, which could result in compressor breakdown.

This unit is a shell-and-tube heat exchanger with flange and nozzles welded to the shell, and is built in tandem with the evaporator or, for the suction string option, to the compressor for seamless installation.

## Features and benefits

- Designed to protect the compressor from liquid migration and breakdown
- Capacity: Customisable to Sabroe chillers and heat pumps
- Low pressure drops at refrigerant side – less impact on COP and capacity
- High and efficient heat transfer rate
- Fully welded and leak-proof design; PED compliant
- Easy and fast product calculation and selection via COMP1

## Operating conditions

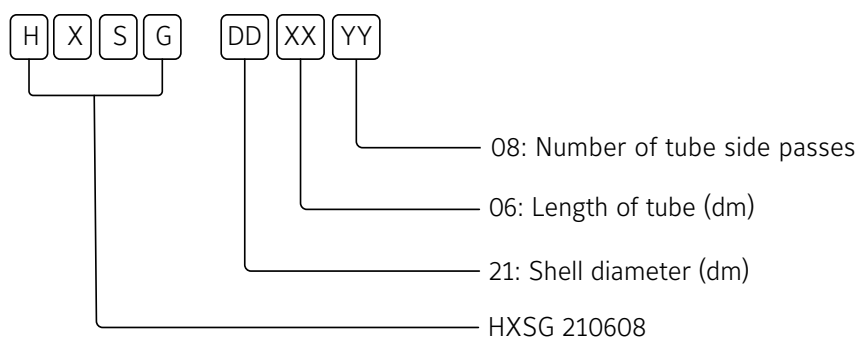
	Shell side	Tube side
<b>HXSG</b>	-50°C to 170°C 40 bar(g)	-50°C to 170°C 40 bar(g)

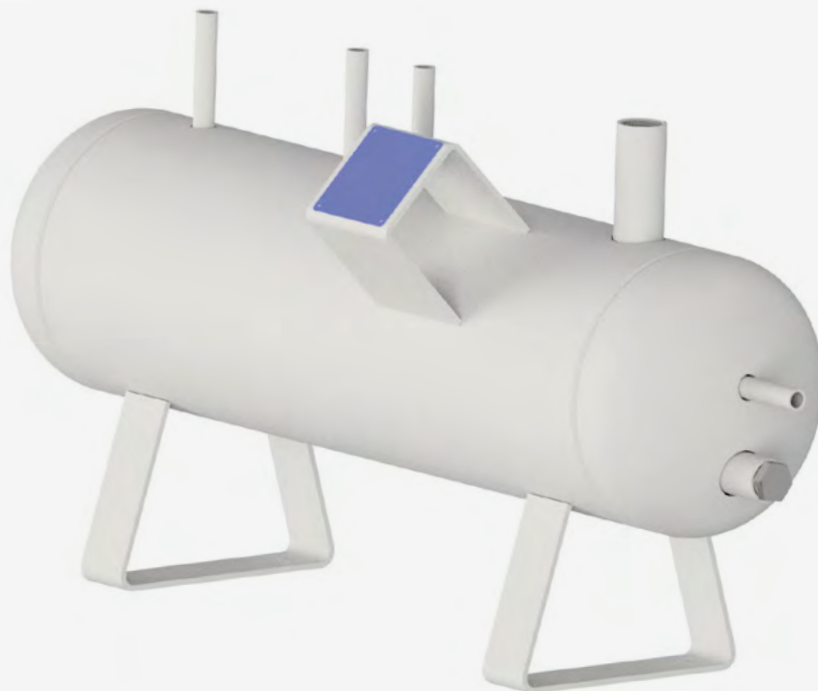
We have a wide range of suction gas superheaters available, with different configurations and temperature ranges to suit your specific application. For help choosing the right one for your facility, reach out to our sales team.

				Connection	
Shell diameter (dm)	Shell length (dm)	Shell-side pass	Ø19 tube	Tube side (inlet + outlet)	Shell side (inlet + outlet)
DD	XX	YY	Number	DN Size	DN Size
16	05-14	02-12	30	50-80	25-80
21	05-26	02-14	48	50-125	25-80
27	05-26	02-16	82	65-200	40-125
32	05-31	02-18	130	125-250	50-150
41	05-31	02-18	220	200-250	50-150

## Type designation for HXSG

All Sabroe gas superheaters follow a standard key for naming and identification. For the HXSG product line, the name of a given configuration can be identified by the key below.





Oil drain vessel with standard connections

## Sabroe vessels Receivers and Oil Vessels

Vertical and horizontal receivers and oil drain vessels for site installations

The Sabroe vessel and heat exchanger product range includes both vertical and horizontal receivers for onsite installations. The series of receivers also includes oil drain vessels.

### Receivers

If the standard range of Sabroe vessels does not contain a product that fully matches a given application, a special vessel can be manufactured according to customer specifications. The maximum diameter for receivers is 2400 mm. For all standard receivers, the following applies:

- Carbon steel
- Design pressure: 24 bar
- Design temperature: -40/+50°C
- Acceptance according to module H1
- Variable number of connections (2-12)
- Legs included

### Oil drain vessels

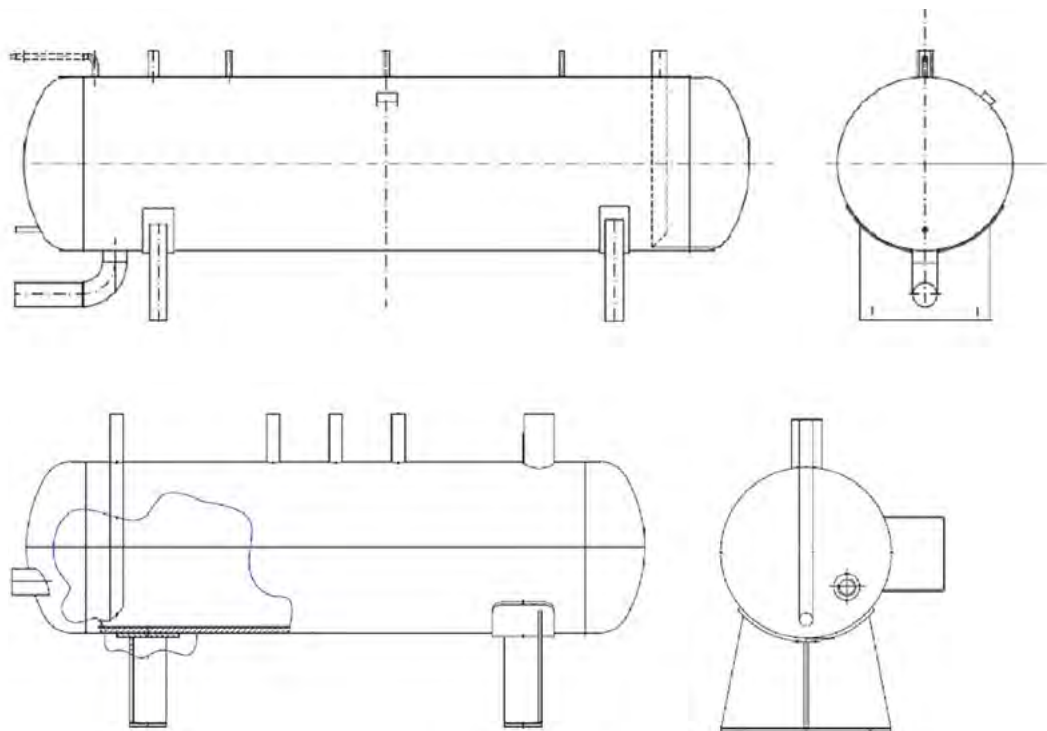
In addition to the series of horizontal and vertical receivers, the Sabroe product line also includes oil drain vessels. The standard product range contains two models, one with a heating element and one without.

The following applies to both oil drain vessels:

- Carbon steel
- Design pressure: 24 bar
- Design temperature: -40/+50°C
- Acceptance according to module H1
- Legs included

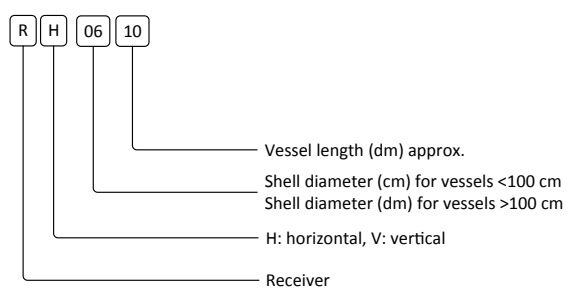
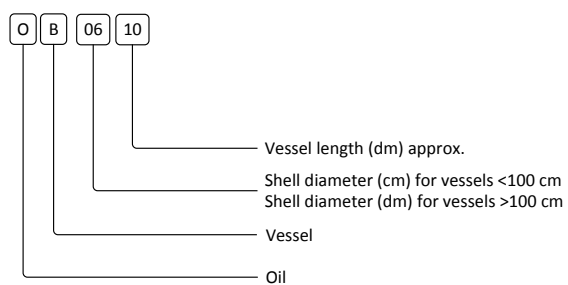
Features	Benefits
In-house design department	We can approve and produce vessels based on customer designs
Dedicated heat exchanger and vessel factory	We can produce units with shell diameters up to 2,400 mm

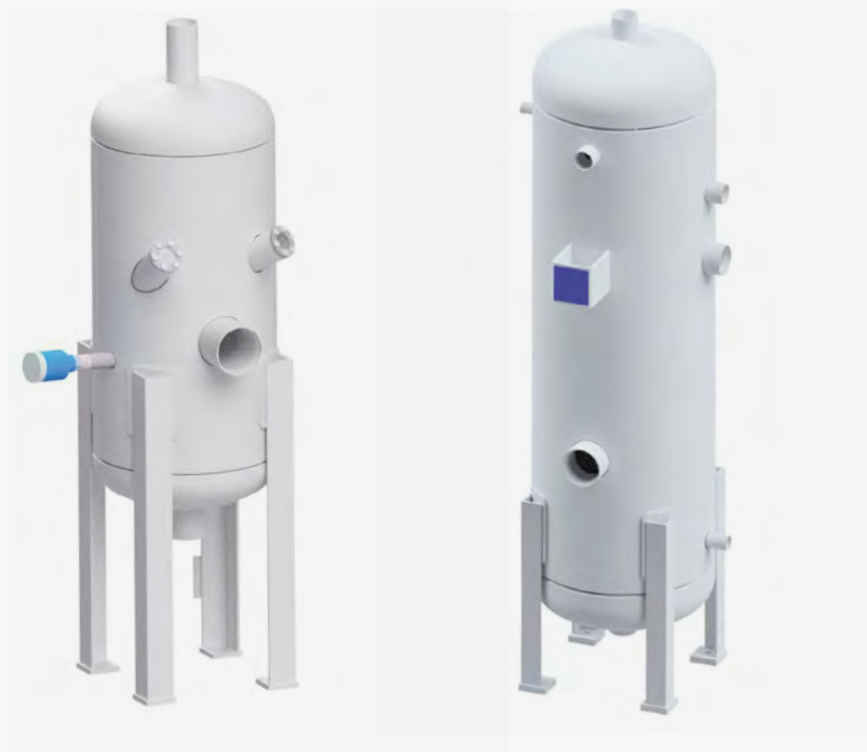




## Type designation

Like all Sabroe vessels and heat exchangers, the receivers follow a standard key for naming and identification. Oil drain vessels can be identified by the keys below.





SVER open economisers shown with feet for easy on-site installation

## Sabroe SVER Open Flash Economiser

SVER is an open flash economiser with an integrated separator designed for operation with most refrigerants. The capacity range is tailored to fit the Sabroe screw compressor range.

The function of the economiser is to cool the liquid refrigerant (subcooling) from the condenser before it is led to the evaporator. The subcooling obtained by installing an economiser improves the efficiency of the refrigeration plant.

### Range

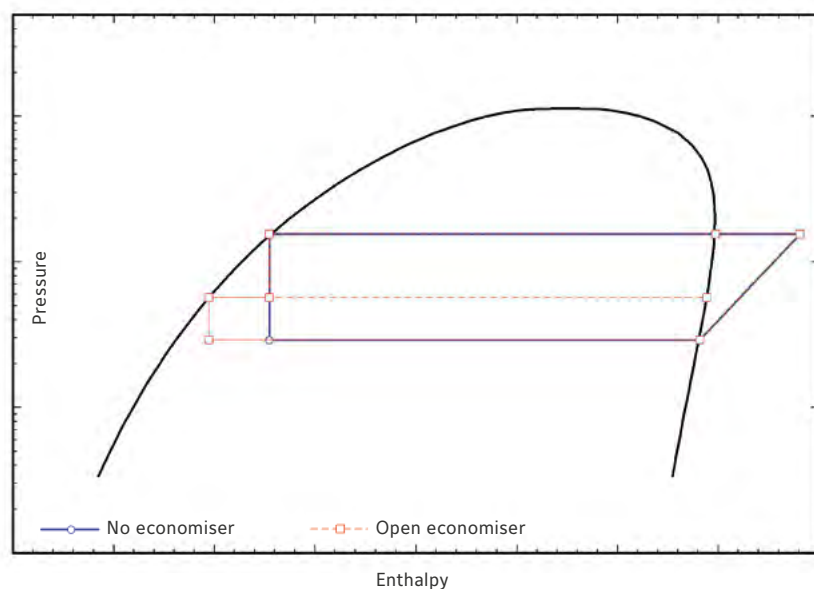
The SVER closed flash economiser is available in five different configurations. The five standard configurations are designed to match the Sabroe screw compressor products range.

The SVER unit is approved for operation between 80°C and -40°C and 26/-1 barg.

Features	Benefits
Subcooling of condenser liquid	Increased cooling capacity for the same amount of compressor work.
Calculation and product selection via COMP1	Simple selection of SVER type for Sabroe screw compressors
Integrated liquid separator	External liquid separator not needed, and the overall footprint of the installation is reduced

## SVER - capacity and product range

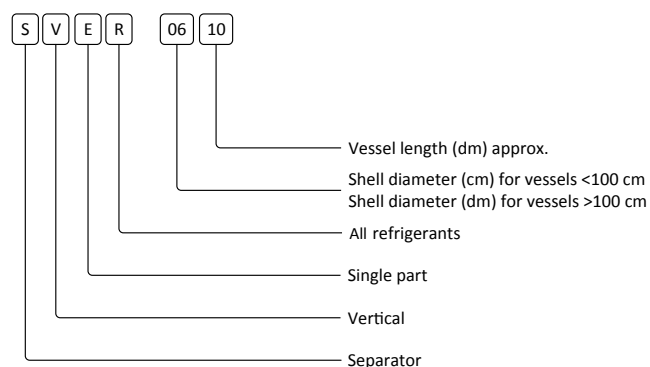
Type	Shell diameter	Unit height	Flash inlet		Liquid outlet		Eco port	
	mm	mm	Size [mm]	Count	Size [mm]	Count	Size [mm]	Count
0307	309	1,455	73.7	1	54.5	1	54.5	1
0408	403	1,175	107.1	1	70.3	1	70.3	1
0509	496	1,580	120.6	1	82.5	1	82.5	1
0610	597.6	2,095	146	1	107.1	1	107.1	1
0814	800	2,610	270	1	130	1	130	1



The figure illustrates the impact of installing an open economiser. By separating the liquid and gas in the open flash economiser, the condenser liquid is subcooled and the cooling capacity of the system is increased.

## SVER type designation

All Sabroe vessels follow a standard key for naming and identification. For the SVER product line, the name of a given configuration can be identified by the key below.









# Sabroe's Customised Solutions



## Sabroe's Customised Solutions

The Sabroe portfolio of standard industrial refrigeration solutions is extremely comprehensive. Sometimes, however, this just isn't enough to meet a customer's very specific operating requirements or installation environment. In such cases, we partner with our customers to customise one or more Sabroe solutions to comply with the particular requirements.

Sabroe's customised solutions feature maximum flexibility to support the engineering of solutions that comply with any special customer requirement. These are just some of the options normally available – ask Sabroe experts about more.

- Compliance with special design codes and national technical requirements
- Wide range of refrigerants and gases
- Special brines and secondary refrigerants
- Special configurations for installation in:
  - Hazardous environments
  - Explosive environments
  - Corrosive environments
  - Low and high ambient temperatures
- Special compressor units for gas transfer
- Dual compressor packs
- Customised chiller and heat pump packages
- High-temperature heat pumps
- High-capacity chillers and heat pumps
- Ultra-low temperature process cooling
- Skid-mounted systems – single or modular
- Special heat exchangers and vessels

- Associated systems, including ventilation, hydraulic solutions, etc.
- Special control systems including PLC, and any type of SCADA control system architecture
- Special instrumentation
- Special electrical panels
- High-voltage motors

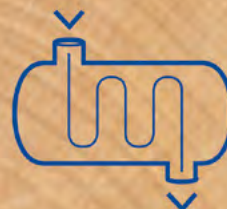
In Sabroe customised solutions, research and development go hand in hand with ingenuity and experience. Each project is managed by a matrix team consisting of the appropriate specialists and other highly skilled staff.

Great flexibility throughout ensures product quality and appropriate technical compliance as well as on-time, on-spec delivery.





All of Sabroe's customised products are subject to factory acceptance testing (FAT) in the Sabroe End-of-Line test centre (EOL). This means we carry out extensive checks on capacity, performance, vibration, and control functions prior to delivery. Any customer is welcome to participate in or supervise these tests.



Multiple configurations, many options, maximum capability – you decide exactly what best suits your operating priorities.





# Sabroe's End-Of-Line Test Centre

## Full satisfaction – no surprises

Not only are Sabroe systems at the forefront of industrial refrigeration technology, they're also backed by state-of-the-art facilities for pre-delivery, pre-commissioning testing.

We rigorously test the performance of every chiller and heat pump unit before it leaves the factory, so you can be 100% sure it lives up to your expectations in full when it arrives. You're entitled to expect full transparency – and we make sure Sabroe systems deliver.

## Testing in the factory – not on site

The unique Sabroe End-of-Line (EOL) Test Centre, located in Denmark, is a purpose-built facility comprehensively equipped with state-of-the-art monitoring and testing equipment.

We can conduct a comprehensive range of tests, ranging from a full-blown Factory Acceptance Test (FAT) to any specific test package you may prefer. You and your staff are, of course, welcome to witness every stage of tests and trial runs to make sure everything performs as intended, with no unwelcome surprises.



All Sabroe chiller and heat pump units are tested before dispatch





## Documented capabilities

Rigorous pre-commissioning testing gives you comprehensive, reliable documentation of the performance and capabilities of the exact equipment you'll be receiving – not just generic approximations.

Solid, dependable documentation helps you and your technical staff plan effective implementation and integration with other equipment. And all the pre-delivery tests help save you time, money, and hassle with commissioning and running-in. With Sabroe product deliveries, you get what you ordered – and it works as you expected.



Solid, dependable documentation helps you and your technical staff









# AfterMarket Solutions



# AfterMarket Solutions

## Expertise when and where you need it

AMS has many years of practical experience with the repair and refurbishment of used refrigeration compressors bearing the Sabroe, Frick, Gram and Stal brand names. We share the full scope of our expert know-how and specialist experience about compressor units, control systems and how to optimise their operation.

The unique AMS blend of repair, refurbishment and consulting capabilities provides big, practical benefits for both your operations and your end-user customers (including less downtime, greater energy efficiency and a better return on investment). Additionally, our product lines with Air Purgers (AP) and Water, Dirt and Oil

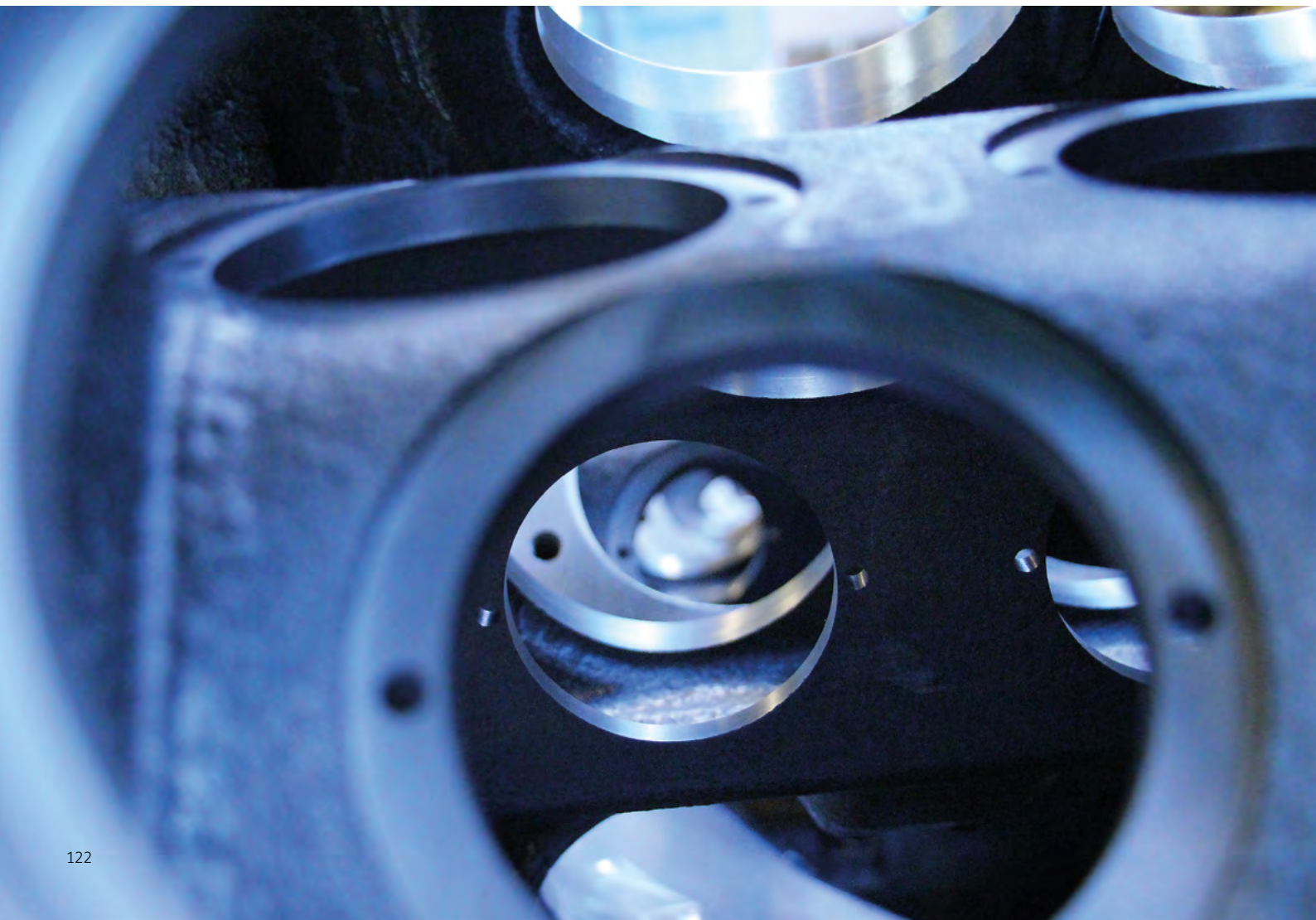
Purifiers (WDO) make Sabroe the smart choice to optimise your industrial refrigeration system. We offer products and solutions that ensure operational stability and with minimum operating costs while always complying with legal and environmental regulations.

[AfterMarketSolutions@jci.com](mailto:AfterMarketSolutions@jci.com)

## Training

Increase your knowledge of Sabroe products with one of our industrial refrigeration courses for hands-on, classroom training. They're held at the Sabroe Learning Center near Aarhus, Denmark with a 200 m<sup>2</sup> training area workshop.

[www.sabroe.com/services-and-support/training](http://www.sabroe.com/services-and-support/training)



# AfterMarket Compressor Solutions

AfterMarket Solutions offer compressor solutions for every need. Our programme enables the customer to choose between an exchange compressor, a factory overhaul or a retrofit compressor. All three solutions support recycling and sustainability.

## Compressor exchange

Is a recycling programme that enables customers to buy a new or rebuilt compressor in exchange of an old, worn out compressor.

## Compressor factory overhaul

Send your compressor to our AMS workshop for repair or service. The overhaul is carried out with genuine spare parts by a highly qualified team of technicians.

## Compressor retrofit

Enables customers to buy a new compressor block to be mounted on an existing unit. This will drastically reduce your maintenance costs and shorten the lead times.

## Tested to ensure reliability

Sabroe products and systems are renowned for exceptional reliability and technological advantages, backed by our ability to meet even the most demanding customer requirements.

One of the big advantages of doing business with Johnson Controls is that our compressor, chiller, and heat pump products are all systematically tested before delivery. This ensures rapid, glitch-free commissioning and a bare minimum of interruption to your operations.

[www.sabroe.com/services-and-support/aftermarket-solutions](http://www.sabroe.com/services-and-support/aftermarket-solutions)



# Parts Centre

The Parts Centre provides round-the-clock aftermarket support services that enable both owners and providers of Sabroe equipment all over the world to maximise their return on investment, and to ensure the long-term efficiency and stability of their operations.

Making the most of an effective worldwide logistics infrastructure and rapid-response inventory management, the Parts Centre dispatches any part to wherever in the world it may be needed, within just 24 hours (if the part is in stock).

[IRpartssupportdk@jci.com](mailto:IRpartssupportdk@jci.com)

## EasyParts - Solution Navigator

– online ordering of Industrial Refrigeration parts

- 40,000 items, of which approx. 6,000 are in stock
- Easy item search and ordering
- Integrated enquiry system for technical support and warranty
- Shipment tracking and invoice download

<https://solutionnavigator.com>

# Sabroe AP1000 Air Purger

Improves performance and reduces operating costs for all types of industrial ammonia refrigeration equipment

The AP1000 Air Purger is specially designed to maintain the efficiency of an ammonia-based refrigeration setup by removing any air present in the refrigerant charge. Air is an uncondensable gas that reduces the effective surface of the condenser and evaporators, resulting in poorer refrigeration performance and higher operating costs.

Any air entering the refrigeration equipment also contains moisture. The mix of water, oxygen and ammonia tends to break down the compressor oil, resulting in loss of viscosity and lubricating properties and premature wear of compressor parts.

Removing air restores any gradual loss of refrigeration capacity, thus making it possible to either increase any production related to refrigeration output, or to reduce energy consumption. Typical performance improvements average 5% to 10% of the overall refrigeration capacity, or a corresponding 5% to 10% reduction in power consumption.

The AP1000 features an easy-to-connect control box connected to both the air purger and up to 16 purge points, via settings entered with the four-inch touchscreen on the front of the electrical panel. The box is prepared for connecting additional purge box modules if more than 16 purge points are required.



Features	Benefits
Protects against gradual reductions in cooling capacity	Greater cooling capacity
Constantly purges efficiency-sapping air from refrigeration equipment	Reduced energy consumption for refrigeration equipment (normally 5% to 10%)
Uncomplicated design	Rapid return on investment (normally less than 12 months for medium-sized plants)
No maintenance required	Less oil decomposition and fewer unexplained refrigeration equipment stoppages
Easy to install	More stable operation Lower refrigeration service and maintenance costs

## Installing the Sabroe AP1000 Air Purger

Installation of the air purger, as illustrated below, is fairly simple. A solenoid valve must be fitted in each purge point line and connected to the control box.



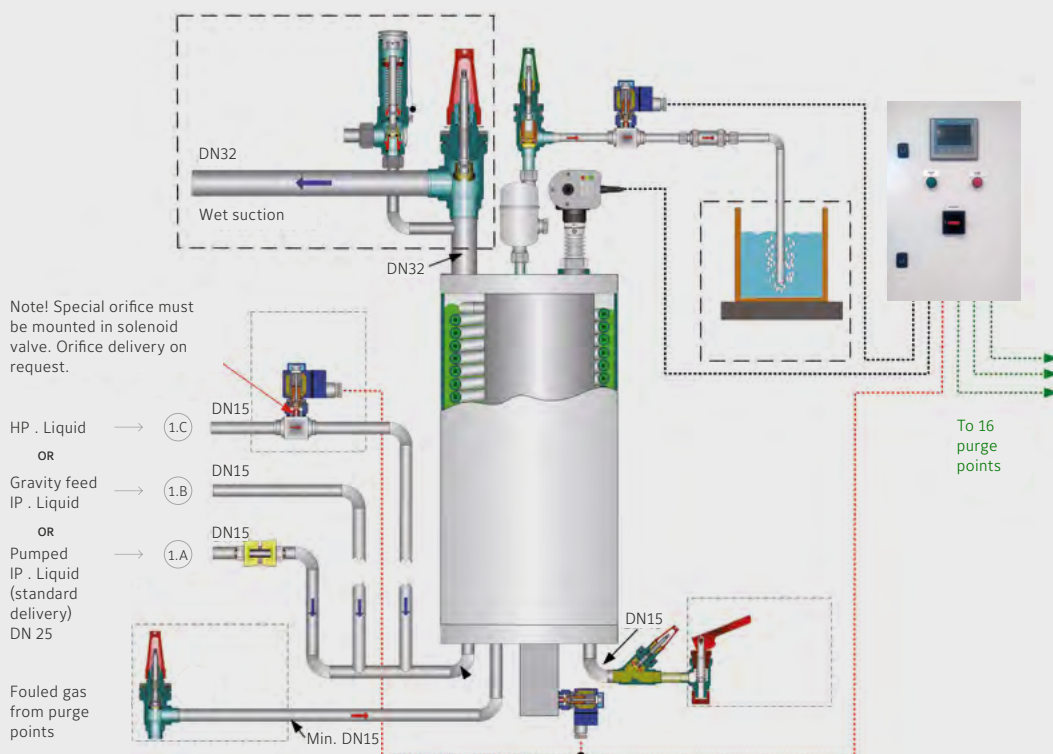
## How to operate

The control box monitors the level indicator in the vessel as well as controls the three solenoid valves on the air purger itself and up to 16 solenoid valves mounted in purge lines. Settings for the on and off periods of the purge point solenoid valves are entered on the touch panel.

Remote monitoring and control of the air purger:

- Green lamp indicates purge active
- Red lamp indicates fuse fault
- Remote activation of the air purger (potential-free "HP compressor running" signal to digital input)
- Remote monitoring of fuse fault (potential-free contact)

Air purger type AP1000



### Technical data for the AP1000 air purger

Material	Carbon steel/Stainless steel
Dimensions H x W x D	1,300 x 550 x 370 mm
Weight	80 kg
Condensing capacity	10 to 13 kW
Refrigerant	Mainly suited for R717
Ingress protection	IP65

### Part numbers

4385.010 Carbon steel without controls
4385.020 Stainless steel without controls
4385.031 Controls for AP1000

### Technical data for the control box

Power supply	230VAC 50HZ
Dimensions H x W x D	500 x 400 x 300 mm
Encapsulation/Ingress protection	Painted-steel plate/IP66
Contents	Main switch Siemens S7-1200 PLC Siemens KTP400 Basic 4-inch Lamps indicating operation and fault Relays on outputs
Output voltage for solenoids	230 VAC 50 Hz
Compliance	CE/PED



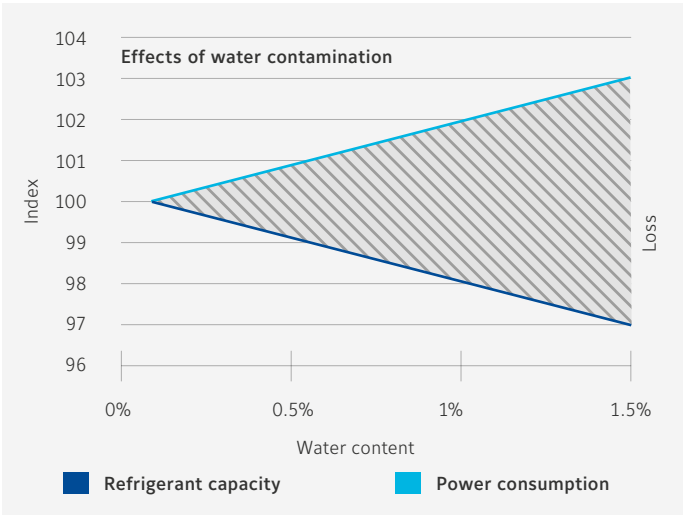
# Sabroe WDO Water, Dirt, and Oil Purifier

For removing any water, dirt and oil present in the refrigerant charge

WDO Purifiers maintain refrigeration plant efficiency by reducing the amounts of water and oil in the refrigerant. This in turn makes it possible to roll back operating costs as well as any risk of unscheduled plant shutdowns.

WDO Purifiers reduce water contamination in ammonia plants, as well as benefiting refrigeration capacity, power consumption and operating costs. Any water contamination present in the refrigerant will almost certainly have a negative impact on the overall plant performance.

For a typical ammonia-based refrigeration setup, removing unwanted water can help reduce power consumption by as much as 5–10 percent. For a medium-sized plant, a WDO Purifier normally has a payback time of less than 12 months.



Features	Benefits
Removes oil and dirt from your refrigeration installation	Reduces operating costs and keeps system components operating at maximum efficiency
Removes any water present in the ammonia refrigerant	Less corrosion of mechanical parts, along with fewer breakdowns and unscheduled service interruptions
Fewer oil changes needed	Prevents any water present in the refrigerant degrading the lubricating oil and reducing operating efficiency and service life

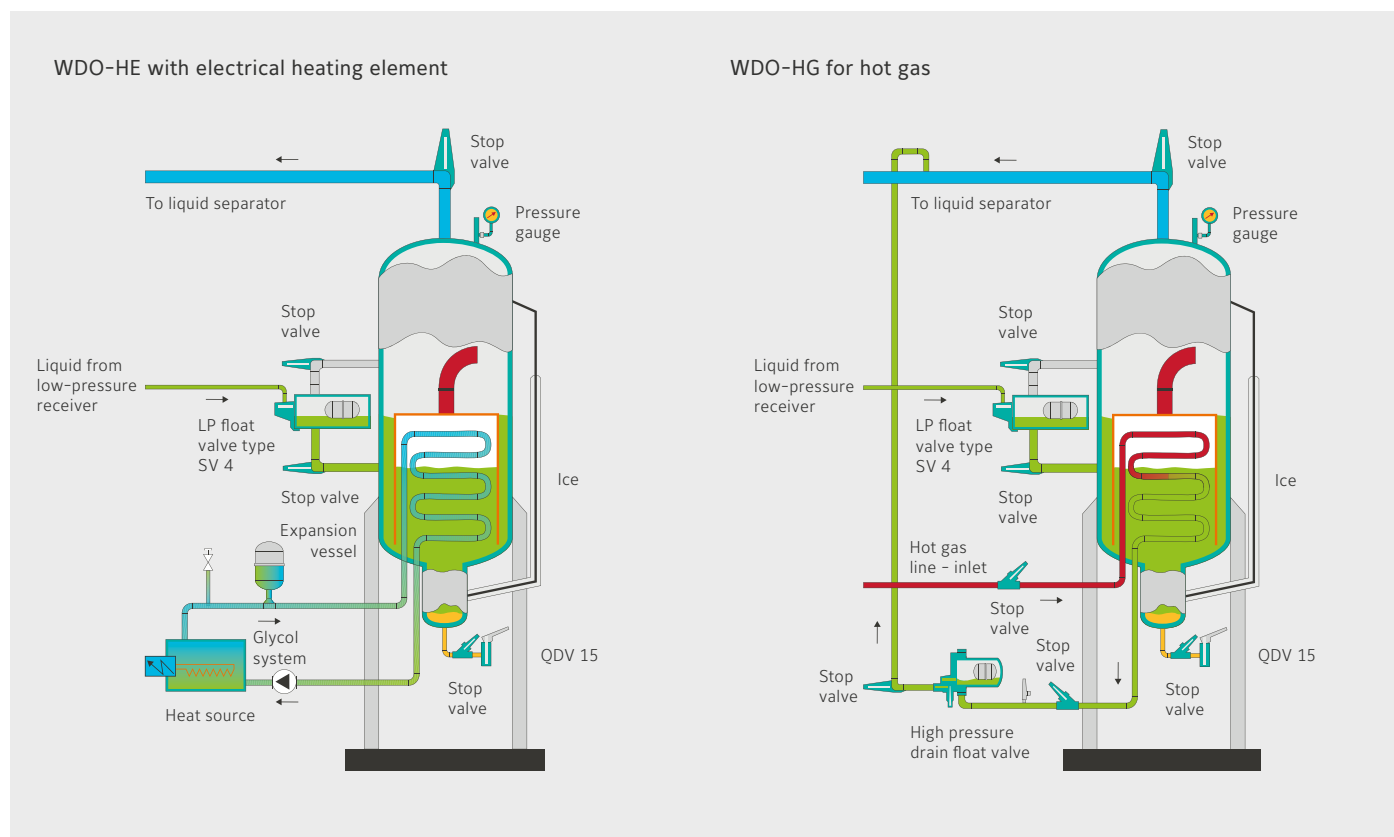


Sabroe WDO-HE (insulated)



Sabroe WDO-HG (not insulated)

## Two versions available



Technical data	
Refrigerant charge	35 kg
Maximum operating pressure	22 bar
Surface of R717 separator	1.2 m <sup>2</sup>
Capacity	15 kW (approx.)
Compliance	CE/PED
Operating limits	
Lowest operating temperature	-50°C
Highest operating temperature	50°C
WDO-HE	
Unit dimensions H x W x D	2,000 x 800 x 1,100 mm
Weight, empty	389 kg
WDO-HG	
Unit dimensions H x W x D	1,800 x 750 x 700 mm
Weight, empty	221 kg
Power supply (for WDO-HE version only)	
Voltage	3 x 400 V, 50 Hz
Consumption	6.5 amp
Maximum fuses in supply	16 amp

Part numbers	
WDO-HE (insulated)	
4245.001	WDO HE (electrically heated)
WDO-HG (not insulated)	
4245.002	WDO HG (hot-gas heated)

# Sabroe AP1200 + WDO1200 Purging System

New feature: Controller with signal of water content and purged air timer

Removes any air, water and other impurities that are present in an ammonia refrigerant charge

The very powerful AP1200 + WDO1200 is a combined air and water purging system that can handle all sizes of industrial refrigeration systems that use ammonia (R717) as refrigerant and ensure no air, water and other impurities are left in the system.

The AP1200 + WDO1200 purging system uses excess thermal energy from the air purger to remove any water, dirt or oil (WDO) that might be present in an ammonia refrigerant charge.

This enables you to tackle multiple refrigerant contamination problems at once at relatively low cost.

By installing an AP1200 + WDO1200 purging system, you reap the full benefits of clean ammonia with consistent specifications, for use at the heart of your refrigeration system.

This whole purging system is easy and cheap to install, operate, and service.

It is also ideal as a low-cost, energy-effective way to boost operating efficiency as well as to avoid and prevent unpleasant surprises, service interruptions, and possible breakdowns in your key processes.



Sabroe AP1200 + WDO1200  
Purging System

Features	Benefits
The amount of purged air can be determined from controller with purge timer and capacity table	Normally reduces refrigeration equipment energy consumption by as much as 5% to 10%
Relation between air and water content in system becomes visible	Reduces operating costs and keeps the refrigeration system and its components operating at maximum efficiency
Helps prevent undesirable chemical reactions in all systems in a refrigeration installation	More stable operation as well as lower service and maintenance costs
Warning signals when ready for pump down and water drainage from controller	Fewer oil changes needed, improved operating efficiency and longer service life for equipment and installations
Low installation costs as AP1200 + WDO1200 can use the same connections	Easy and cheap to install, operate and service



## How to install

Due to its small footprint, an AP1200 + WDO1200 purging system can be installed where it is most convenient on site.

It is very easy to install as only three shared connections are needed – for wet suction, low-pressure liquid and an input line for the fouled gas.

### AP1200

The AP1200 works automatically when connected to a controller.

The amount of purged air can be determined from a controller with purge timer and capacity table. This makes sure that the pressure inside is high enough and the temperature low enough for the gaseous ammonia in the inner chamber to condense.

When the air purger is filled with non-condensable gas, the controller opens the air purge connection and releases air until high liquid level is restored. It then closes the air purge connection again.

### WDO1200

The WDO1200 works automatically, but requires manual draining of the sludge and water reservoir when it is full.

A WDO unit evaporates – and thus purifies – the liquid ammonia by exploiting the refrigerant's particular properties, pressure and temperature, with no additional energy inputs needed. The ammonia evaporates before water, leaving dirt, oil and other contaminants to settle in the sludge reservoir.

When the controller display shows the alarm **Pump down necessary**, it means that the water percentage is higher than the set point 40%.



The WDO1200 then holds back the water dissolved in the liquid ammonia.

When the controller display shows the alarm **Emptying necessary**, it means that the water reservoir temperature is higher than the evaporation temperature (approximately 12°C) and the water must be drained off. This is also a manual operation.



Technical data	
Refrigerant charge	35 kg
Maximum operating pressure	25 bar
Surface of R717 separator	0.748 m <sup>2</sup>
Capacity	12 kW (approx.)
Compliance	CE/PED
Operating limits	
Lowest operating temperature	-50°C
Highest operating temperature	50°C
AP1200	
Unit dimensions H x W x D	1,374 x 302 x 330 mm
Weight, empty	51 kg
WDO1200	
Unit dimensions H x W x D	1,340 x 588 x 344 mm
Weight, empty	46 kg

Part numbers	
AP1200 + WDO1200 purging system without controls	
4385.200 AP1200 + WDO1200 stainless steel combined without controls	
AP1200 without controls	
4385.150 AP1200 stainless steel without controls	
Controls for AP1200/WDO1200	
4385.060 Controls for AP1200/WDO1200 16 purge point	
4385.061 Controls for AP1200/WDO1200 32 purge point	

# Sabroe AP100 + Mini WDO Combined Air and Water Purger

Removes any air and water present  
in an ammonia refrigerant charge

The AP100 + Mini WDO is a combined air and water purger specially designed for use in small industrial refrigeration systems and industrial chiller units – of all sizes – that use ammonia (R717) as refrigerant.

AP100 + Mini WDO units use excess thermal energy from the air purger to remove any water, dirt or oil (WDO) that might be present in an ammonia refrigerant charge. This enables you to tackle multiple refrigerant contamination problems at once at relatively low cost. Installing an AP100 + Mini WDO unit means you reap the full benefits of clean ammonia with consistent specifications, for use at the heart of your refrigeration systems.

This whole purging system is easy and cheap to install, operate, and service. It is also ideal as a low-cost, energy-effective way to boost operating efficiency as well as to avoid and prevent unpleasant surprises, service interruptions, and possible follow-on breakdowns in your key processes.

Features	Benefits
Uses energy often wasted in an air purger to provide additional water purging capabilities	Normally reduces refrigeration equipment energy consumption by as much as 5% to 10%
Constantly purges efficiency-sapping air and water from your refrigeration system	Reduces operating costs and keeps the refrigeration system and its components operating at maximum efficiency
Helps prevent undesirable chemical reactions in all systems in a refrigeration installation	More stable operation as well as lower service and maintenance costs
Prevents any water present in the refrigerant from degrading the lubricant oil	Fewer oil changes needed, improved operating efficiency and longer service life for equipment and installations
Only three connections needed – wet suction, low-pressure liquid, and fouled gas line	Easy and cheap to install, operate and service



The mounting plate shown above is standard equipment



The mounting stand shown above is an optional extra

## How to install

An AP100 + Mini WDO unit can be mounted on a special supporting frame, freestanding or mobile.

It is very easy to install because only three connections are needed – for wet suction, low-pressure liquid, and an input line for the fouled gas.

### AP100

The AP100 works automatically when connected to a control panel and/or level switch.

When powered on, a timer delay ensures that the air purge solenoid valve cannot open during the first 10–30 minutes of running (depending on the timer setting). This makes sure the pressure inside is high enough and the temperature is low enough for the gaseous ammonia in the inner chamber to condense.

When the air purger is filled with non-condensable gas, the liquid level switch opens the air purge connection and releases air until high liquid level is restored, and then closes the air purge connection again.

Technical data	
Material	Stainless steel
Dimensions HxWxD	1,200 x 620 x 360 mm
Weight	28 kg
Capacity	
Nominal ammonia evaporating capacity of the water purger:	2 kW (approx.)
Nominal ammonia capacity of the air purger:	2 kW (approx.)
Compliance	
CE/PED	
Part numbers	
4385.100 AP100 + Mini WDO – no controls	
4385.101 AP100 + Mini WDO – incl. level switch for 1 pp (stand-alone)	
4385.102 AP100 + Mini WDO – incl. control panel for 16 pp	

## Mini WDO

The Mini WDO works automatically, but requires manual draining of the sludge reservoir and water reservoir when these are full.

A WDO unit evaporates – and thus purifies – the liquid ammonia by exploiting the refrigerant's particular properties, pressure, and temperature with no additional energy inputs needed. The ammonia evaporates before water, leaving dirt, oil and other contaminants to settle in the sludge reservoir.

When the sludge reservoir temperature is higher than the evaporation temperature (10–15°C), this reservoir must be drained. This is a manual operation.

The water purger also holds back the water dissolved in the liquid ammonia. When the water reservoir temperature is higher than the evaporation temperature (10–15°C), this water must be drained off, after a pump down. This is also a manual operation.

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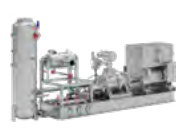
## Compressors



SabroeScrew






SabroeRecip

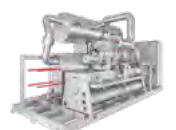



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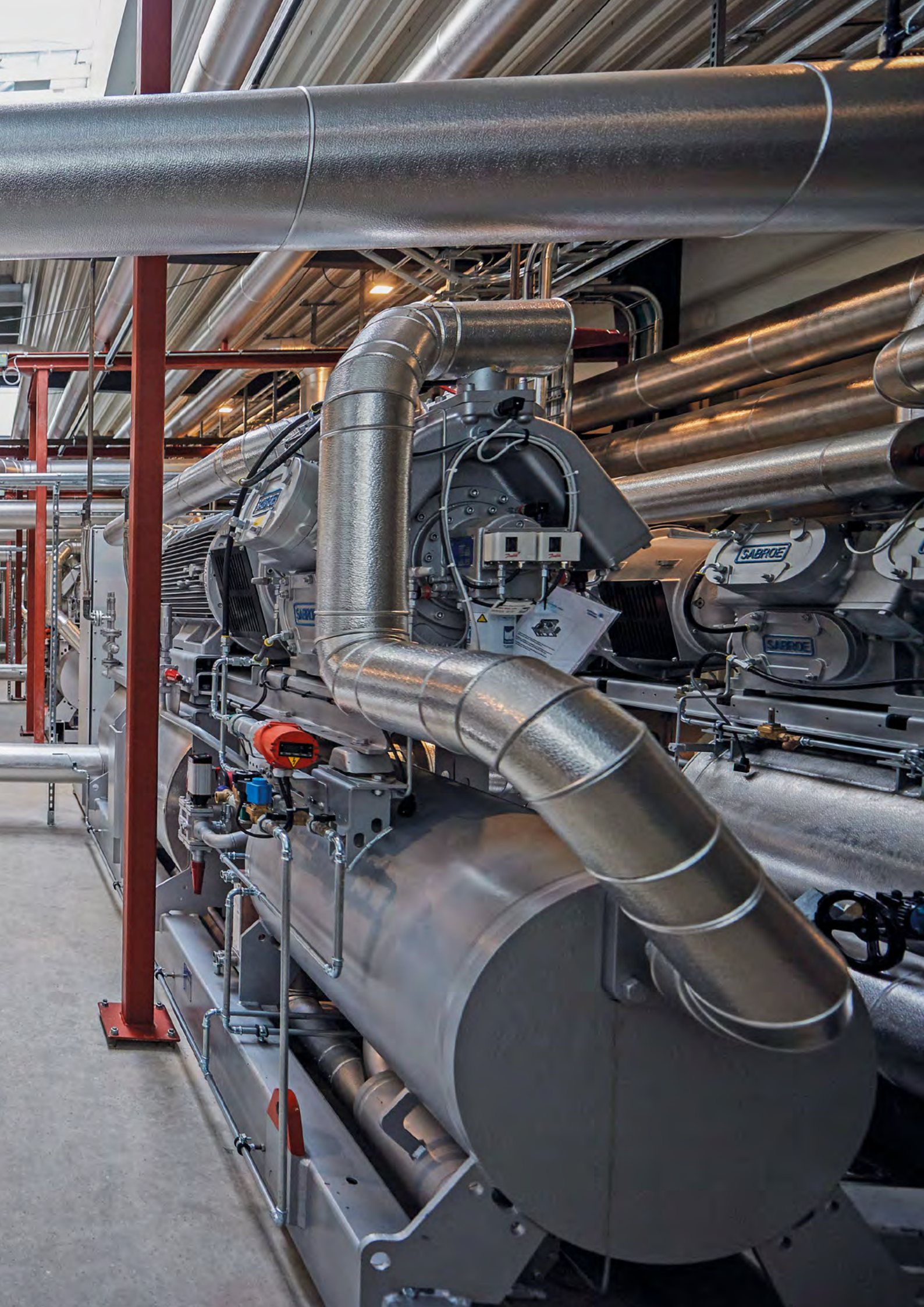
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A photograph of industrial machinery, likely a large pump or compressor, surrounded by extensive piping. The pipes are wrapped in silver insulation. The equipment is located in a large industrial building with a high ceiling and corrugated metal roof. The scene is well-lit, showing the complexity of the industrial system.

High-performing and reliable  
equipment that lasts









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