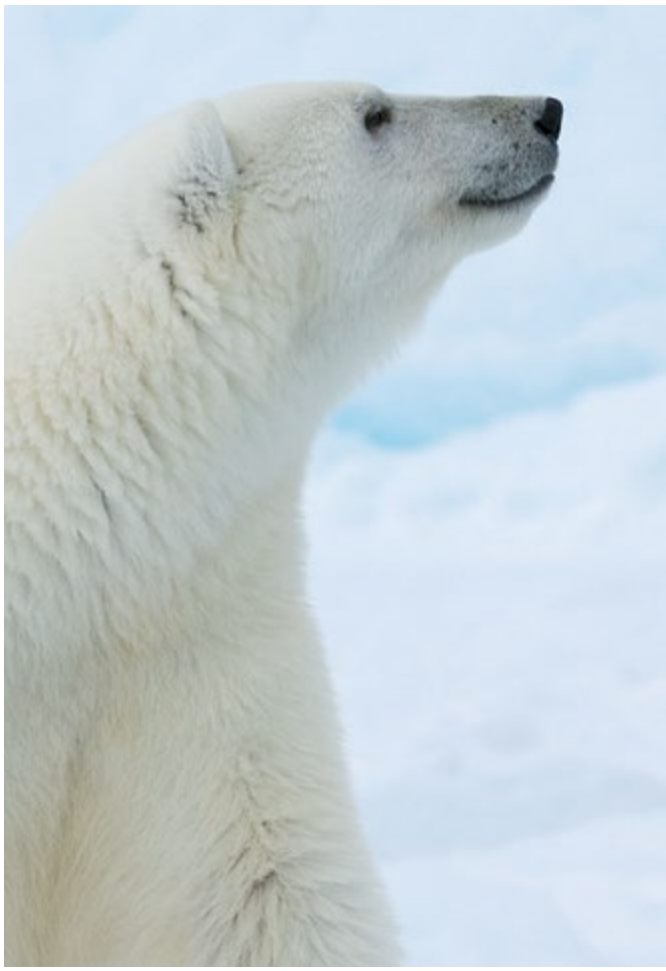
Sabroe Products 2021



Creating customer confidence

The power behind **your mission**

Johnson Controls

Sabroe products – smart, safe and sustainable

Content

Sabroe – creating customer confidence for a better world 04

120 years of new ideas and better technology 05

Business with global goals 06

Sabroe oder Sabroe – what's the difference? 08

Reducing emissions, recovering heat 09

Sabroe products – the big difference 10

Compressors

Sabroe reciprocating compressors 16

Sabroe screw compressors 24

Chillers

Sabroe chillers 31

Sabroe low-temperature chillers 44

Heat pumps

Sabroe heat pumps 47

Controls

Sabroe controls 57

Customised

Sabroe customised solutions 79

AfterMarket

AfterMarket solutions 83

Sabroe End-of-Line test centre 92

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.

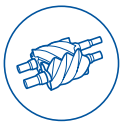
We drive positive changes in the industries we serve as the world champions in green cooling and heating solutions, offering supreme flexibility and relentless quality.

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.


SABrecip


SABscrew


SABchill


SABfreeze


SABheat


SABcontrol


SABcustom

120 years of new ideas and better technology

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

We listen to where your real difficulties lie and what you really want to achieve. And then we focus 120 years of specialist experience and know-how on how best to help you achieve it all.

2021 NS heat pump 273 60 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 CAFP
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_2 compressor
1897 Introduction of natural refrigerants
1897 Sabroe founded

Business with global goals – Johnson Controls keeps its cool

Johnson Controls believes in doing well by doing good

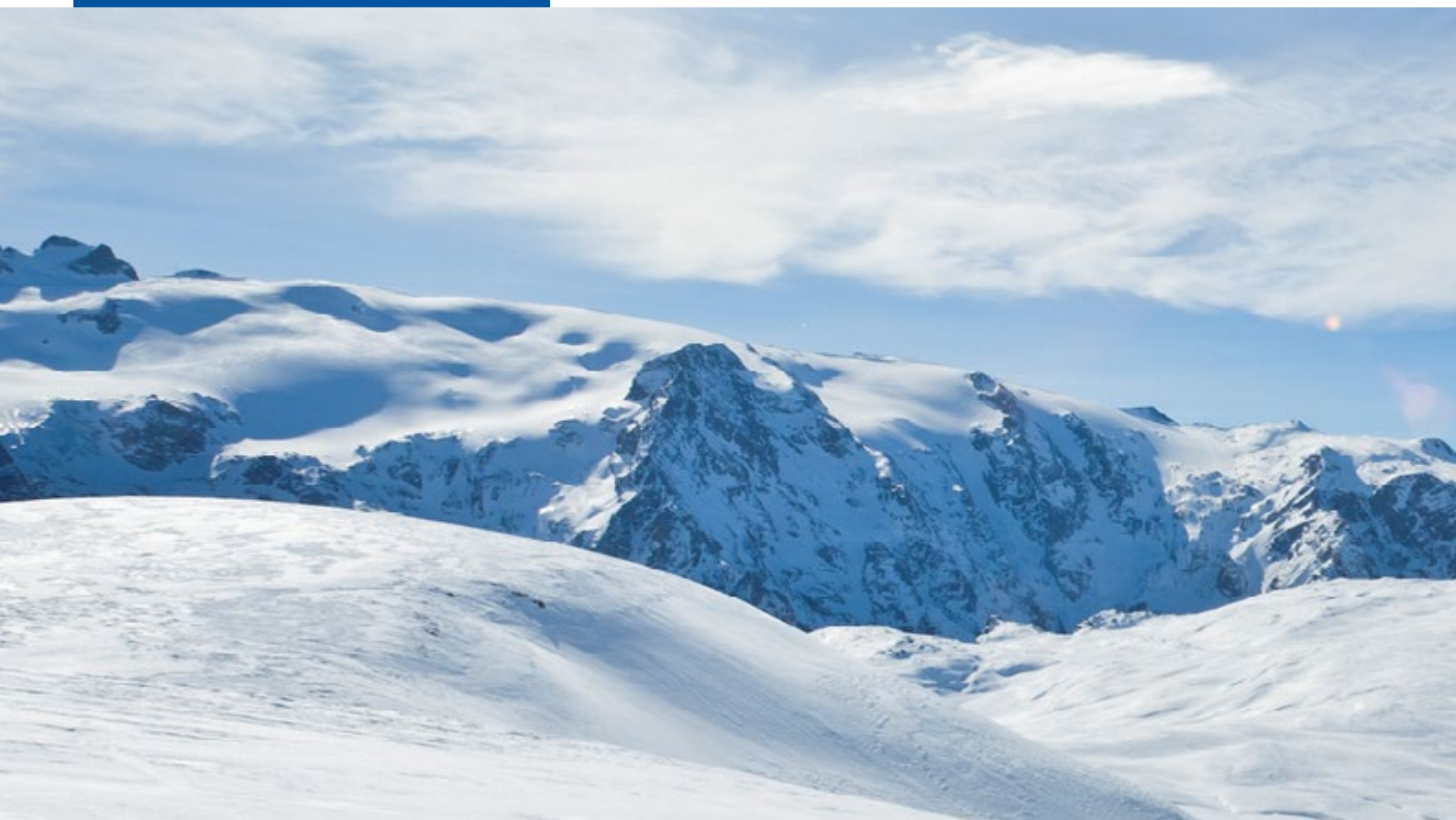
We will design and deliver increasingly sustainable products, services and solutions that help our customers improve their energy efficiency, reduce their carbon footprint and achieve their environmental goals.

Leading by example, we will improve our own environmental performance and that of our supply chain. We will protect our environment through recycling and reducing greenhouse gases, energy, water, and waste.

Determined to do something

The seventeen UNDP Sustainable Development Goals (SDGs) came into effect in January 2016 as part of a worldwide push to implement real measures to help end poverty, protect the planet, and ensure peace and prosperity for everyone.

As a world leader in the commercial application of innovative thinking and sustainable technology, Johnson Controls – and its Sabroe business unit – strongly support, endorse, and encourage the implementation of the UNDP SDGs to ensure good business with a minimum of environmental impact. But we are only going to achieve these global goals if we all actively support and comply with them and pass on the message about their importance.



Applied technology, shared benefits

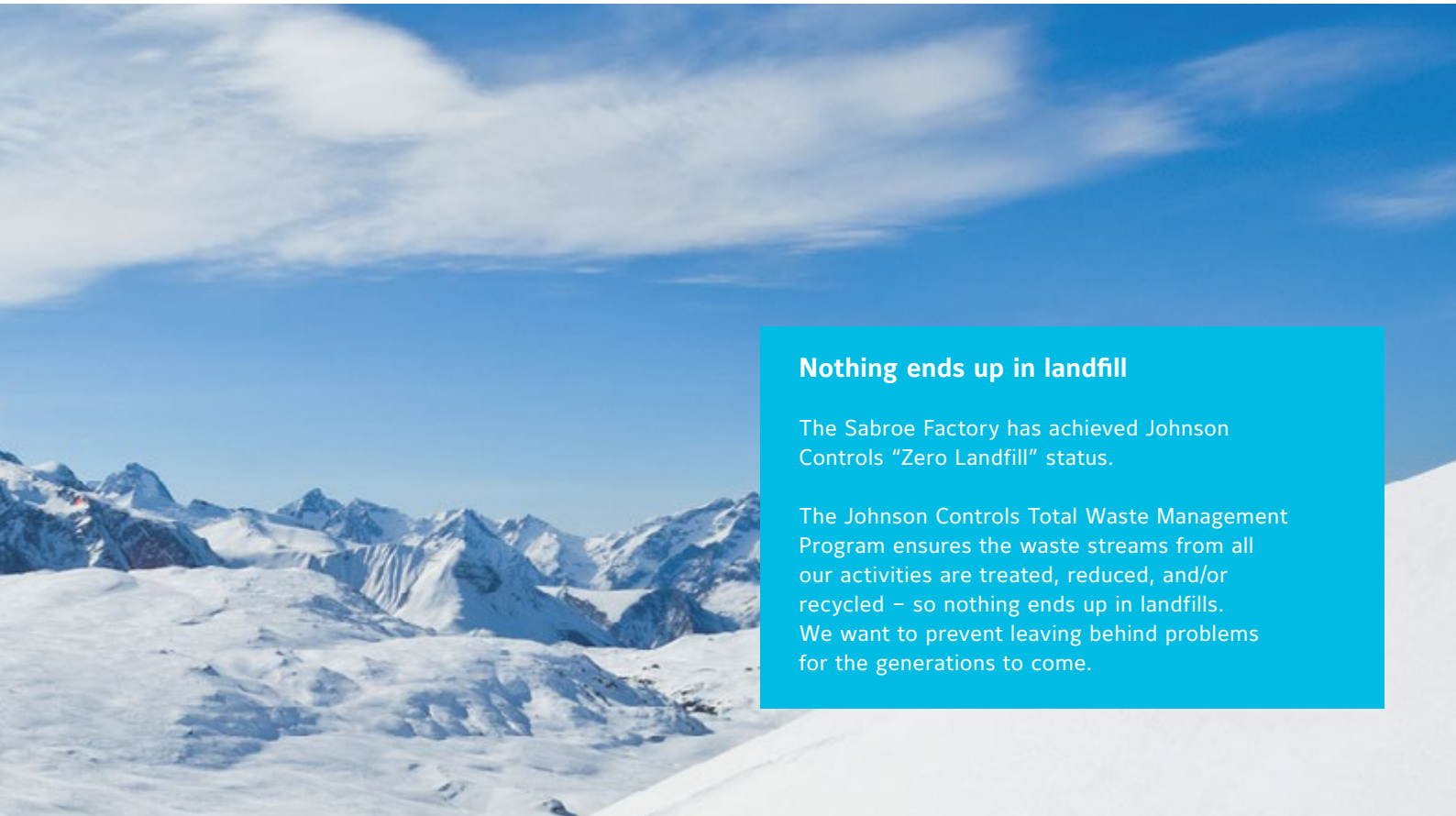
We can supply the technology to help you make amazing things happen – good for the climate, good for business. Opting for heating or cooling solutions supplied by Sabroe means you and your company are part of the push to tackle climate change in all the many ways laid down in the SDGs.

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:

- Exceptionally efficient refrigeration plants that only use water as refrigerant – it doesn't get more environmentally friendly than that.
- Sabroe DualPAC and HeatPAC heat pumps reclaim waste heat, extract valuable thermal energy, and roll back CO_2 emissions by combining compressor and heat-exchanger technologies with patented Sabroe evaporator and condenser designs.
- Sabroe ChillPAC refrigeration plants that deliver 1400 kW of cooling effect using just 55kg of ammonia refrigerant.



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 or **Sabroe** – what's the difference?

The **Sabroe** units are configured for use in refrigeration, cooling, and air conditioning.

The **Sabroe** compressors are specifically for use in heat pumps and heat-recovery setups, and are therefore specially designed to cope with the high pressures normally encountered in such systems.

All Sabroe compressors used to feature the brand name in capitals on the top covers in blue letters.

In 2018, however, we also introduced red lettering on certain compressor top covers.

To most people, this detail may seem of very little importance. But we didn't introduce the blue or red lettering just for marketing purposes.

We wanted to provide a clear distinction between two very different kinds of compressors that look virtually the same from the outside, even though the innards have significant differences.

And these two different Sabroe compressor product ranges are also designed and equipped for completely different kinds of installations – the **Sabroe** units are configured for use in refrigeration, cooling and air conditioning, whereas the **Sabroe** compressors are specifically for use in heat pumps and heat recovery setups. This means the latter are specially designed to cope with the high pressures normally encountered in such systems.

Reducing emissions, recovering heat

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_2 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. 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.

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.

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, and to do so inexpensively and with only limited environmental impacts.

Sabroe heat pumps can be used to supply a wide range of different temperatures and in this way help owners and operators save money as well as reducing CO_2 emissions as well as limiting the financial penalties now increasingly associated with these emissions.

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. Whether **blue** or **red**.

Sabroe products – the big difference

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 helping our customers as much as possible. That's why we also use the same data and documentation in all subsequent Sabroe calculations about 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 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 moe 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.

Compressors

Screw or reciprocating compressor?

There is no simple answer to this constantly recurring question. Both technologies are viable alternatives for use in almost all installations, and both types are normally capable of doing the job.

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.

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.

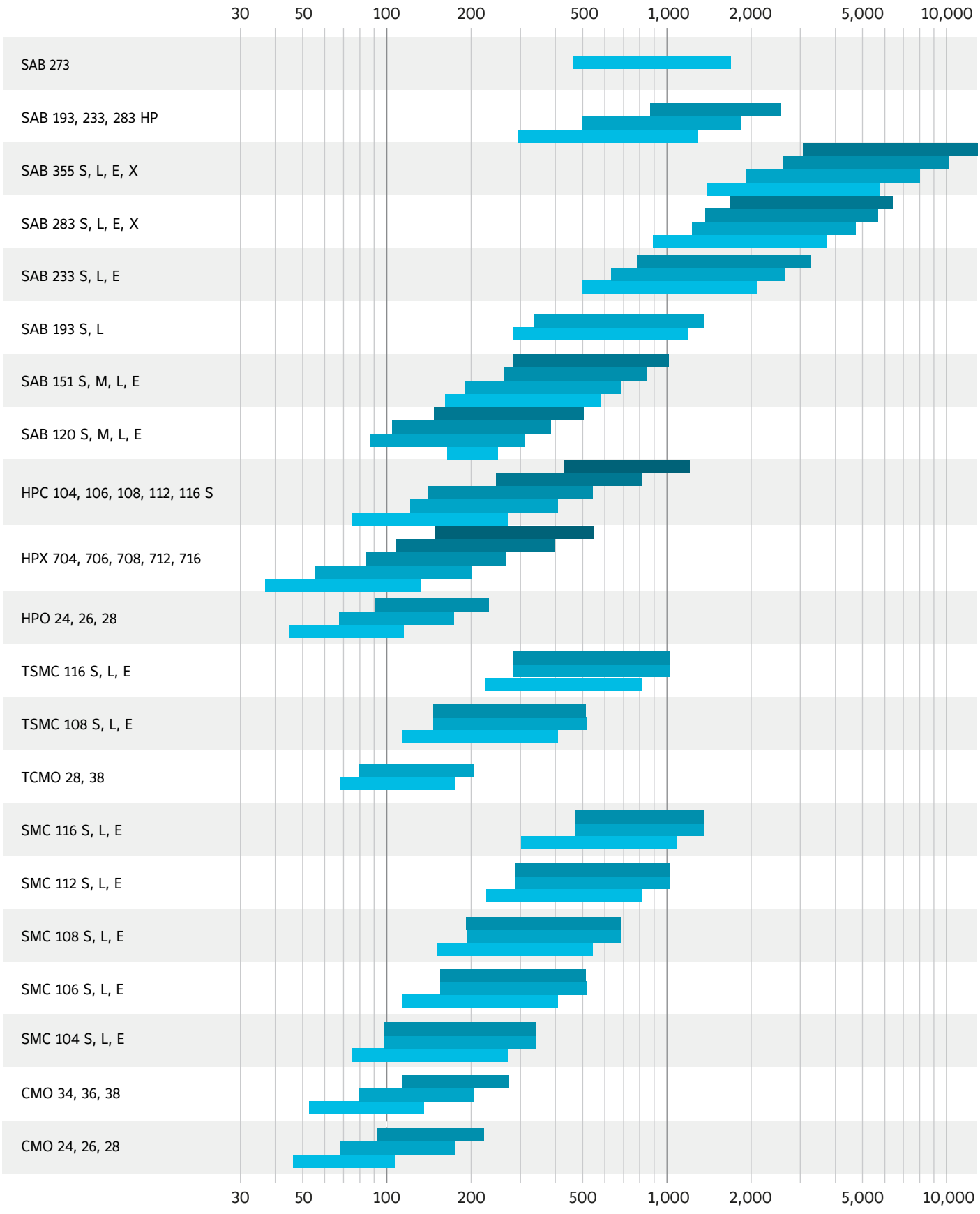
This helps you achieve maximum cooling effect using minimum energy, as well as keeping operating costs to an absolute minimum. The combination of a frequency converter, a VSD motor, and the UniSAB integrated systems controller makes it possible to run the drive motor at speeds that match the load at any given time.

This enables you to reduce energy costs by as much as 30 percent compared with traditional fixed-speed compressors.

The criteria you have to balance normally include:

- 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 compressor programme



Swept volume m³/h in 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 m³/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 m³/h.

Advantages	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	
		1500 rpm	1800 rpm	1500 rpm		1800 rpm						1500 rpm	1800 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	2150-2400	1050	1100	680	69	72
CMO 26	6	146	175	78	120	93	144	2200-2400	1150	1100	780	71	73
CMO 28	8	194	233	104	160	125	192	2250-2400	1200	1100	960	72	74
CMO 34	4	114	136	61	94	73	113	2150-2400	1050	1100	680	70	73
CMO 36	6	170	204	91	141	109	169	2200-2400	1150	1100	780	72	74
CMO 38	8	227	273	122	187	146	225	2250-2400	1200	1100	960	73	75

Dimensions, weight and sound pressure levels are guidelines only.

CMO min./max. speed (with R717): 700-1800 rpm

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

* Nominal capacities are based on:

1500 rpm at 50 Hz
1800 rpm at 60 Hz or VSD

Refrigerant: R717
Other refrigerants available on request.

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

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

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 m³/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 m³/h.

Advantages	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 1500 rpm			Nominal capacities * in kW at 1800 rpm			Unit dimensions in mm			Weight excluding motor	Sound pressure level	
		1500 rpm	1800 rpm	Single/high-stage		Booster	Single/high-stage		Booster					1500 rpm	1800 rpm
		m^3/h	m^3/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	2261-2865	1213	1229	1195	79	82
SMC 104 L	4	283	339	165	250	47	198	300	57	2261-2865	1213	1229	1215	80	83
SMC 104 E	4	339	N/A	203	306	58	N/A	N/A	N/A	2261-2865	1213	1229	1220	80	83
SMC 106 S	6	339	407	191	293	53	229	352	64	2286-2890	1267	1247	1380	81	83
SMC 106 L	6	424	509	247	375	71	297	450	85	2286-2890	1267	1247	1400	82	84
SMC 106 E	6	509	N/A	304	459	87	N/A	N/A	N/A	2286-2890	1267	1247	1410	82	84
SMC 108 S	8	452	543	255	391	71	306	469	85	2311-2915	1361	1247	1595	82	84
SMC 108 L	8	566	679	330	500	94	396	600	113	2311-2915	1361	1247	1630	83	85
SMC 108 E	8	679	N/A	406	612	116	N/A	N/A	N/A	2311-2915	1361	1247	1650	83	85
SMC 112 S	12	679	814	382	586	106	459	703	127	3279-3687	1475	1448	2255	83	85
SMC 112 L	12	848	1018	495	750	141	593	900	169	3279-3687	1475	1448	2280	83	86
SMC 112 E	12	1018	N/A	609	918	173	N/A	N/A	N/A	3279-3687	1475	1448	2330	83	86
SMC 116 S	16	905	1086	510	782	141	611	938	170	3329-3737	1536	1445	2505	84	86
SMC 116 L	16	1131	1357	659	1000	188	791	1200	226	3329-3737	1536	1445	2535	84	87
SMC 116 E	16	1357	N/A	812	1224	231	N/A	N/A	N/A	3329-3737	1536	1445	2590	84	87

Dimensions, weight and sound pressure levels are guidelines only.

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

Min./max. speed	R717
SMC S	500-1800 rpm
SMC L	500-1800 rpm
SMC E	500-1500 rpm

* Nominal capacities are based on:

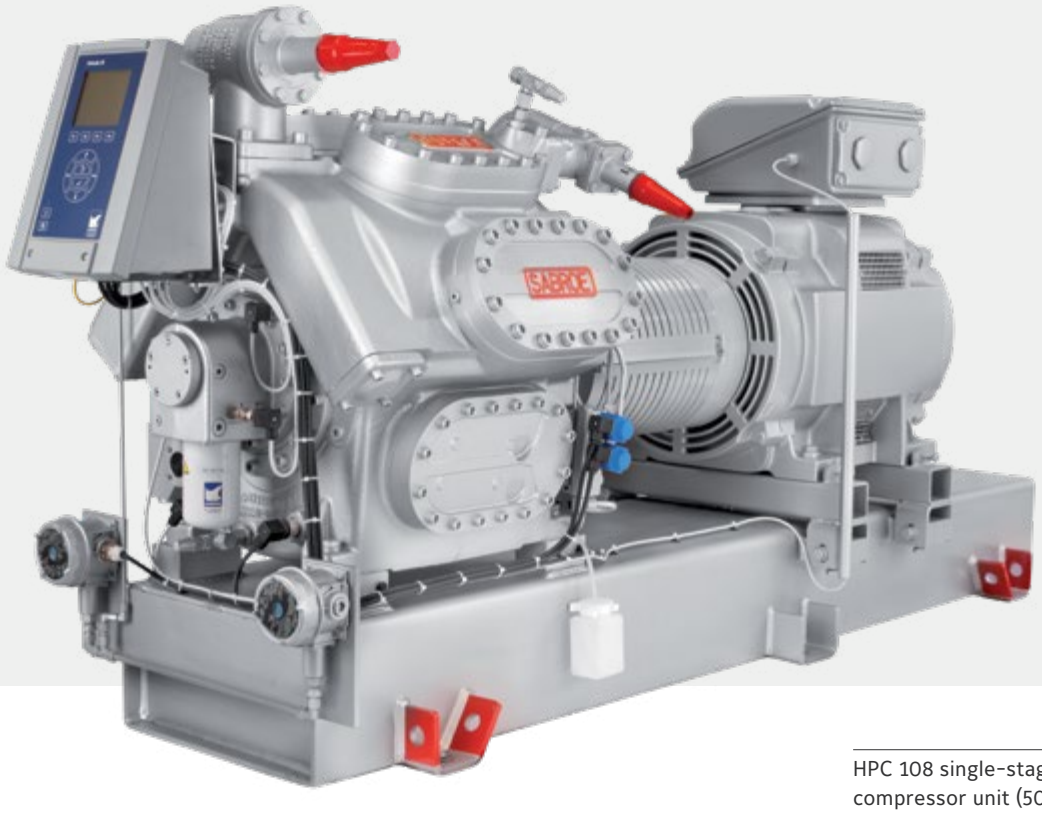
1500 rpm at 50 Hz.
1800 rpm at 60 Hz or VSD.

Refrigerant: R717
Other refrigerants available on request.

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

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



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^3/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_2 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.

Advantages	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

Range

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

Technical data

Model	Number of cylinders	Swept volume		Nominal capacities in kW at 1800 rpm				Unit dimensions in mm			Weight excluding motor	Sound pressure level at 1800 rpm
		1500 rpm	1800 rpm	Heating R717		Cooling R717	Cooling R744					
		m^3/h	m^3/h	+35/+73°C	+35/+90°C	0/+55°C	-50/-10°C	L	W	H	kg	db(A)
HPO 24	4	97	116	332	N/A	83	116	1580–1930	835	985	510	77
HPO 26	6	146	175	497	N/A	125	174	1600–1950	940	985	550	78
HPO 28	8	194	233	663	N/A	167	232	1620–1970	940	985	580	80
HPC 104 S	4	226	271	786	N/A	198	214*	2261-2865	1305	1214	1340	83
HPC 106 S	6	339	407	1177	N/A	297	321*	2286-2890	1345	1260	1580	84
HPC 108 S	8	452	543	1569	N/A	396	428*	2311-2915	1486	1247	1660	85
HPC 112 S	12	679	814	2351	N/A	594	642*	3279-3687	1525	1448	2520	86
HPC 116 S	16	905	1086	N/A	N/A	792	856*	3329-3757	1525	1448	2600	87
HPX 704	4	111	133	380	356	95	133	2261-2865	1213	1214	1220	82
HPX 706	6	166	200	570	535	143	200	2286-2890	1267	1260	1440	84
HPX 708	8	222	266	760	713	190	266	2311-2915	1278	1260	1510	85
HPX 712	12	333	399	1140	1069	286	400	3279-3687	1345	1448	2430	86
HPX 716	16	443	532	1520	1426	381	533	3329–3737	1356	1445	2600	87

* at 1500 rpm

Dimensions, weight and sound pressure levels are guidelines only.

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.

Nominal capacities are based on:
1500 rpm at 50 Hz.
1800 rpm at 60 Hz or VSD.

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.

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

Min./max. speed	R717	R744
HPO	700-1800 rpm	700-1800 rpm
HPC	500-1800 rpm	500-1500 rpm
HPX	500-1800 rpm	500-1800 rpm

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 compresor unit shown with closed flash inter-stage cooling system and UniSAB systems controller

Sabroe TCMO/TSMC two-stage reciprocating compressor units

Two-stage versions of CMO and SMC reciprocating compressors, with swept volumes of 150–1,000 m³/h

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

TCMO/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 and save space.

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 150 and 1,000 m³/h.

Advantages	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	
		1500 rpm	1800 rpm							1500 rpm	1800 rpm
		m^3/h	m^3/h	1500 rpm	1800 rpm	L	W	H	kg	db(A)	db(A)
TCMO 28	6 / 2	146	175	20	24	1400–1750	700	1000	500	68	70
TCMO 38	6 / 2	170	205	23	28	1400–1750	700	1000	500	69	71
TSMC 108 S	6 / 2	339	407	50	60	2311–2915	1052	1247	1746	80	82
TSMC 108 L	6 / 2	424	509	66	79	2311–2915	1052	1247	1781	81	83
TSMC 108 E	6 / 2	509	N/A	81	N/A	2311–2915	1052	1247	1796	81	83
TSMC 116 S	12 / 4	679	814	100	121	3329–3737	1327	1445	2791	81	83
TSMC 116 L	12 / 4	848	1018	133	159	3329–3737	1327	1445	2841	82	84
TSMC 116 E	12 / 4	1018	N/A	163	N/A	3329–3737	1327	1445	2891	83	84

Dimensions, weight and sound pressure levels are guidelines only.

* Nominal capacities are based on:

1500 rpm at 50 Hz.
1800 rpm at 60 Hz or VSD.

Refrigerant: R717
Other refrigerants available on request.

For R717
2K liquid subcooling, 0.5 K non-usable suction superheat and liquid subcooling in intermediate cooler to 10K above intermediate temperature.

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

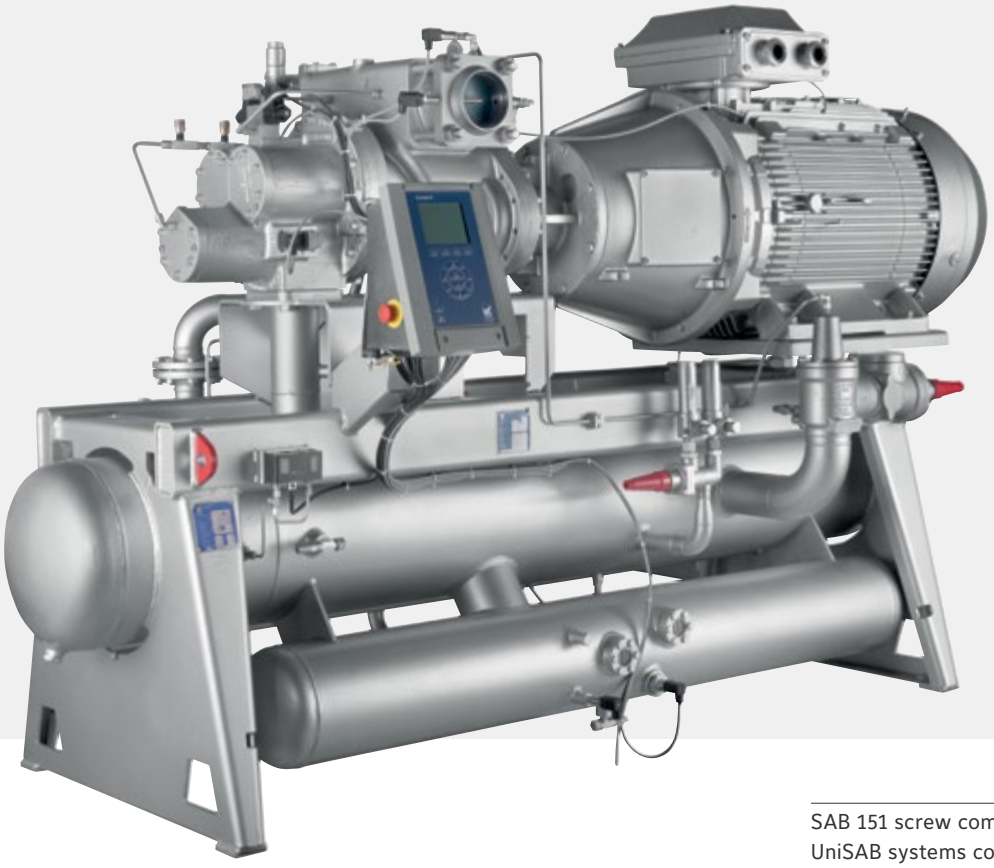
For TSMC
Design pressure, HP side: 28 bar
Design pressure, LP side: 18 bar
Differential pressure: 25 bar.

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

Min./max. speed	R717
TCMO	700–1800 rpm
TSMC S	500–1800 rpm
TSMC L	500–1800 rpm
TSMC E	500–1500 rpm

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

Small single-stage compressors with swept volumes of 200–1,000 m^3/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^3/h.

Advantages	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 5 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 3600 rpm R717			Unit dimensions in mm	Weight excluding motor/ oil	Sound pressure level	
	at 3000 rpm*	at 3600 rpm*	High-stage	Booster	With economiser			at 3000 rpm	at 3600 rpm
	m³/h	m³/h	-10/+35°C	-40/-10°C	-40/+35°C	L x W x H	kg	db(A)	db(A)
SAB 120 S*	204	245	145	44	44	2200 x 1300 x 1500	1200	85	87
SAB 120 M	255	306	191	58	58	2200 x 1300 x 1500	1200	86	88
SAB 120 L	316	379	243	73	73	2200 x 1300 x 1500	1300	88	90
SAB 120 E	413	496	325	98	99	2200 x 1300 x 1500	1300	89	91
SAB 151 S	484	581	373	116	106	3000 x 1450 x 1800	2050	90	92
SAB 151 M	571	685	448	139	127	3000 x 1450 x 1800	2050	91	93
SAB 151 L	708	850	565	175	160	3000 x 1450 x 1800	2050	91	93
SAB 151 E	847	1016	680	211	193	3000 x 1450 x 1800	2050	92	94

Dimensions, weight and sound pressure levels are guidelines only.

2-pole motor:
3000 rpm at 50 Hz.
3600 rpm at 60 Hz or VSD.

*** 4-pole motor (for SAB 120 S):**
1500 rpm at 50 Hz.
1800 rpm at 60 Hz or VSD.

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

For R717:
2 K liquid subcooling and 0.5 K non-usable suction superheat.

28 bar design pressure:
SAB 120 and SAB 151

Min./max. speed	R717
SAB 120 S	1000-1800 rpm
SAB 120 M-L-E	1000-3600 rpm
SAB 151 S-M-L-E	1000-3600 rpm

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

Large single-stage compressors with swept volumes of 850–11,000 m^3/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^3/h.

Advantages	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 5 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 3600 rpm R717			Unit dimensions in mm	Weight excluding motor/oil	Sound pressure level	
	at 3000 rpm	at 3600 rpm	High-stage	Booster	With economiser			at 3000 rpm	at 3600 rpm
	m^3/h	m^3/h	-10/+35°C	-40/-10°C	-40/+35°C	L x W x H	kg	db(A)	db(A)
SAB 193 S	848	1018	653	194	193	3150 x 1500 x 1800	2700	84	86
SAB 193 L	1131	1358	872	260	258	3250 x 1500 x 1900	2800	84	86
SAB 233 S	1494	1792	1172	344	334	3700 x 1700 x 2100	4600	86	88
SAB 233 L	1880	2257	1477	484	421	3700 x 1800 x 2200	4750	86	88
SAB 233 E	2323	2788	1826	537	520	3700 x 1800 x 2200	4800	86	88
SAB 283 S	2676	3211	2096	616	597	3700 x 1800 x 2250	5500	88	90
SAB 283 L	3370	4044	2638	776	752	4150 x 1900 x 2650	5850	88	90
SAB 283 E	4055	4865	3159	929	901	4450 x 2100 x 2850	7650	88	90
SAB 355 S	4192	5031	3236	963	917	4550 x 2350 x 3500	10000	89	91
SAB 283 X	4580	5496	3592	1056	1025	4600 x 2100 x 2850	8950	88	90
SAB 355 L	5716	6860	4369	1299	1240	4700 x 2350 x 3500	10000	89	91
SAB 355 E	7275	8730	5550	1630	1576	4850 x 2350 x 3500	10200	89	91
SAB 355 X	9180	11016	NA	2053	1966	5000 x 2350 x 3500	10400	89	91

Dimensions, weight and sound pressure levels are guidelines only.

2-pole motor:
3000 rpm at 50 Hz.
3600 rpm at 60 Hz or VSD.
4200 rpm at 70 Hz or VSD.

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

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

Min./max. speed	R717
SAB 193	1000-4200
SAB 233	1000-3800
SAB 283	1000-3600
SAB 355	1000-3600

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 193 high-pressure screw compressor unit with UniSAB systems controller

Sabroe SAB high-pressure screw compressor units

Variable-speed high-pressure screw compressor units with swept volumes of 1000–2,700 m^3/hour

These unique high-pressure compressor units are ideal for large, site-built ammonia heat pump installations that condense at either 90 °C or 72 °C. They are also the ideal choice for larger CO_2 systems or low-temperature two-stage freezer installations, such as carbon dioxide–ammonia (R744–R717) cascade refrigeration systems.

Using CO_2 as refrigerant makes it possible to make big savings on installation, piping and compressor costs because a single compressor unit can replace multiple compressors using traditional refrigerants.

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 1000 rpm to maximum rpm.

The SAB 193, 233 and 283 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.

Range

Four models are available to provide swept volumes of between 1000 and 2,700 m^3/h.

Advantages	Benefits
High-pressure units designed specifically for applications that use CO_2 or ammonia as refrigerant	Makes it possible to undertake freezing and defrosting in a single stage, or to utilise waste heat
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

For R717, 40 bar

Model	Max. rpm	Swept volume at max. rpm	Capacities in kW including economiser +4/72°C R717			Capacities in kW including economiser at max. rpm +32/72°C, R717			Unit dimensions in mm	Weight excluding motor/ oil	Sound pressure level
			Cooling	Heating	COP_{line} Heating/cooling	Cooling	Heating	COP_{line} Heating/ cooling			
		m^3/h							L x W x H	kg	db(A)
SAB 193 HP	4200	1188	1270	1797	3.41/2.41	2822	3399	5.90/4.90	3150 x 1500 x 1800	2700	90
SAB 233 HP	3800	1890	2040	2866	3.47/2.47	4576	5466	6.15/5.51	3700 x 1700 x 2100	4600	90
SAB 283 HP	3000	2676	2853	4025	3.35/2.37	6475	7735	6.01/5.03	3700 x 1800 x 2250	5500	92

For R717, 60 bar

Model	Max. rpm	Swept volume at max. rpm	Capacities in kW R717 Heating			Unit dimensions in mm	Weight excluding motor/oil	Sound pressure level
		m^3/h	+40/90 °C	+30/90 °C	+20/90 °C	L x W x H	kg	db(A)
SAB 273	3600	1680	5180	4780	3780	6000 x 1500 x 2100	5000	On request

For R744

Model	Max. rpm	Swept volume at max. rpm	Capacities in kW R744		Unit dimensions in mm	Weight excluding motor/oil	Sound pressure level
		m^3/h	-40/-5°C	-50/-5°C	L x W x H	kg	db(A)
SAB 193 HP	4200	1188	1711	1159	3150 x 1500 x 1800	2700	88
SAB 233 HP	3800	1890	2773	1875	3700 x 1700 x 2100	4600	88

All Sabroe high-pressure screw compressors are available on request.

40 bar design pressure:
SAB 193 HP, SAB 233 HP and SAB 283 HP

60 bar design pressure:
SAB 273

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

Dimensions, weight and sound pressure levels are guidelines only.

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

Min./max. speed	R717 and R744
SAB 273	1000-3600 rpm
SAB 193	1000-4200 rpm
SAB 233	1000-3800 rpm
SAB 283	1000-3000 rpm

Chillers

Chillers based on Sabroe 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.

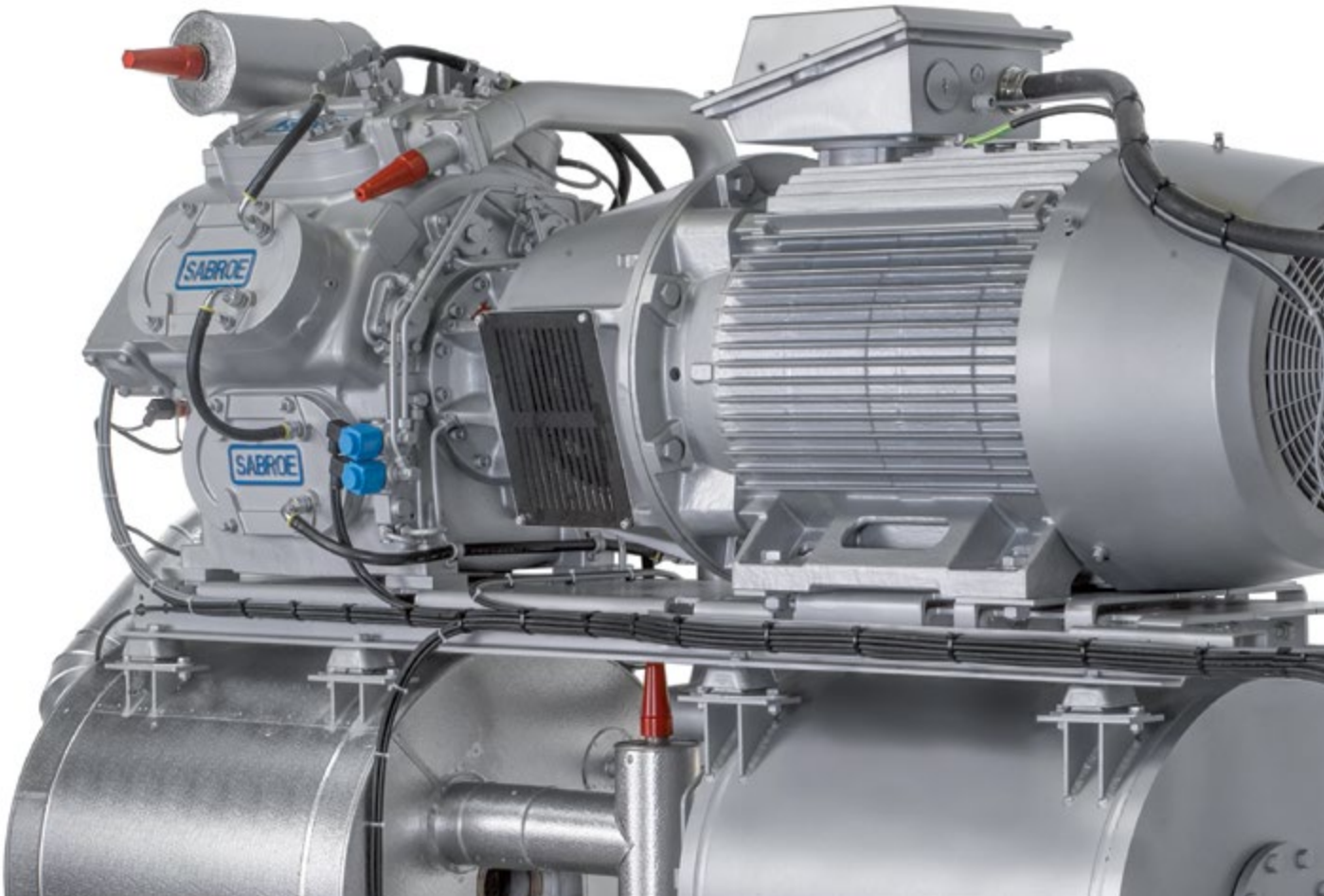
Another driver lies in both national and international legislation that requires the phasing-out of particular refrigerants because of their environmental impacts.

Meeting the demand for chillers

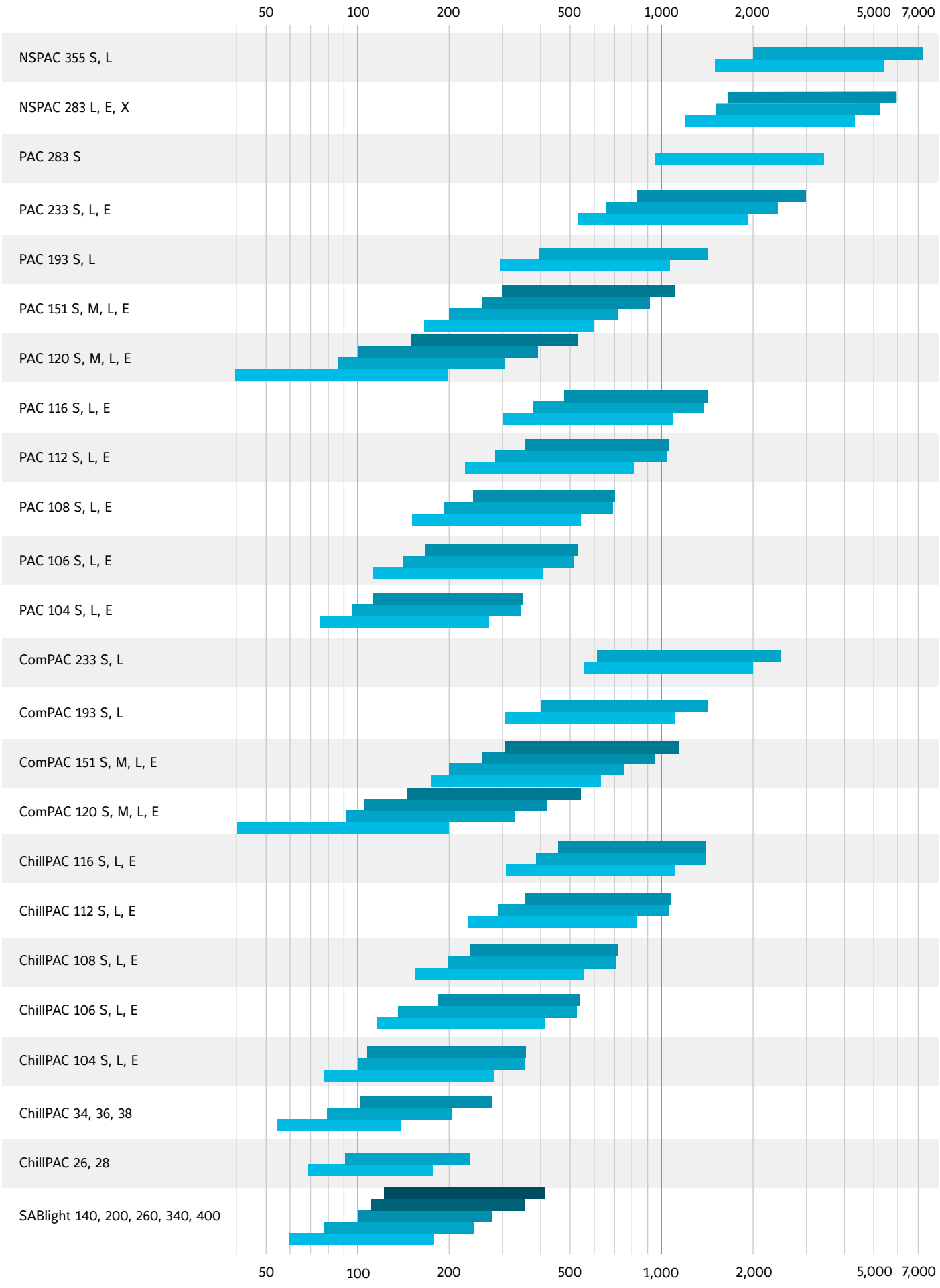
Sabroe therefore provides a range of energy-efficient standardised packaged chiller configurations, all based on high-efficiency Sabroe reciprocating and screw compressors that are world-renowned for their reliability. As a result, Sabroe chillers are at the forefront of this rapidly developing specialist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



Capacities in kW at 7/12°C (cold side) and 30/35°C (hot side) in maximum speed
(Reciprocating compressors at 50/60 Hz. Screw compressors at 50/60/70/100 Hz)

ChillPAC 108 with VSD panel and UniSAB as standard

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.

Advantages	Benefits
Factory-assembled, pre-tested packaged units based on Sabroe reciprocating compressors world-renowned for their reliability	Easy pre-commissioning makes installation and running-in both faster and cheaper. 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 (R717) 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 cost 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
- Factory acceptance test (FAT), customer-witnessed
- Heater package for low-temperature heat pump operation
- Shunt solution for high-temperature difference

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)	
ChillPAC 24 A	116	24	10	2000	2900	1000	2000	72	5.6
ChillPAC 34 A	137	30	10	2000	2900	1000	2000	72	5.6
ChillPAC 26 A	172	37	12	2050	2900	1000	2000	72	5.4
ChillPAC 36 A	200	45	13	2100	2900	1000	2000	73	5.3
ChillPAC 28 A	228	47	14	2150	2900	1000	2000	73	5.3
ChillPAC 38 A	268	61	16	2900	2900	1000	2000	74	5.3
ChillPAC 104 S-A	273	72	15	2300	2900	1000	2000	80	5.4
ChillPAC 104 L-A	353	74	21	2410	2900	1000	2000	83	5.5
ChillPAC 104 E-A *	359	73	19	2652	2900	1000	2000	80	5.2
ChillPAC 106 S-A	421	90	20	2727	2900	1000	2000	83	5.5
ChillPAC 106 L-A	534	108	27	2950	2900	1000	2000	79	5.6
ChillPAC 106 E-A *	540	110	27	3225	3100	1000	2000	81	5.3
ChillPAC 108 S-A	555	108	28	3060	2900	1000	2000	84	5.5
ChillPAC 108 L-A	706	142	31	3526	3100	1000	2000	85	5.5
ChillPAC 108 E-A *	719	164	34	2880	3300	1000	2000	84	5.3
ChillPAC 112 S-A	835	163	40	4315	4000	1000	2200	86	5.6
ChillPAC 112 L-A	1056	204	46	4738	4500	1000	2200	86	5.6
ChillPAC 112 E-A *	1074	222	50	5196	4600	1000	2200	84	5.3
ChillPAC 116 S-A	1109	222	51	5044	4500	1000	2200	86	5.6
ChillPAC 116 L-A	1405	303	53	5556	4700	1000	2200	87	5.6
ChillPAC 116 E-A *	1422	290	53	5878	5000	1000	2200	85	5.3

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)	
ChillPAC 24 C	59	19	10	2000	2900	1000	2000	73	3.4
ChillPAC 34 C	69	24	10	2000	2900	1000	2000	73	3.3
ChillPAC 26 C	86	30	10	2000	2900	1000	2000	73	3.3
ChillPAC 36 C	100	37	10	2050	2900	1000	2000	73	3.2
ChillPAC 28 C	113	39	11	2100	2900	1000	2000	74	3.2
ChillPAC 38 C	131	45	12	2250	2900	1000	2000	74	3.2
ChillPAC 104 S-C	139	45	13	2253	2900	1000	2000	78	3.3
ChillPAC 104 L-C	179	61	15	2378	2900	1000	2000	79	3.3
ChillPAC 104 E-C *	183	61	15	2586	2900	1000	2000	79	3.3
ChillPAC 106 S-C	205	66	16	2505	2900	1000	2000	80	3.3
ChillPAC 106 L-C	264	90	20	2701	2900	1000	2000	80	3.3
ChillPAC 106 E-C *	274	90	22	2866	2900	1000	2000	80	3.3
ChillPAC 108 S-C	272	90	22	2766	2900	1000	2000	82	3.3
ChillPAC 108 L-C	355	117	26	3091	3100	1000	2000	82	3.3
ChillPAC 108 E-C *	363	117	26	3523	3300	1000	2000	82	3.3
ChillPAC 112 S-C	406	131	32	3696	3800	1000	2200	83	3.3
ChillPAC 112 L-C	527	177	37	4290	4200	1000	2200	83	3.3
ChillPAC 112 E-C *	545	174	38	4733	4300	1000	2200	83	3.3
ChillPAC 116 S-C	537	177	38	4390	4200	1000	2200	83	3.3
ChillPAC 116 L-C	702	222	47	4898	4300	1000	2200	83	3.4
ChillPAC 116 E-C *	729	264	46	5322	4300	1000	2200	83	3.3

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

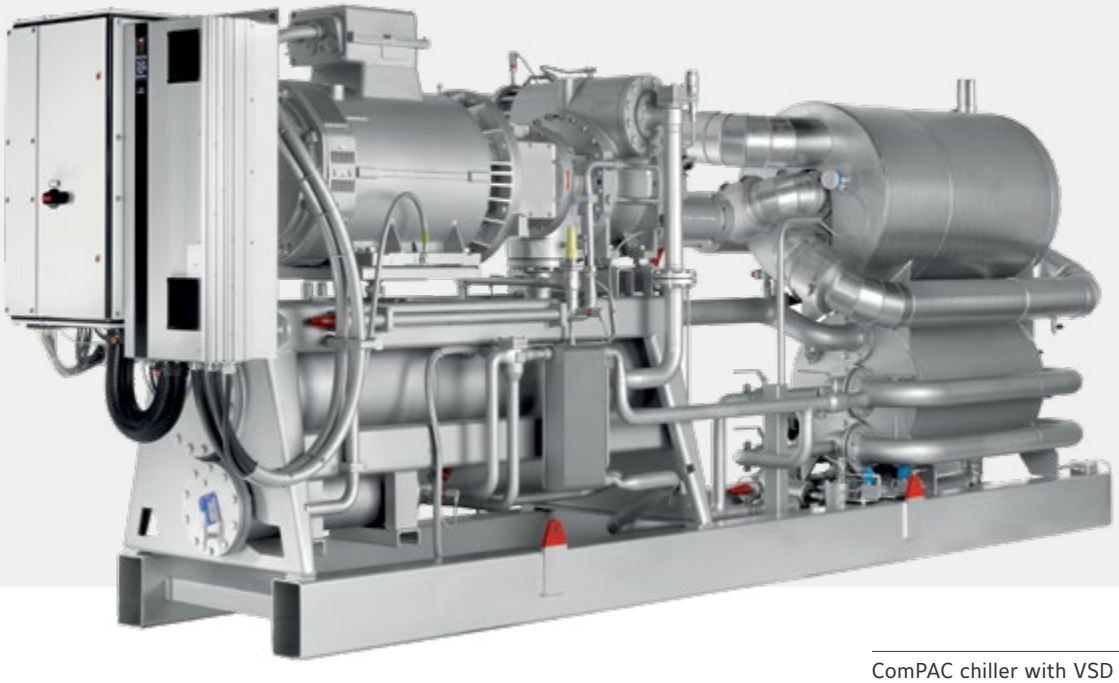
Capacities are nominal at 1800 rpm.
*Capacities are nominal at 1500 rpm.

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

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

Dimensions, weight and sound pressure levels are guidelines only.

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.

Advantages	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	3600	4600	1200	2300	85	4.4
ComPAC 120 M-A	316	78	26	3800	4700	1200	2300	86	4.8
ComPAC 120 L-A	400	93	29	4000	4800	1200	2300	87	4.9
ComPAC 120 E-A	541	140	36	5200	5000	1200	2300	89	4.9
ComPAC 151 S-A	614	140	38	5500	5000	1200	2300	91	5.0
ComPAC 151 M-A	735	175	44	5800	5100	1200	2300	92	5.0
ComPAC 151 L-A	929	217	51	5900	5300	1200	2300	92	5.1
ComPAC 151 E-A	1111	269	59	6300	5600	1200	2300	93	5.0
ComPAC 193 S-A	1063	269	57	7100	5600	1500	2400	85	5.2
ComPAC 193 L-A	1447	327	159	7400	6100	1500	2400	85	5.4
ComPAC 233 S-A	1933	410	238	13000	7000	1500	2400	86	5.5
ComPAC 233 L-A	2314	536	297	15000	7100	1500	2400	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	3600	4500	1200	2300	85	2.7
ComPAC 120 M-C	177	78	26	3800	4600	1200	2300	86	2.9
ComPAC 120 L-C	224	93	29	4000	4700	1200	2300	87	2.9
ComPAC 120 E-C	297	114	36	5200	4900	1200	2300	89	2.9
ComPAC 151 S-C	344	140	38	5500	4900	1200	2300	91	3.1
ComPAC 151 M-C	408	175	44	5800	5000	1200	2300	92	3.1
ComPAC 151 L-C	515	217	51	5900	5200	1200	2300	92	3.1
ComPAC 151 E-C	617	269	59	6300	5500	1200	2300	93	3.1
ComPAC 193 S-C	594	217	57	7100	5500	1500	2400	85	3.2
ComPAC 193 L-C	795	327	71	7400	6000	1500	2400	85	3.2
ComPAC 233 S-C	1052	410	75	13000	6900	1500	2400	86	3.4
ComPAC 233 L-C	1361	536	225	15000	7000	1500	2400	86	3.4

Dimensions, weight and sound pressure levels are guidelines only.

Condenser: Water inlet 30 °C, outlet 35 °C.
All data and nominal capacities kW at 3600 rpm, except for:
ComPAC 120 S at 1470 rpm.

Sound pressure levels measured in free field, over reflecting plane and one metre distance from the unit.
Available with high-pressure compressors as HeatPAC.

Options

- Variable-speed drive (VSD)
- Soft-starter or Y/D starter
- Sound enclosure for outdoor mounting
- External condenser
- Control panel mounted separately
- Economiser option for low-temperature brine
- Factory acceptance test (FAT), customer-witnessed
- 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.

Advantages	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	3100	3300	1850	2300	77	5.2
PAC 104 L-A	346	74	49	3250	3300	1850	2300	77	5.3
PAC 104 E-A *	352	74	51	3400	3300	1850	2300	78	5.1
PAC 106 S-A	407	90	51	3500	3300	1850	2300	78	5.3
PAC 106 L-A	519	108	54	3550	3300	1850	2300	79	5.3
PAC 106 E-A *	528	113	57	3700	3550	1850	2300	79	5.1
PAC 108 S-A	543	117	54	3700	3300	1850	2300	79	5.3
PAC 108 L-A	692	142	58	3900	3550	1850	2300	80	5.3
PAC 108 E-A *	704	164	74	4300	3850	1850	2450	80	5.1
PAC 112 S-A	815	164	73	4650	4130	1850	2450	80	5.4
PAC 112 L-A	1037	205	78	5000	4130	1850	2450	81	5.4
PAC 112 E-A *	1055	222	84	5300	4550	1850	2450	81	5.2
PAC 116 S-A	1086	222	79	5350	4130	1850	2450	81	5.4
PAC 116 L-A	1383	279	98	5650	4900	1850	2450	82	5.4
PAC 116 E-A *	1407	291	137	6300	5750	2000	2600	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	3000	3300	1850	2300	76	3.1
PAC 104 L-C	172	61	48	3050	3300	1850	2300	77	3.2
PAC 104 E-C *	177	61	49	3200	3300	1850	2300	77	3.2
PAC 106 S-C	197	66	50	3250	3300	1850	2300	78	3.2
PAC 106 L-C	257	90	53	3450	3300	1850	2300	79	3.2
PAC 106 E-C *	265	90	54	3600	3300	1850	2300	79	3.2
PAC 108 S-C	262	90	53	3550	3300	1850	2300	79	3.2
PAC 108 L-C	343	117	57	3650	3300	1850	2300	80	3.2
PAC 108 E-C *	354	117	71	4100	3600	1850	2450	80	3.2
PAC 112 S-C	393	131	71	4400	4130	1850	2450	80	3.2
PAC 112 L-C	515	177	78	4600	4130	1850	2450	81	3.3
PAC 112 E-C *	531	174	79	5050	4130	1850	2450	81	3.2
PAC 116 S-C	525	177	77	5150	4130	1850	2450	81	3.3
PAC 116 L-C	686	258	86	5400	4130	1850	2450	82	3,3
PAC 116 E-C *	708	258	128	6000	4550	2000	2600	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 1800 rpm.
* Capacities are nominal at 1500 rpm.
PAC S and L models, 60 Hz or VSD operation possible.

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

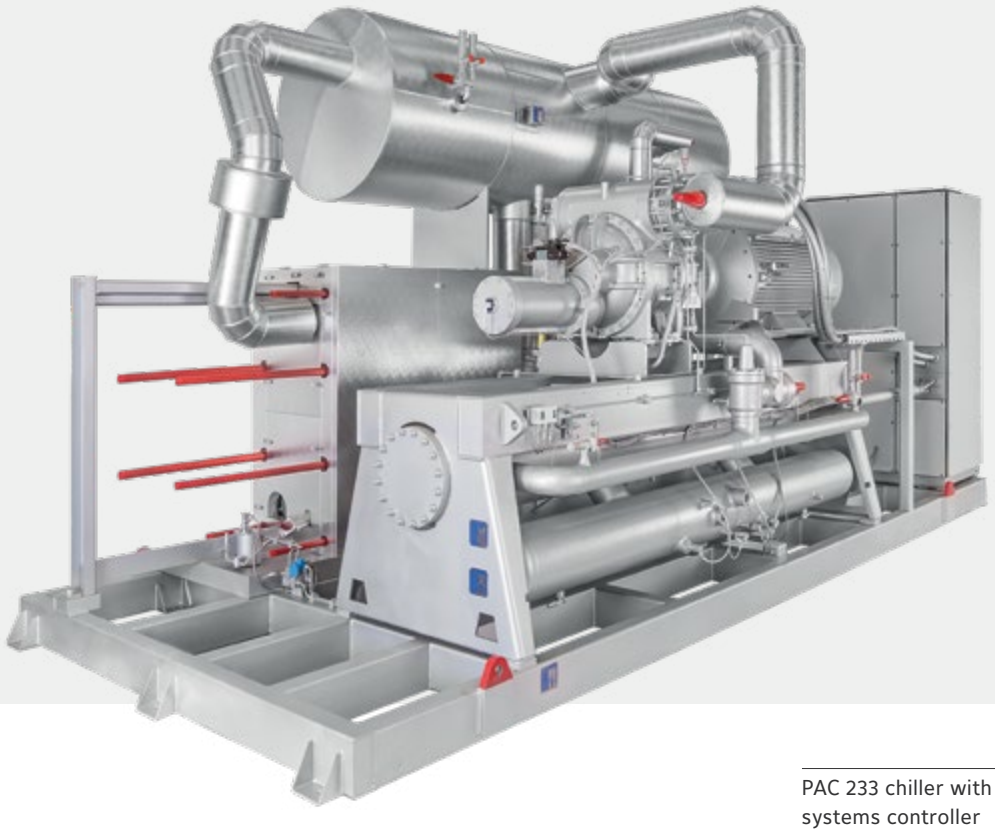
Available with high-pressure compressors as HeatPAC.

Dimensions, weight and sound pressure levels are guidelines only.

Options

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

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 100–6,200 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 6,200 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.

Advantages	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	4000	4310	1870	2260	82	4.4
PAC 120 M-A	252	75	40	4150	4310	1870	2260	83	4.6
PAC 120 L-A	324	75	50	4550	4310	1870	2260	84	4.8
PAC 120 E-A	439	110	54	4800	4560	1870	2360	86	4.9
PAC 151 S-A	508	132	55	5600	3800	2070	2360	88	5.0
PAC 151 M-A	599	160	59	5700	5700	2070	2360	89	5.0
PAC 151 L-A	760	200	75	6200	3940	2090	2450	89	5.1
PAC 151 E-A	872	200	80	6350	4600	2090	2450	90	5.2
PAC 193 S-A	920	200	81	6400	4600	2350	2450	82	5.1
PAC 193 L-A	1171	315	91	7000	5300	2350	2450	82	5.2
PAC 233 S-A	1592	355	167	11500	5500	2900	3200	83	5.5
PAC 233 L-A	2006	450	183	12500	6700	3000	3200	83	5.4
PAC 233 E-A	2479	560	211	15200	6700	3050	3400	84	5.5
PAC 283 S-A	2876	630	229	17000	7500	3400	3400	85	5.4
NSPAC 283 L-A	3620	800	350	20500	7300	3700	4500	83	5.4
NSPAC 283 E-A	4357	900	391	25500	8500	3700	4700	83	5.4
NSPAC 355 S-A	4953	1000	410	28000	8500	4000	4700	83	5.4
NSPAC 283 X-A	4519	1000	450	30000	9100	4000	4700	83	5.4
NSPAC 355 L-A	6119	1250	700	40000	10000	4000	6000	83	5.3

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	4000	4310	1870	2260	82	2.6
PAC 120 M-C	140	75	39	4150	4310	1870	2260	83	2.8
PAC 120 L-C	180	75	48	4500	4310	1870	2360	84	2.9
PAC 120 E-C	243	110	52	4700	4310	1870	2360	86	2.9
PAC 151 S-C	282	110	53	5550	3940	2070	2360	88	3.1
PAC 151 M-C	333	132	56	5600	3940	2070	2360	89	3.1
PAC 151 L-C	422	160	71	6100	3940	2090	2450	89	3.1
PAC 151 E-C	488	200	76	6200	4290	2090	2450	90	3.2
PAC 193 S-C	511	200	77	6250	4600	2350	2450	82	3.1
PAC 193 L-C	655	250	85	6750	5000	2350	2450	82	3.2
PAC 233 S-C	886	315	158	11250	5200	2750	3200	84	3.3
PAC 233 L-C	1117	400	170	12100	5800	2750	3200	84	3.3
PAC 233 E-C	1380	450	193	14700	6500	2800	3400	84	3.3
PAC 283 S-C	1605	560	206	16350	6700	3150	3400	86	3.3
PAC 283 L-C	2012	710	230	19000	7100	3700	3400	88	3.3
NSPAC 283 E-C	2423	800	374	24500	7300	3700	4500	84	3.3
NSPAC 355 S-C	2752	1000	380	26000	8000	4000	4700	84	3.3
NSPAC 283 X-C	2534	900	400	28000	8500	4000	4700	84	3.3
NSPAC 355 L-C	3406	1200	600	38000	9500	4000	6000	84	3.3

Dimensions, weight and sound pressure levels are guidelines only.

Condenser: water inlet 30°C, outlet 35°C.
The above data are only valid for the stated temperatures and operating conditions.
All data and nominal capacities kW at 3000 rpm.
60 Hz or VSD operation possible.

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
- 4200 rpm at 70 Hz or VSD (PAC 193, 233, 283, 355)
- Available with high-pressure compressors as HeatPAC
- Factory acceptance test (FAT), customer witnessed

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.

SABlight air-cooled chiller

Sabroe SABlight air-cooled chillers

Compact air-cooled chillers for outdoor installation, based on a screw compressor, with a 160–400 kW capacity range

The SABlight air-cooled chiller is a particularly compact design that uses V-coil condensers to substantially reduce the overall footprint. The screw compressor and fully brazed plate heat exchanger are mounted underneath the V-coils, resulting in a height of 2.9m and a width of only 1.3m.

SABlight units provide a cost-effective alternative to traditional air conditioning, chilled rooms and industrial/process refrigeration. They are designed for quiet running and outdoor operation, and a special ultra-low noise version is available.

SABlight uses a small propane refrigerant charge, providing an attractive, economical, and environmentally responsible alternative to air-cooled chillers that use HFCs as refrigerant.

Range

There are five standard models in this range of air-cooled chillers, with capacities ranging from 160 kW to 400 kW.

Advantages	Benefits
Compact design with small footprint	Easy to mount outdoors – no special machinery room required
Quiet while running Available in both low and ultra-low noise versions	Can be placed close to occupied buildings
Variable-speed drive fitted to both compressor and fans, providing very high coefficient of performance (COP), even under part-load conditions	Low power consumption, which means low operating costs
Designed for maximum safety, with very small natural refrigerant charge (propane R290)	No expenditure on special safety precautions
Easy to mount, install, and connect	Low installation costs and rapid commissioning
Straightforward, uncomplicated construction	Low maintenance costs

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

Type	Cooling capacity	Power consumption	R290 charge	Dry weight	Unit dimensions in mm			Nominal load current	Sound pressure level	COP ESEER
	kW	kW	kg	kg	L	W	H	A	dB(A)	
SABlight A140-1	166	54	24	2300	5260	1250	2835	100	55	4.42
SABlight A140-2	163	55	24	2300	5260	1250	2835	105	45	4.63
SABlight A200-1	210	71	24	2500	5260	1250	2835	135	55	4.51
SABlight A200-2	208	71	32	3000	6660	1250	2835	140	45	4.48
SABlight A260-1	277	92	32	3000	6660	1250	2835	170	55	4.57
SABlight A260-2	274	94	40	3300	8060	1250	2835	170	45	4.52
SABlight A340-1	324	101	40	3700	8060	1250	2835	190	55	4.70
SABlight A340-2	314	106	48	4200	9460	1250	2915	195	45	4.55
SABlight A400-1	406	133	48	4600	9460	1250	2915	245	55	4.31

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.

ESEER = European Seasonal Energy Efficiency Ratio (Eurovent Institute, Europe).
Fans and VSD are included in the power consumption.

Dimensions, weight and sound pressure levels are guidelines only.

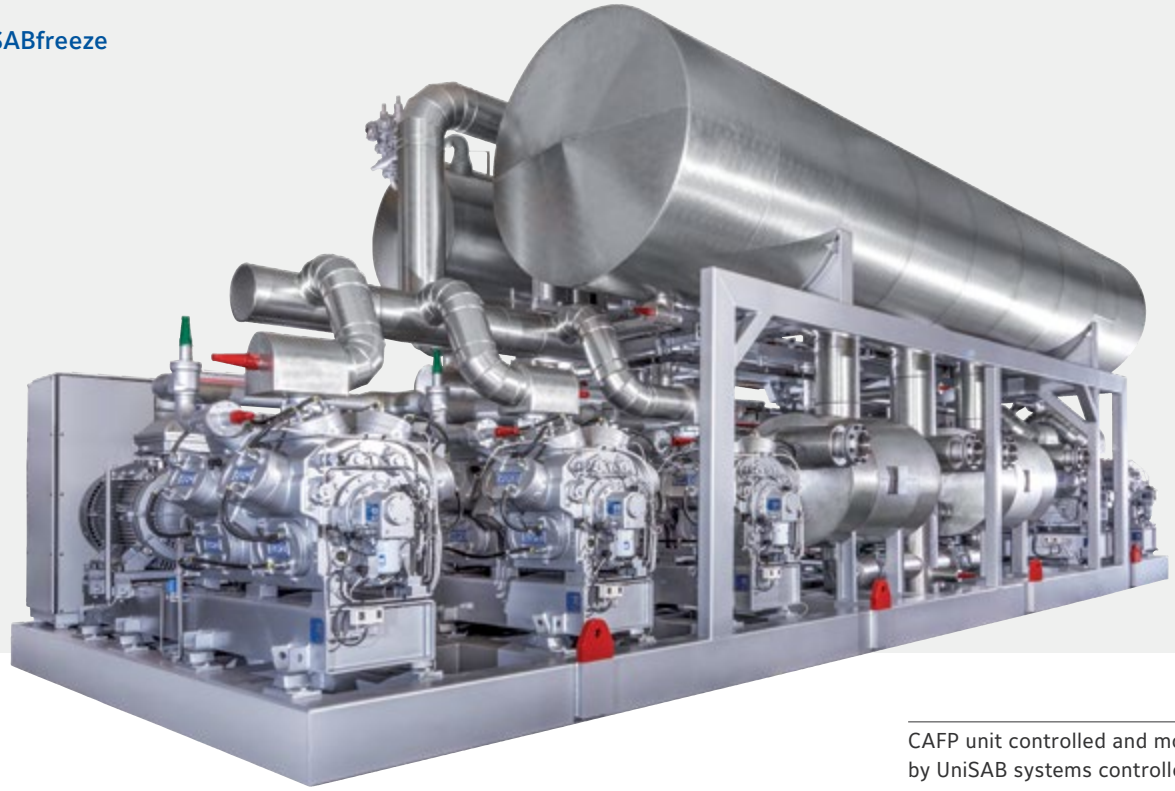
Standard equipment

- Control and monitoring system
- Variable-speed drive
- Hot-dip galvanised base frame
- Screw compressor
- Precharged with refrigerant

Options

- External communication via network and industrial-standard bus systems
- Evaporator heating elements for frost-proofing
- Epoxy coating of condenser surface
- Oil cooler
- Models operating with inlet temperatures down to -10 °C available on request
- Desuperheater
- Condenser with air fresh-water spray system
- AxiTop diffuser on condenser fans for additional noise reduction
- Heating element in evaporator
- Heat tracing of brine pipeline

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.



CAFP unit controlled and monitored by UniSAB systems controller

Sabroe CAFP CO_2/NH_3 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_2 on the low-temperature side and NH_3 (ammonia) on the high-temperature side, giving you the best of both worlds.

CO_2 has its strength at low temperatures, and NH_3 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_2 is distributed to the user production area. CO_2 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_2 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.

Advantages	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_2 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_2 is a simple, inexpensive natural refrigerant	Low operating costs

Technical data

Model	Evaporation temperature	Cooling capacity	Power consumption	Compressors R744/R717	Minimum NH_3 charge (approx.)	Minimum CO_2 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	5500 x 2400 x 3000	7000	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	5700 x 3200 x 3300	10000	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	5900 x 2900 x 3300	11000	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	5900 x 3100 x 3800	14000	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	6300 x 3200 x 3900	16000	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	6500 x 3700 x 4000	19000	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,
1500 rpm at 50 Hz.
Power consumption applies to compressors only.
Refrigerant charge depends on application.

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

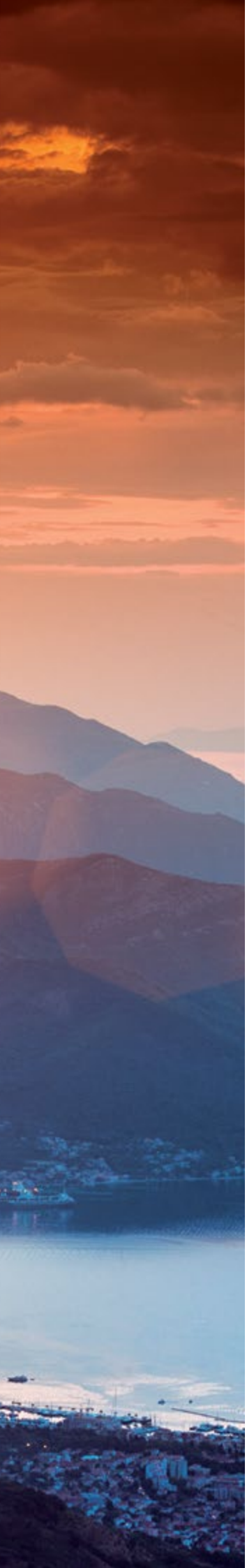
Dimensions, weight and sound pressure levels are guidelines only.

Standard equipment

- Double control panel including UniSAB systems controller
- CO_2 pump separator including two pumps (one standby)
- Shell-and-tube cascade cooler with double-tube sheet to minimise any risk of CO_2 and ammonia mixing
- Standstill cooling unit, with separate control panel and power supply to limit CO_2 pressure
- Automatic oil recovery system in both circuits
- Water-cooled condenser (plate heat exchanger type) on ammonia side
- Insulation of all cold parts

Options

- Variable-speed drive
- Titanium plates in condenser
- Oversized CO_2 pump separator for high CO_2 evaporator volume
- Oversized CO_2 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



Heat pumps

Heat pumps based on Sabroe core technologies

Sabroe heat pumps for commercial and industrial use are the result of intensive pioneer work on the idea of reaping energy benefits from using heat pumps in industry – long before heat pumps became fashionably greentech.

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.

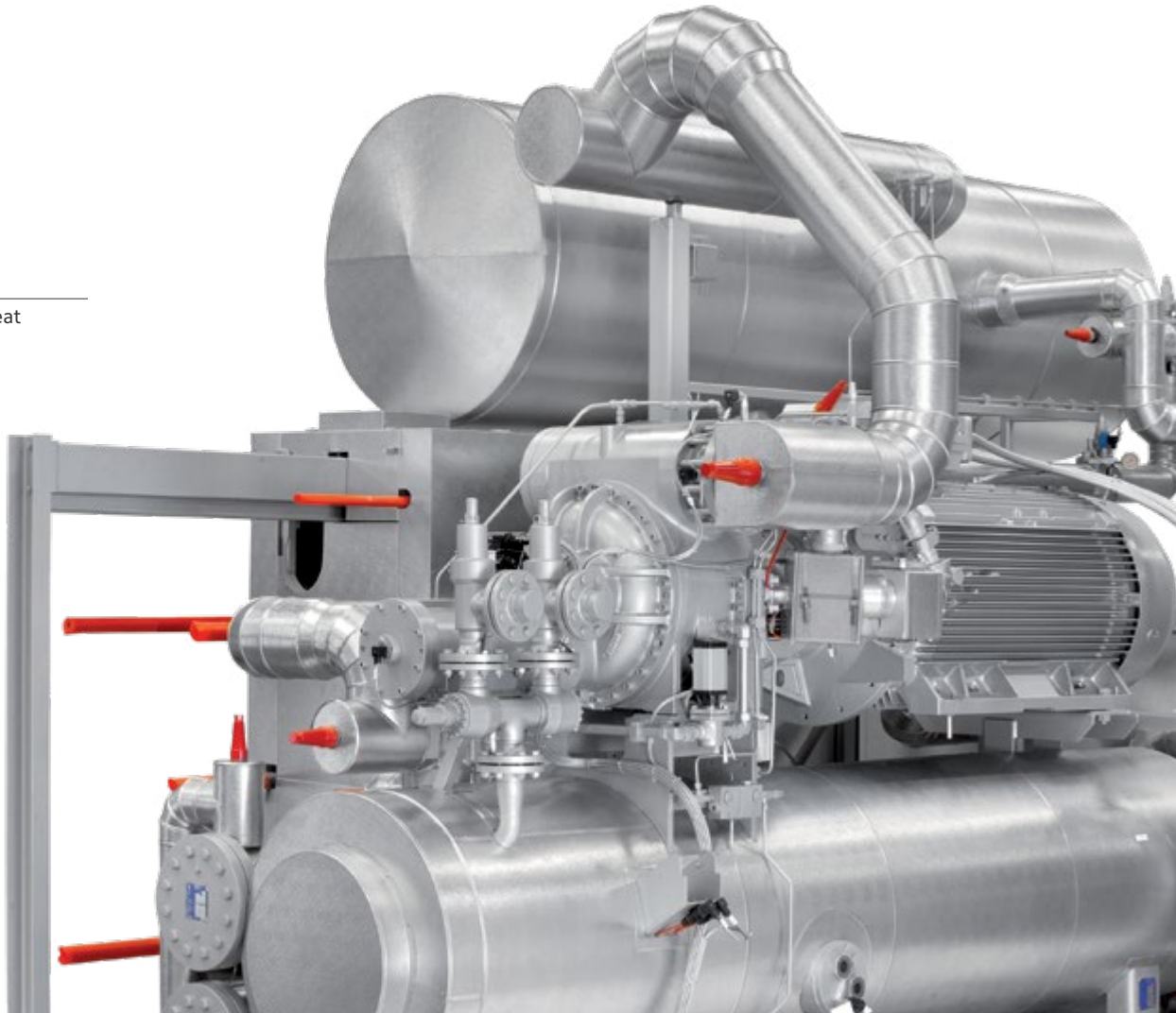
Ammonia as refrigerant

Sabroe industrial heat pumps use ammonia (R717) as refrigerant. Each unit is customised for the specific use and the particular installation, making sure that a minimum of thermal energy is used to provide maximum effect.

Compliance

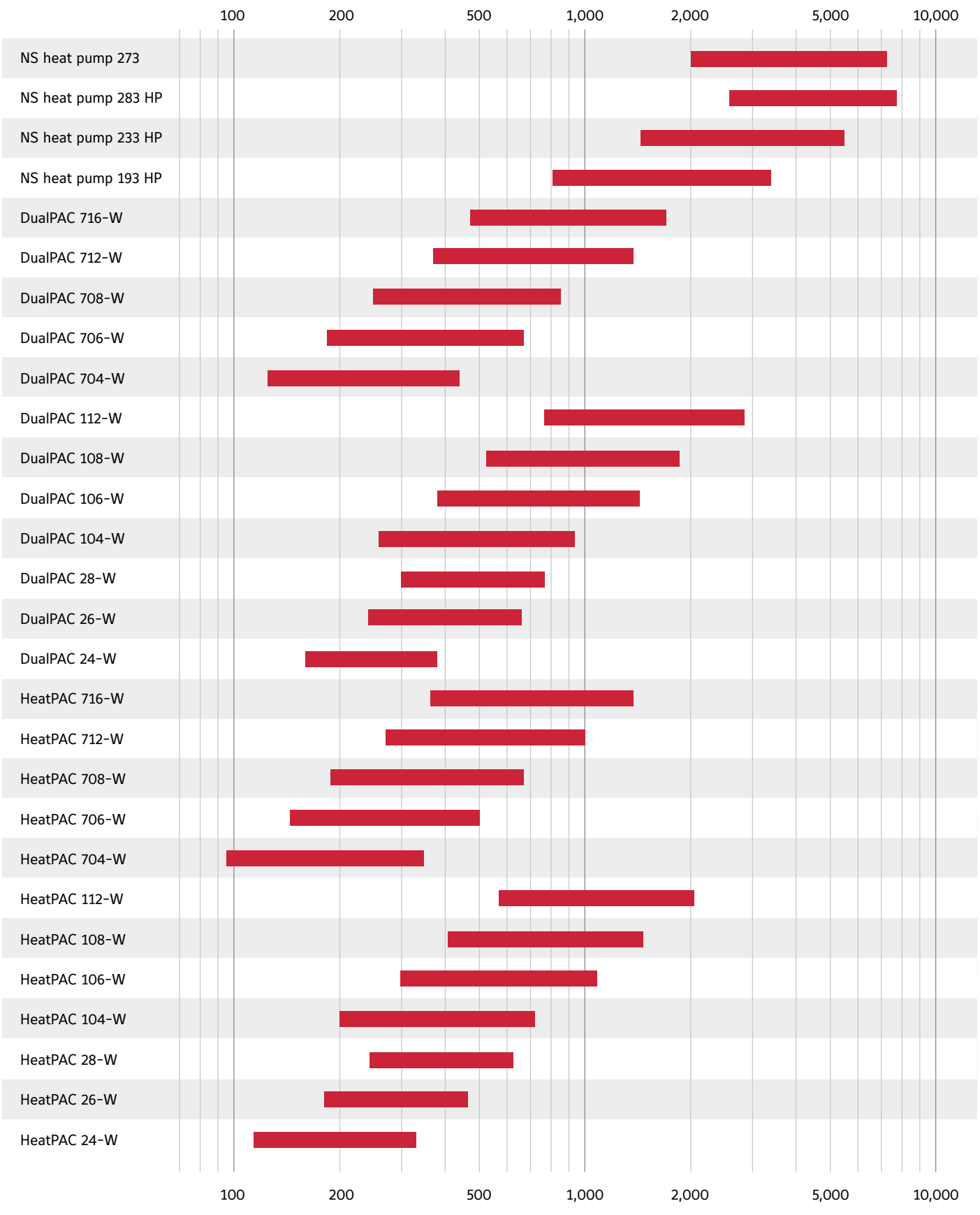
All Sabroe heat pumps are fully compliant with appropriate major international design codes and the specifications laid down by the most common classification societies.

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

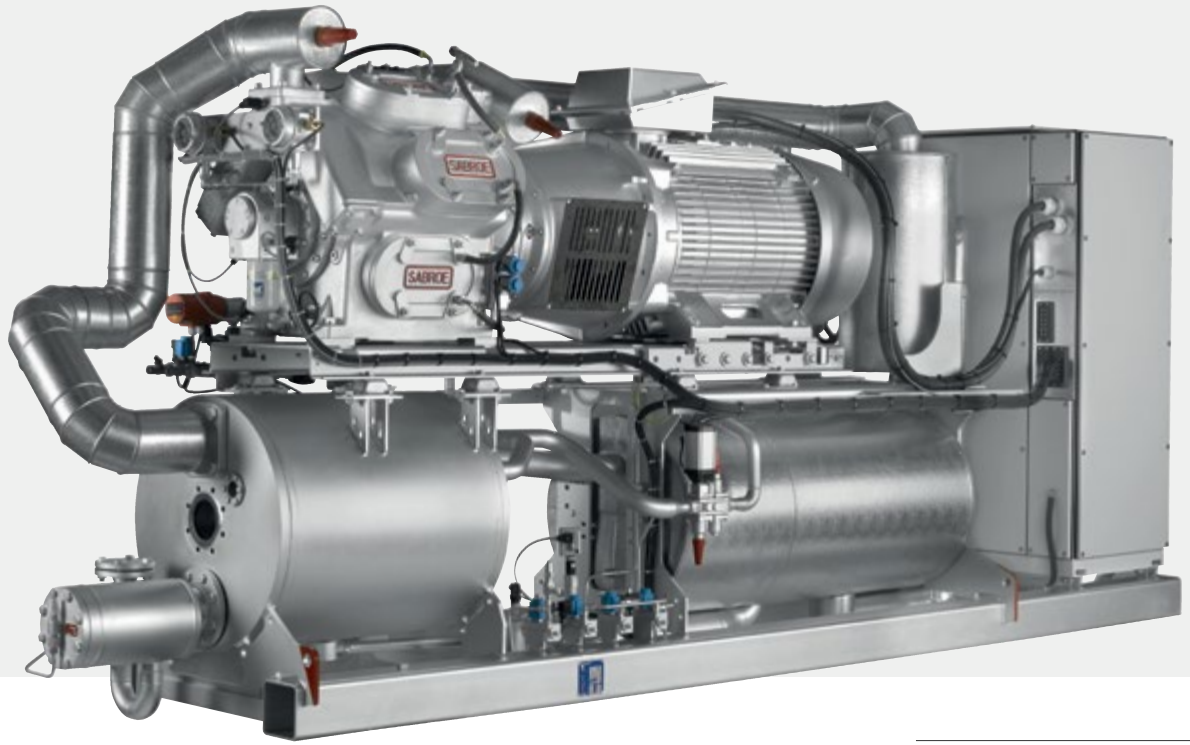


Customised single-stage heat pump with compressor

Sabroe heat pump programme



Heating capacity in kW



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 300–2,000 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 twelve standard models in this range of heat pump systems, with capacities ranging from 300 kW to 2,000 kW.

Advantages	Benefits
Factory-assembled, pre-tested packaged units based on Sabroe reciprocating compressors world-renowned for their reliability	Easy pre-commissioning makes installation and running-in both faster and cheaper
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	2020	2800	1000	2000	76	6.5
HeatPAC 26-W	461	391	79	71	48	2230	2850	1000	2000	78	6.5
HeatPAC 28-W	615	521	114	95	55	2420	2900	1000	2000	79	6.5
HeatPAC 104-W	725	611	136	112	73	2630	3050	1000	2000	82	6.5
HeatPAC 106-W	1087	916	207	168	87	3300	3750	1000	2000	83	6.5
HeatPAC 108-W	1432	1206	253	224	104	3950	4050	1000	2000	84	6.4
HeatPAC 112-W	2078	1742	399	338	121	5270	5050	1000	2100	85	6.2

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	3500	3500	1000	2100	83	4.4
HeatPAC 706-W	511	403	136	116	44	4200	3700	1000	2100	84	4.4
HeatPAC 708-W	682	537	172	154	54	5000	4100	1000	2100	85	4.4
HeatPAC 712-W	1023	805	271	232	73	6250	4700	1000	2100	86	4.4
HeatPAC 716-W	1346	1059	347	308	88	7000	6000	1000	2100	86	4.4

Dimensions, weight and sound pressure levels are guidelines only.

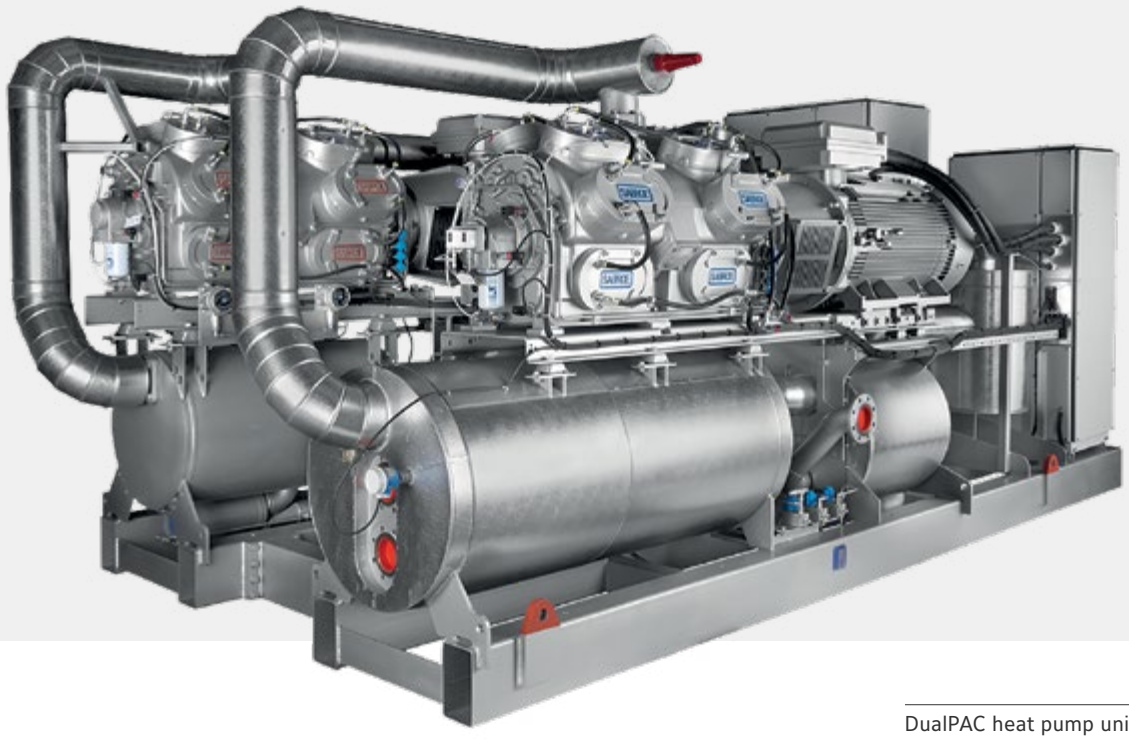
W = Heat pump unit water/water.
All data and nominal capacities kW at 1800 rpm.

All HeatPACs: 60 Hz or VSD operation possible.

Sound pressure levels 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
- Factory acceptance test (FAT), customer witnessed



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.

Advantages	Benefits
Stepless, skip-free capacity control ensures that output always matches requirements	Lowest possible operating costs and maximum return on investment
Consistently high performance at both full and part load	Maximum part-load efficiency and low life cycle costs
Unique two-stage solution featuring patented 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

Range

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

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

Type	Heating capacity	Cooling capacity	Power consump-tion (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	4020	2900	3000	2000	82	4.8
DualPAC 26-W	652	519	134	60	4460	2900	3000	2000	83	4.9
DualPAC 28-W	869	692	178	71	4840	2900	3000	2000	84	4.9
DualPAC 104-W	1039	827	213	78	5500	4500	3000	2000	84	4.9
DualPAC 106-W	1557	1232	325	103	6700	5000	3000	2000	85	4.8
DualPAC 108-W	2075	1625	450	119	7890	6000	3000	2200	86	4.6
DualPAC 112-W	2895	2266	628	132	10450	7500	3000	2200	86	4.6
DualPAC 704-W	498	395	102	53	6500	3500	3000	2100	86	4.9
DualPAC 706-W	747	594	153	64	7900	3700	3000	2100	86	4.9
DualPAC 708-W	996	789	206	78	10000	4100	3000	2100	87	4.8
DualPAC 712-W	1494	1180	312	106	13500	5000	3000	2100	88	4.8
DualPAC 716-W	1991	1559	433	118	16500	6000	3000	2100	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	6500	3500	3000	2100	86	3.1
DualPAC 706-W	690	476	223	65	7900	3700	3000	2100	86	3.1
DualPAC 708-W	920	623	298	75	10000	4100	3000	2100	87	3.1
DualPAC 712-W	1381	940	445	102	13500	5000	3000	2100	88	3.1
DualPAC 716-W	1841	1243	608	114	16500	6000	3000	2100	89	3

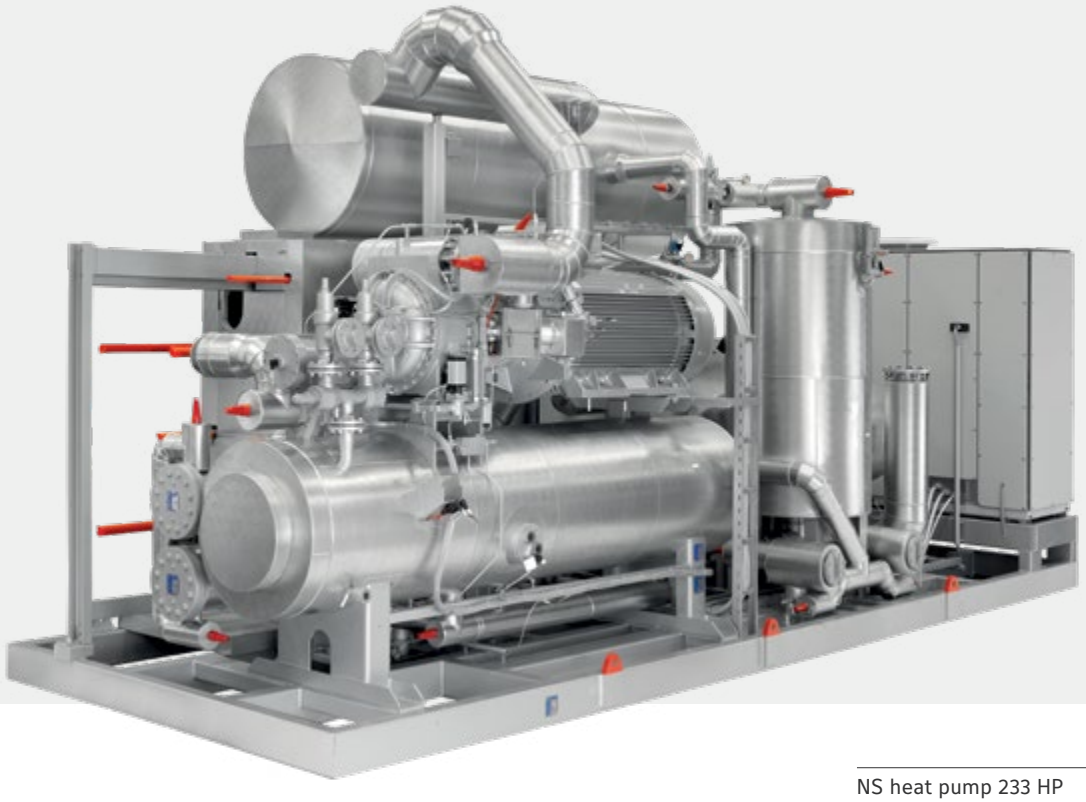
W = Heat pump unit water/water
Please contact your Sabroe representative for availability.

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
- Factory acceptance test (FAT), customer witnessed



NS heat pump 233 HP
with economiser

Sabroe customised heat pumps

Ammonia-based heat pumps using a screw compressor with capacities of up to 8,000 kW

Johnson Controls provides Sabroe customised large-capacity heat pumps for reclaiming waste heat or supporting industrial processes that require both heating and cooling at the same time. These highly effective heat pumps, utilising the economiser technology of screw compressors, ensure very high performance and exceptional reliability as well as the cost-effective exploitation of a key heat source in industry – waste heat from other processes.

These extremely large customised heat pumps can be configured with one, two or even three heat exchangers and compressors to provide capacities extending as high as 8,000 kW.

The backbone for all this is the unique high-pressure version of SAB screw compressors, featuring casings made of ductile iron, ensuring exceptional reliability and long service life. Individually configured units focus on meeting specific operating requirements, and the wide range of options makes it possible to achieve a considerable effect on operating margins in heating solutions.

All Sabroe heat pumps are designed to make clear business sense when in operation. Large Sabroe heat pumps – even single-stage high-lift units fitted with an economiser – deliver the performance needed for effective interaction with boiler systems or modern district heating systems.

The design paves the way for running modes in which the heat pump is used either as a parallel supplier to the boiler or in series to boost performance, thus optimising operating conditions so that Sabroe heat pumps can reclaim waste heat effectively under different conditions over the course of the year. This provides maximum return on investment.

Advantages	Benefits
Factory-assembled, pre-tested packaged units	Easy pre-commissioning makes installation and running-in both faster and cheaper
Capacity test that ensures high performance at both full and part load	Maximum part-load efficiency and low life cycle costs
Supreme high-pressure units designed specifically for ammonia with strong legacy in the market	Makes it possible to utilise waste heat as an effective alternative heat source
Small, space-saving footprint, with fewer moving parts and very low vibration	Exceptional reliability and low maintenance costs, as well as very easy access for service
Supports Condition Based Service (CBS) schedules, which help improve safety and ensure maximum reliability	Optimised service/maintenance intervals, with a minimum of unscheduled downtime

Condenser water inlet +60 °C, outlet +70 °C | 40 bar design pressure, R717 refrigerant

Model	Max. rpm	Cold side temp. In/out °C	Cooling	Heating	Power consumption	Sound pressure level	COP shaft heating
			kW	kW	kW	db(A)	
NS heat pump 193 HP	4200	10/6	1270	1797	527	84	3.4
	4200	40/34	2822	3399	577	84	5.9
NS heat pump 233 HP	3800	10/6	2040	2866	826	86	3.5
	3800	40/34	4576	5466	890	86	6.2
NS heat pump 283 HP	3000	10/6	2895	4063	1168	88	3.5
	3000	40/34	6492	7744	1252	88	6.2

Condenser water inlet +40 °C, outlet +90 °C | 60 bar design pressure, R717 refrigerant

Model	Max. rpm	Cold side temp. In/out °C	Cooling	Heating	Power consumption	COP shaft heating
			kW	kW	kW	
NS heat pump 273	3600	60/50	6030	7090	1060	6.7
	3600	30/20	2350	3260	910	3.6

40 bar design pressure
SAB 193 HP, SAB 233 HP and SAB 283 HP.
All capacities include economiser operation.

60 bar design pressure
SAB 273

Dimensions on request.

Non-standard Sabroe heat pumps are available on request.

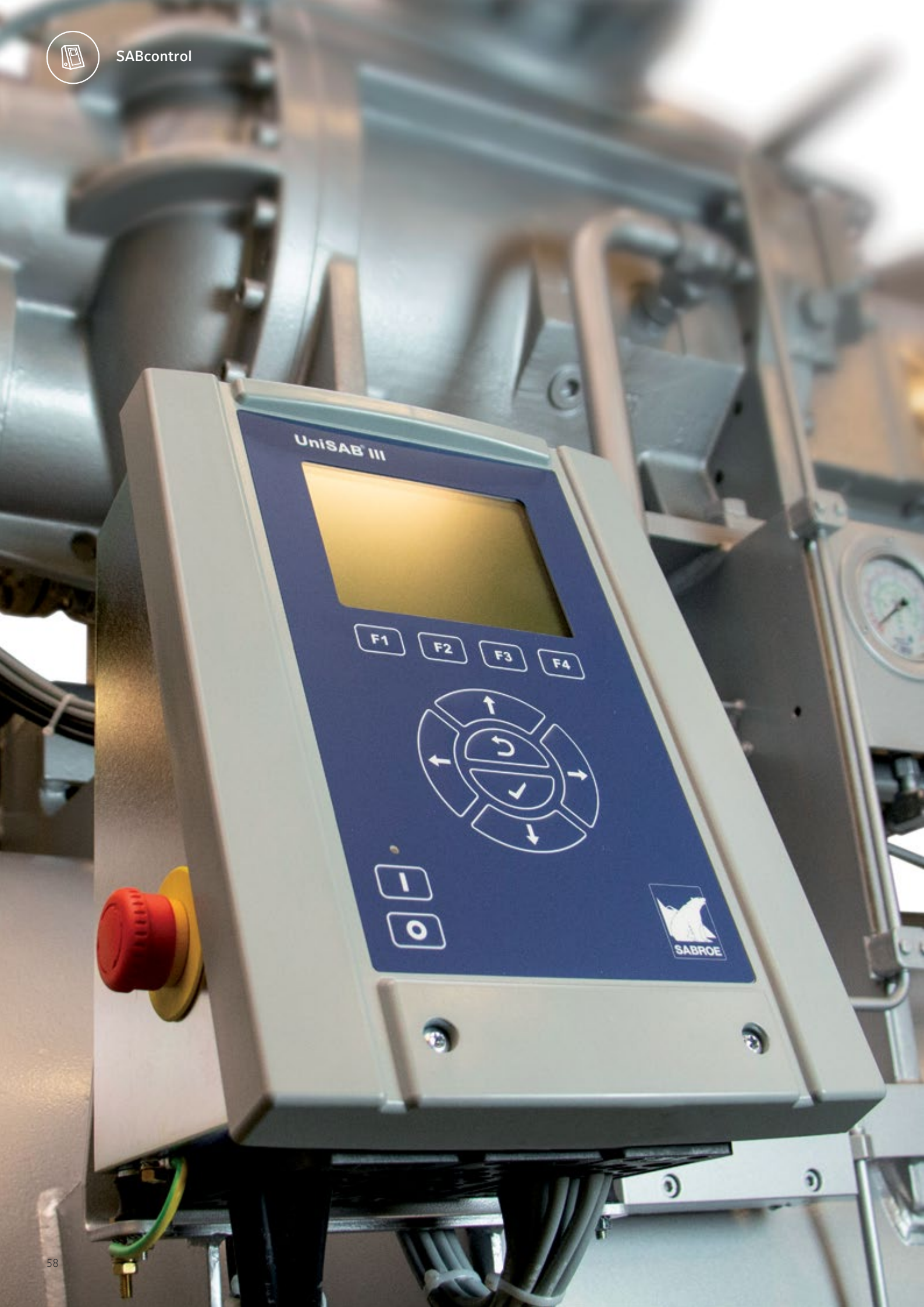
Sound pressure levels measured in free field, over reflecting plane and one metre distance from the unit.

Sound pressure levels are guidelines only.

Options

- Two-stage units
- Modular design for easy transport and rapid on-site assembly
- Shell-and-plate heat exchangers
- Shell-and-tube heat exchangers
- Parallel heat exchanger operation
- Variable-speed drive
- Soft-starter or Y/D starter
- High-voltage motors
- Complete economiser systems
- Customer-witnessed factory acceptance test (FAT)

Sabroe controls

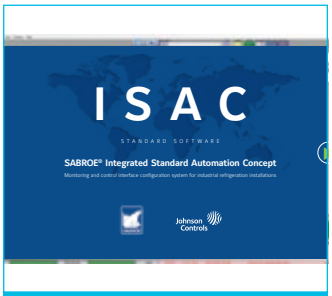

UniSAB® III
F1
F2
F3
F4
SABROE

Control systems for every requirement

Efficiency
Uptime
Best practices
Accessibility
Compliance

UniSAB

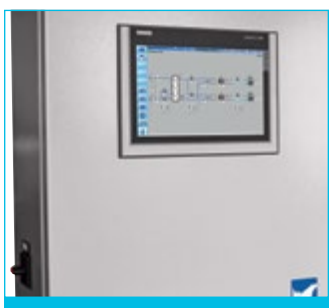
Web



Sabroe Integrated Standard Automation Concept (ISAC)

Condensing Pressure Optimiser (CP Optimiser)

Sabroe panels



Chiller plant controller

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 HVACR systems, as well as the efficiency of the industrial processes of which they are a part.

Sabroe digital monitoring and data management technologies make it easy to harvest, collate, and apply operating data on all levels, right from local equipment conditions to high-level operational status and analysis reports.

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

Sabroe UniSAB

Integrated systems controller for refrigeration compressors, chillers, and heat pumps

UniSAB systems controllers are connectivity hubs that help make sure refrigeration installations have the best possible performance, maximum uptime, and the lowest possible operating costs.

These important control units are pre-equipped and pre-configured with the connectivity equipment and protocols necessary for monitoring and controlling a wide range of compressors, compressor packages, chillers, and heat pumps – as well as using this data for fault-finding and analysis.

Advantages	Benefits
Single, fully integrated control system for use with virtually all types of compressors and chillers	Ensures more effective monitoring, control and diagnostics of a wide range of key refrigeration installations
Easy to integrate into the vast majority of industrial control systems, providing seamless transfer of data between systems	Ensures effective management of important operating data and secures the production process for best performance
Monitoring, control and diagnostics capabilities combined in one compact, integrated unit	Does away with the need for multiple systems, resulting in significant equipment savings
Compressor sequencing and load sharing are possible without additional equipment	Keeps power consumption to a minimum and reduces operating costs
Intuitive, easy-to-use interface, with a consistent look and feel	Requires fewer operator skills, resulting in lower training costs

UniSAB

Web

Cooling/freezing applications

Building automation systems

ISAC PLC/SCADA

Chiller plant controller

Sabroe panels

UniSAB Event app available for both iOS and Android devices

Connectivity

The UniSAB systems controller has normal industry-standard communication ports fitted as standard, and therefore does not require additional communication gateways.

Data can then be made available via any kind of network, where virtually any computer can be used to monitor and operate the UniSAB systems controller.

Functionality

- Service on-demand schedule
- UniSAB app for smartphone
- Configurable for both screw compressors and reciprocating compressors, with or without variable-speed drive (VSD), and using any refrigerant
- Built-in regulation of suction pressure, water temperature, discharge pressure, etc.
- Limitations on suction pressure, discharge pressure, motor current, etc.
- Logging of operating history and profiles for effective fault-finding and diagnosis
- Email dispatch in case of alarm or shutdown

Retrofit

A wide range of UniSAB retrofit kits are available to provide all the advantages of upgrading a wide range of existing compressors to a modern controls standard for improved performance and control system integration.

Retrofit kits are available for the full legacy of Sabroe, Frick, and Stal compressors – and most competitor compressors.

Complete retrofit kit

Technical data	
Connectivity	Multiple communication ports, including Modbus TCP, Profibus DP and Sequence Bus, as standard
Smartphone app	Available for both iOS and Android devices
Sequencing	As many as 14 refrigeration compressors (per temperature or pressure system), chillers, and heat pumps of different makes and types can be linked in sequence to ensure effective load sharing and capacity optimisation
Diagnostics	Detailed operating data documenting 30 shutdown situations
Refrigerants	Pre-loaded with the requisite data about all refrigerants normally used
Operating languages	Multiple languages available as standard, with additional languages as options
Enclosure	IP54
Ambient temperature	0–55°C
Power supply	85–250 volt AC, 50–60 Hz
Dimensions (H x W x D)	380 x 300 x 210 mm
Weight	6.5 kg

SVM system

Sabroe Vibration Monitoring system (SVM)

Automatic vibration monitoring system for large Sabroe screw compressors

The SVM system provides accurate, continuous monitoring of the bearing vibration levels in large Sabroe SAB 193-SAB 355 screw compressor packages, adding crucial extra safety margins that extend the service life of these crucial compressor components. Planned service life figures can also be based on the real condition of these bearings, rather than mere projections.

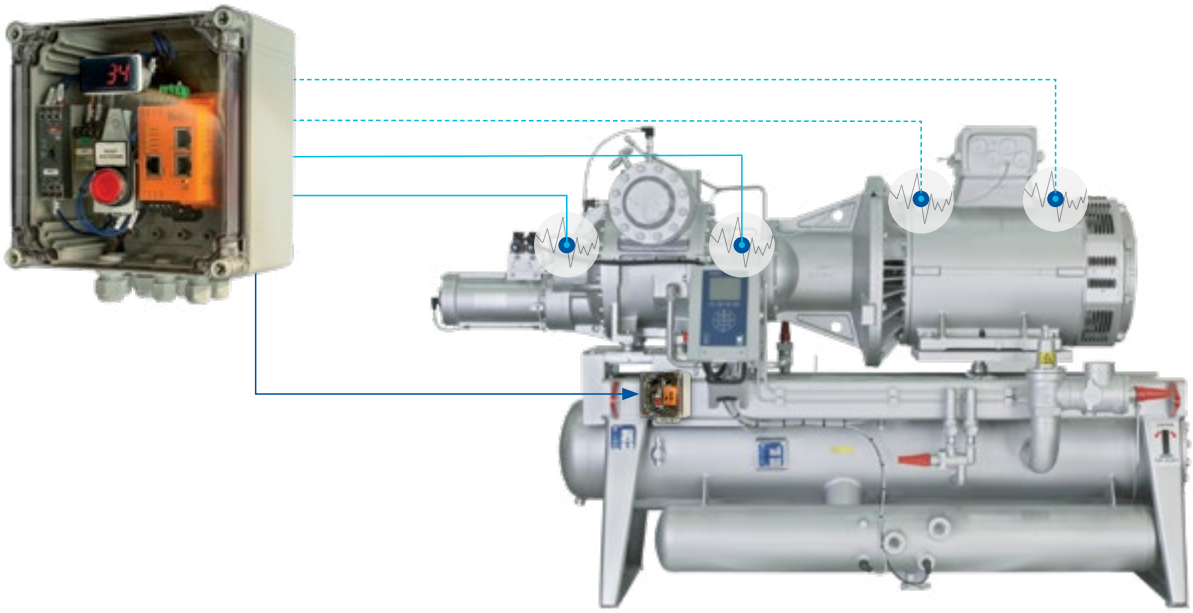
The SVM package includes two accelerometers, factory-mounted in the pre-drilled holes in the compressor. It is also possible to add two additional accelerometers for the compressor motor.

When connected to SVM, the two-step safety system in a UniSAB III systems controller provides an early warning if a vibration level reaches the warning limit. If not responded to in due time before the vibration level reaches the critical threshold, the UniSAB controller proceeds to the next step and automatically shuts down the compressor, drastically reducing any risk of severe equipment damage.

The SVM system is programmed to automatically monitor the frequency ranges that give the best early indications of bearing fatigue, and to ignore any other frequencies that might give misleading signal levels.

With the SVM system, the conventional six-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 the system to ignore normal lobe passing frequencies, and only register frequencies that might cause damage	Suppresses misleading signals, and therefore avoids false alarms and unnecessary shutdowns
Constant monitoring of bearing vibration development ensures the best possible preventive monitoring of bearing condition	The standard recommended 6-month vibration analysis 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
The 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

The SVM system is available factory mounted, but can also be ordered for on-site installation.

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

Ordering information	
SAB-Vib01	SVM kit, including 2 pcs. accelerometers for the compressor, 1 pcs. SVM box, mounting and cable installation on the compressor unit
SAB-Vib02	Danfoss MCB101 I/O expansion module (required)
SAB-Vib03	2 accelerometers for the motor (optional)

Technical data	
Power supply	24V DC, min. 200mA
Dimensions HxWxD	200x200x130 mm
Ingress protection	IP55
Compliance	CE
Enclosure	Plastic – Ensto OABP202013T
Cable connections	4 x M16, 3 x M20
Ambient temperature	-40–80°C

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.

Advantages	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 lifecycle cost of the compressor package

Sabroe VSD panel

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 1000 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)

Technical data

Nominal output	Dimensions in mm		
kW/amp	W	H	D
22/44	816	1434	624
30/61	816	1434	624
37/73	816	1434	624
45/90	816	1434	624
55/106	816	1434	624
75/147	816	1434	624
90/177	816	1434	624
110/212	816	1626	624
132/260	816	1626	624
160/315	816	1818	624
200/395	816	1818	624
250/480	816	1818	624
315/600	816	1818	624
355/658	1200	2202	816
400/745	1200	2202	816
450/800	1200	2202	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

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.

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.

Advantages	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

Sabroe A-frame VSD panel

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 1060 x 378

Sabroe softstarter FSD panel

Electrical panel solution for refrigeration compressor units 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 bring down here-and-now operating costs as well as longer-perspective lifecycle costs for the owner.

Sabroe softstarter FSD panels are integrated electrical panel solutions with a built-in softstarter 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 softstarter FSD panel a complete plug-and-play controls and motor starter solution, ready to supply the motor and ensure that the fixed-speed compressor unit delivers maximum cooling power at a minimum life cycle cost.

Sabroe softstarter FSD panels are an advanced electronic alternative to conventional Y/D starters, enabling a smoother start and (in some setups) making it possible to reduce the starting current better than a Y/D starter.

Sabroe softstarter FSD panel

Advantages	Benefits
Competitively priced electrical panel solution for fixed-speed drive of compressors, chillers and heat pumps	Easy to opt for the Sabroe softstarter 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 lifecycle cost of the compressor package

Factory-mounted units provide the best value by ensuring 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.

Softstarter 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 softstarter FSD panels are also ideal for the retrofit of existing electrical starter systems.

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

Sabroe softstarter FSD panels are mounted in a standardised painted-steel cabinet and include the following equipment:

- Electrical engineering and documentation
- ABB softstarter
- In-line contactor for breaking power supply in case of emergency stop
- 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
- Power inlet in panel top

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	1000	300
90	800	1000	300
110	800	1000	300
132	800	1000	300
160	800	1200	300
200	1000	1400	300
250	1000	1400	300
315	1000	1400	300
355	1000	1800	400
400	1000	1800	400
450	1000	1800	400
500	1000	1800	400
560	1000	1800	400

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.

Sabroe Y/D starter panel

Advantages	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 lifecycle cost of the compressor package

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.

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	1000	300
90	800	1000	300
110	800	1000	300
132	800	1000	300
160	800	1200	300
200	1000	1400	300
250	1000	1400	300
315	1000	1400	300
355	1000	1800	400
400	1000	1800	400
450	1000	1800	400
500	1000	1800	400
560	1000	1800	400

Sabroe chiller plant controller

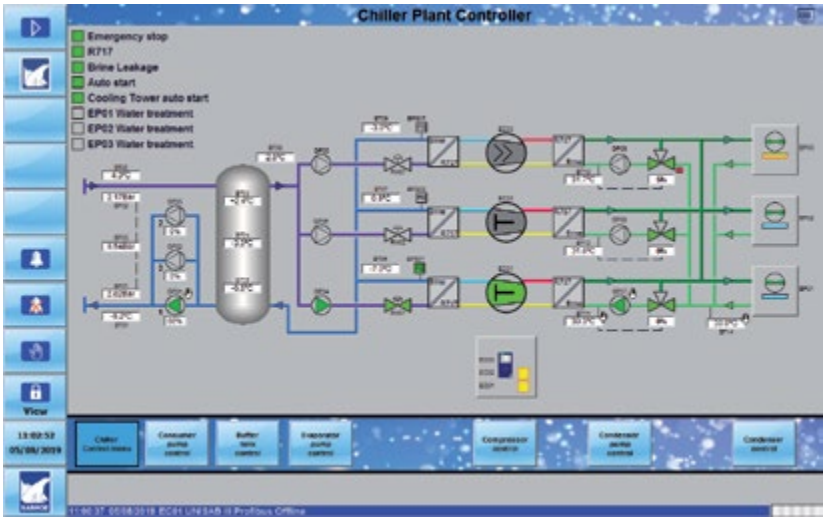
Integrated solution for managing and monitoring controls equipment in chiller plants.

The Sabroe chiller plant controller is a compact, easy-to-install control panel. It contains a pre-programmed PLC system and touch panel for monitoring and controlling a wide range of external equipment that is not part of the chiller itself, but that serves the chilled-water distribution system as well as other key equipment in the chiller plant.

Advantages	Benefits
Competitively priced control and monitoring solution	Easy to opt for the Sabroe Chiller Plant Controller, which will save you additional shop stops
Know-how and experience from the market leader within industrial refrigeration and chilled-water systems combined into one single control box	Ensures maximum efficiency and uptime of the complete chilled-water system
Pre-vetted, documented, and intelligently engineered solution, designed to fit the industrial refrigeration requirements	Saves you a lot of time on electrical engineering, design, documentation, installation, and commissioning
Comprehensive and well thought-out user features	Saves you valuable time in daily use and enables fully informed decisions

Remote access

Complete chiller plant



Chillers are controlled by UniSAB

The chiller plant controller includes:

- Differential pressure monitoring and control of pumps on the consumer side of the buffer tanks
- Buffer tank temperature control function, with remote start/stop of chillers
- Low-temperature protection of condenser circuit
- Optimum condensing pressure control of condenser side to match changing outdoor conditions
- Monitoring of temperatures and pressures and of the functioning of switches, motors, and valves
- Choice of direct or VSD drive control for each motor - VSD control can be by conventional digital/analogue signals or by Profinet data communication with the VSDs
- Remote monitoring and plant operation capability, via internet
- Remote monitoring of connected UniSABs

The Sabroe chiller plant controller provides users with straightforward on-screen configuration of equipment throughout the chiller plant. You simply select the number and type of chillers, the type and number of condensers, the condenser control method, and the distribution system design, including buffer tank option.

You simply click on the number and functions of sensors, valves, pumps, and fans.

Cross-check list for project alignment test is available on request.

Connectivity options

The chiller plant controller is available with a 3G/4G modem and VPN router for wireless internet connection.

The type and make of drive for pumps and for condenser fans are configurable. You can choose between conventional starter methods and VSD. The VSD option means you can use Danfoss and ABB VSD drives featuring Profinet connectivity and extended monitoring.

Control panel specifications	
Cabinet	1200 x 800 x 300 mm (HxWxD) painted steel plate, IP44
Connectivity	Touch panel: Ethernet interface for remote monitoring and operation PLC: Ethernet/Profinet interface for software service and connectivity to VSDs
Main components	Main switch, 24V DC power supply, relays and terminals, Siemens S7-1500SP PLC, and 12-inch Siemens Comfort touch panel

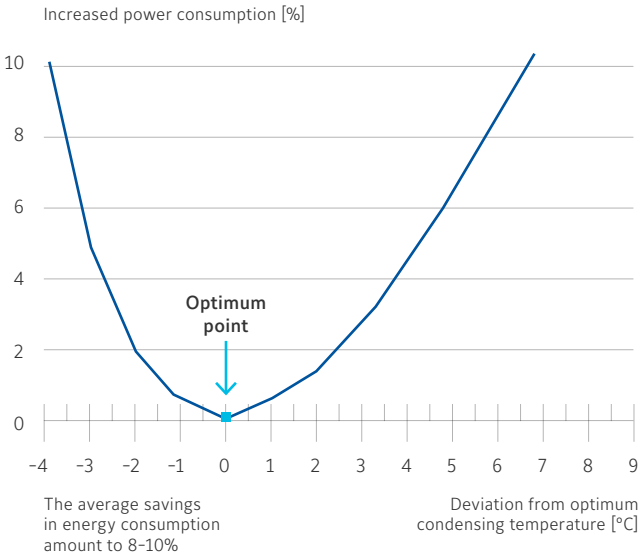
Sabroe CP Optimiser

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.



Advantages	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's 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

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

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

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

Sabroe Integrated Standard Automation Concept (ISAC)

Monitoring and control interface configuration system for industrial refrigeration installations

ISAC is unique Sabroe 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.

Advantages	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 Sabroe 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.

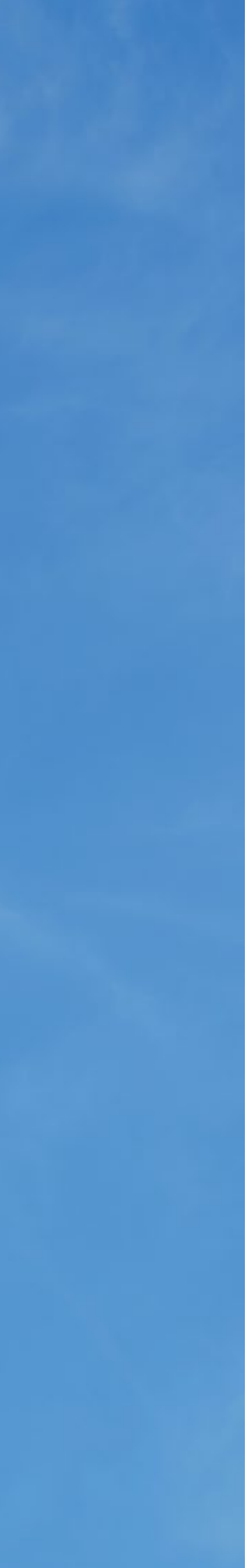
Access to the ISAC toolbox requires membership of the ISAC user community, and the ISAC community administrators provide new members with free training courses.

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_3 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.



Sabroe customised solutions

Sabroe 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 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

- 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 Sabroe 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.

AfterMarket solutions

Long service life saves you money

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.

Industrial Refrigeration Parts Centre

The Industrial Refrigeration 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).
www.sabroe.com/en/parts/

EasyParts – 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://easyparts.johnsoncontrols.com

AfterMarket Solutions (AMS)

The AfterMarket Solutions facility is the overhaul, repair, re-manufacturing, and stock centre for Johnson Controls industrial refrigeration companies throughout the world.

The AMS centre makes it easy to significantly extend the service life of your Sabroe equipment to minimise downtime and to reduce the operating costs of refrigeration installations by replacing worn compressor blocks, or getting existing blocks overhauled or repaired – all with a minimum of practical bother and service interruption.

Attractive retrofit options are also available.
www.sabroe.com/en/aftermarket-solutions/

SABROE Frick STAL REFRIGERATION Gram Refrigeration

SMC Long-life upgrade kit

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 5–10 percent of the overall refrigeration capacity, or a corresponding 5–10 percent 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.

Advantages	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 5–10%)
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 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.

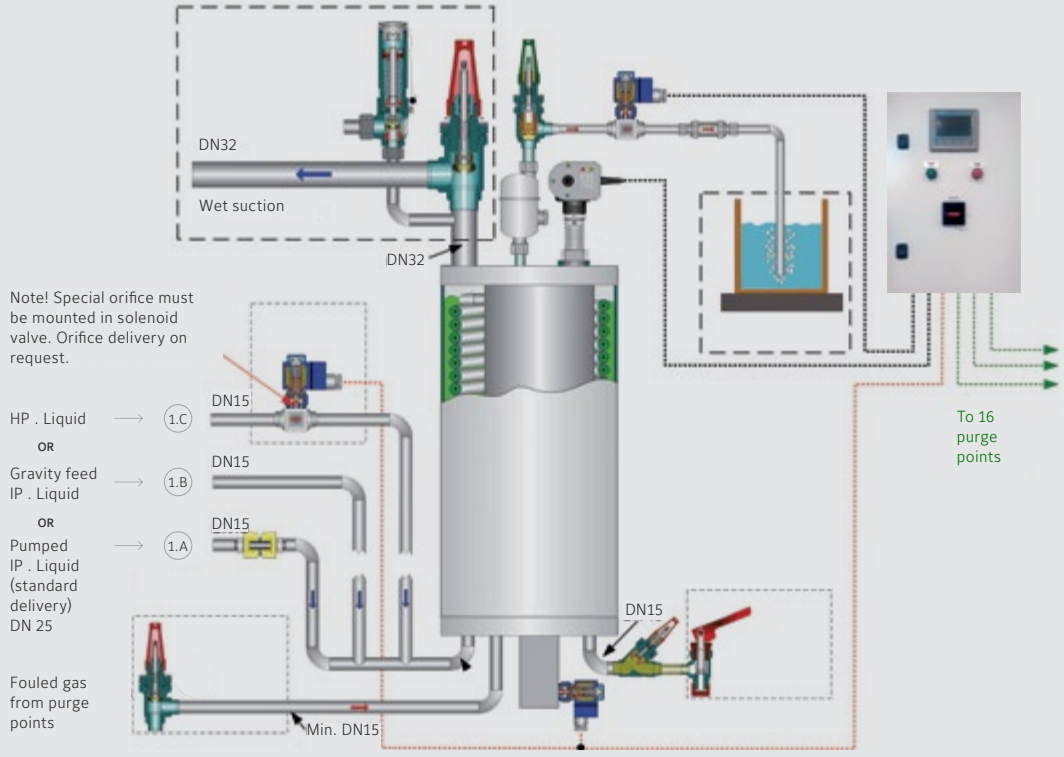
How to operate

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	1300 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
4385.011 Carbon steel with controls
4385.020 Stainless steel without controls
4385.021 Stainless steel with controls

Technical data for the control box	
Power supply	230VAC 50HZ
Dimensions H x W x D	600 x 400 x 300 mm
Encapsulation/Ingress protection	Painted-steel plate/IP54
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

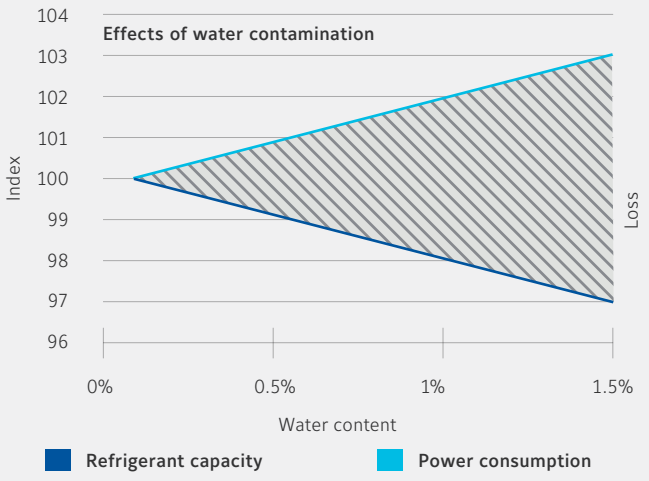
Sabroe WDO Water, Dirt, and Oil Purifier

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.



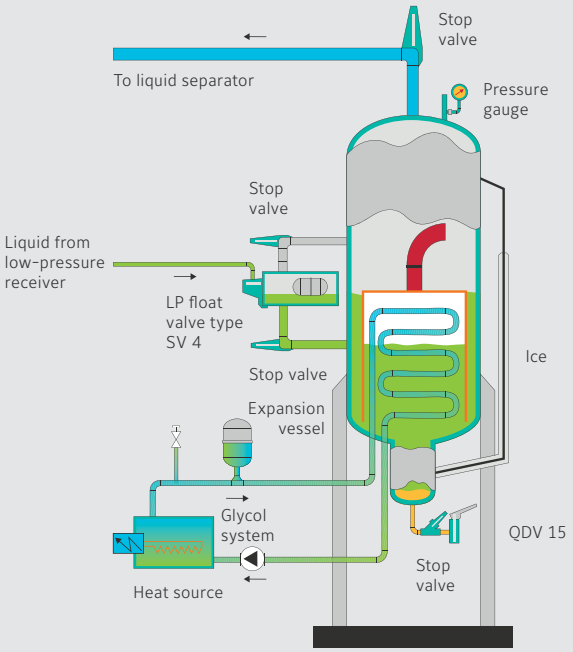
Advantages	Benefits
Removes oil and dirt from your refrigeration installation	Reduces operating costs and keeps system components operating at maximum efficiency
Removes any water present in the ammonia refrigerant	Less corrosion of mechanical parts, along with fewer breakdowns and unscheduled service 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)

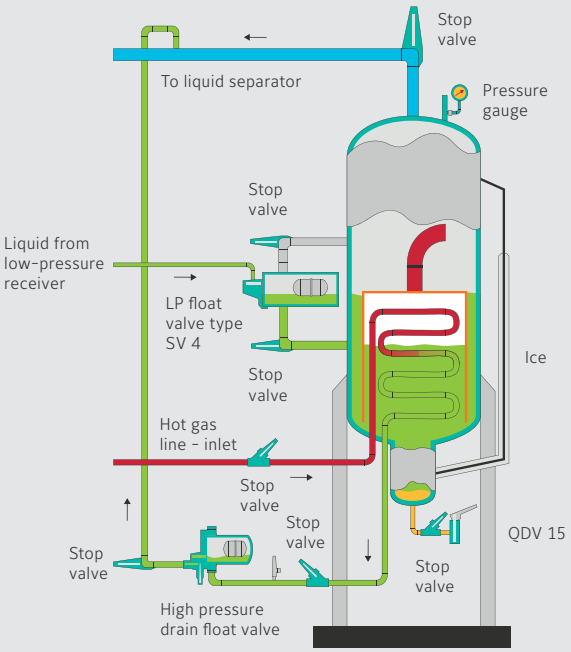
Sabroe WDO-HG (not insulated)

Two versions available

WDO-HE with electrical heating element



WDO-HG for hot gas



Technical data	
Refrigerant charge	35 kg
Maximum operating pressure	25 bar
Surface of R717 separator	1.2 m²
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	2000 x 800 x 1100 mm
Weight, empty	389 kg
WDO-HG	
Unit dimensions H x W x D	1800 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 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.

Advantages	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 5–10%
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	1200 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.

Sabroe 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 percent 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

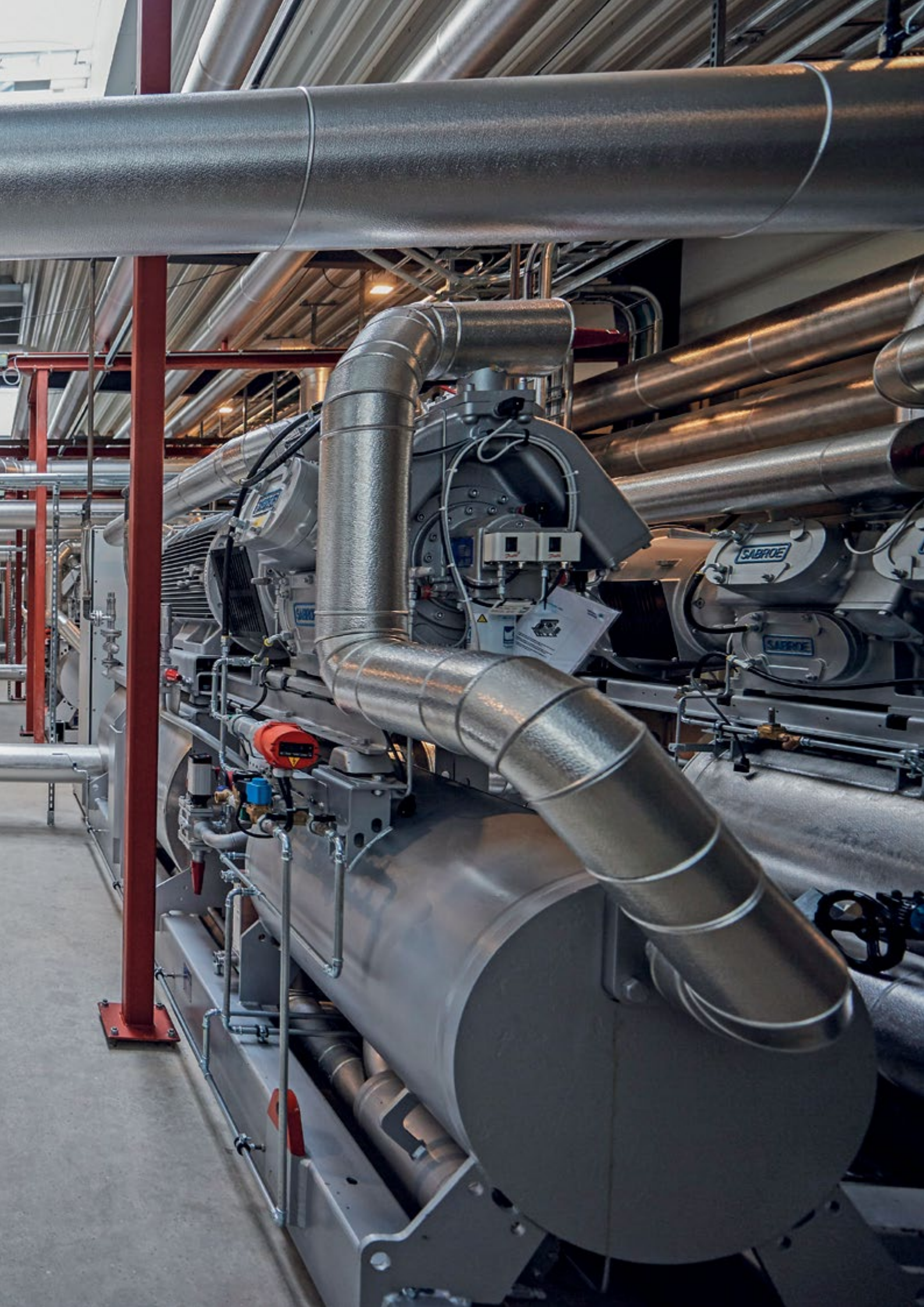
Documented capabilities

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, mone, 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

High-performing and reliable equipment that lasts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At Johnson Controls, we transform the environments where people live, work, learn and play. From optimizing building performance to improving safety and enhancing comfort, we drive the outcomes that matter most. We deliver our promise in industries such as healthcare, education, data centers and manufacturing. With a global team of 105,000 experts in more than 150 countries and over 130 years of innovation, we are the power behind our customers' mission. Our leading portfolio of building technology and solutions includes some of the most trusted names in the industry, such as Tyco®, YORK®, *Metasys*®, Ruskin®, Titus®, Frick®, PENN®, Sabroe®, Simplex®, Ansul® and Grinnell®.

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The power behind **your mission**