



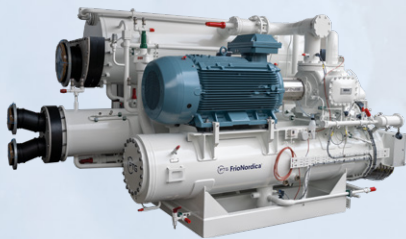
THE VALUE OF
PERFECT TEMPERATURE

Sustainable solutions
for cooling, icing,
freezing and heating



HEAT PUMPS – RSW

Efficient heating and cooling



FREEZING PLANTS

Preserves the original quality of the fish



ICE SYSTEMS

Perfect chilling of seafood

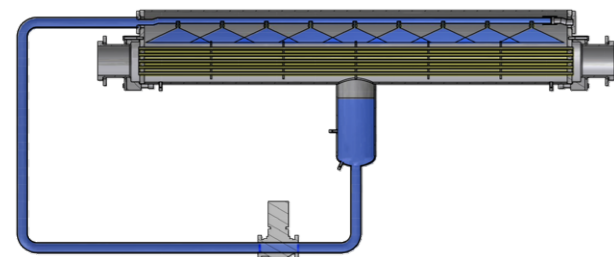


FrioNordica RSW systems and heat pumps

- Delivered complete on a base frame for quick and simple installation
- Tried and tested technology
- More than 600 RSW systems and heat pumps delivered since 2007 with titanium spray evaporator and J & E Hall screw compressor

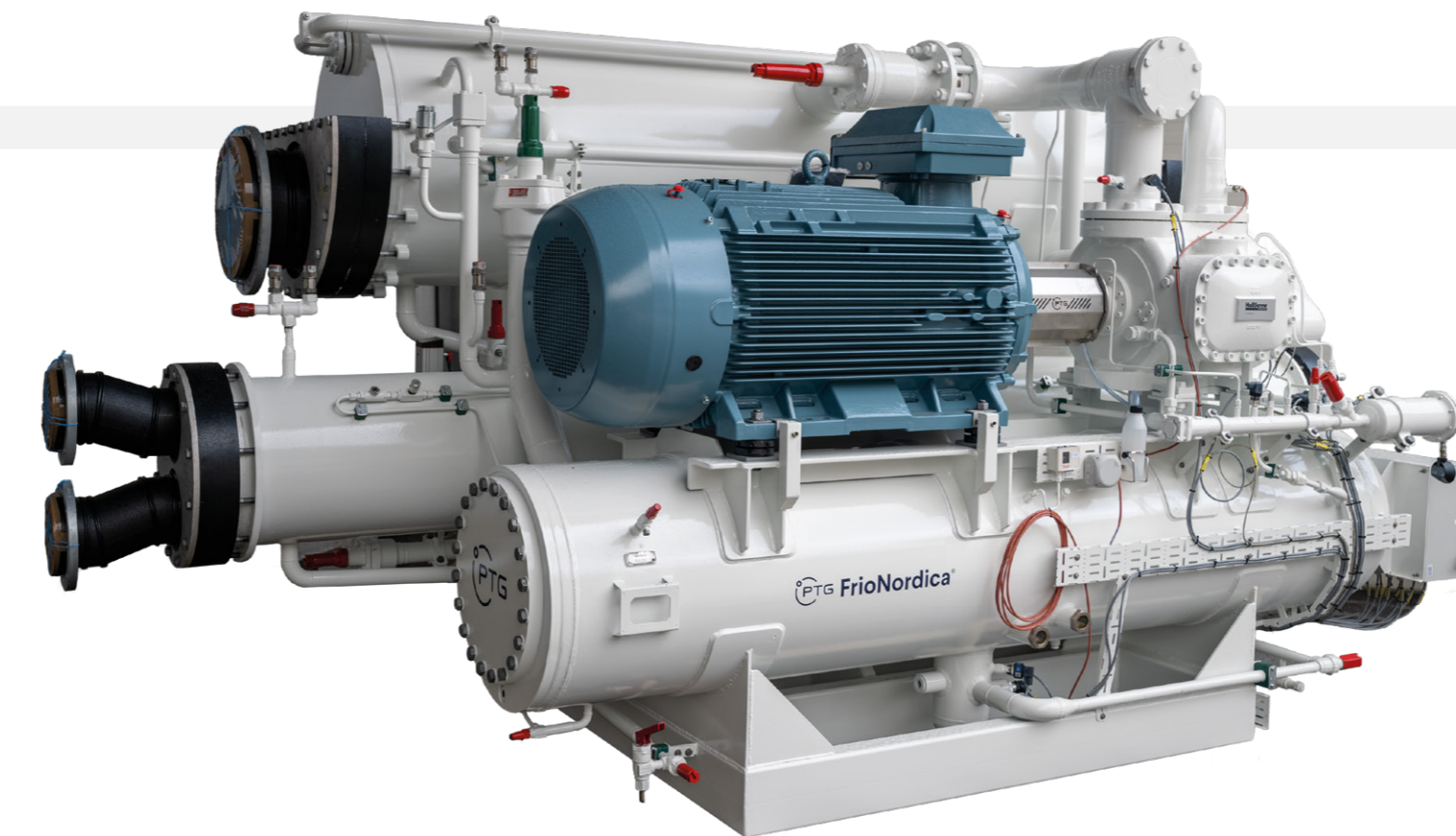
AMMONIA SPRAY CHILLER

- Ammonia is a natural refrigerant without a negative impact on the environment, and has the lowest energy consumption of all refrigerants
- Lowest NH₃ charge is 60-100 grams/kW
- The tube bundle is sprayed with liquid ammonia, forming a thin and turbulent film to give efficient heat transfer
- Low risk of frost damage



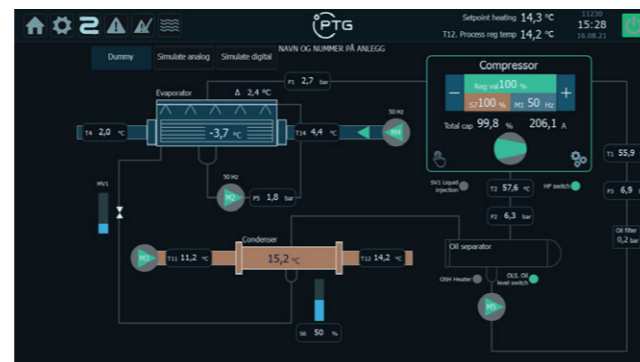
LUBRICATION

- Three-step oil separator with coalescer filter
- Oil carry-over to less than five ppm
- Energy-saving titanium oil cooler



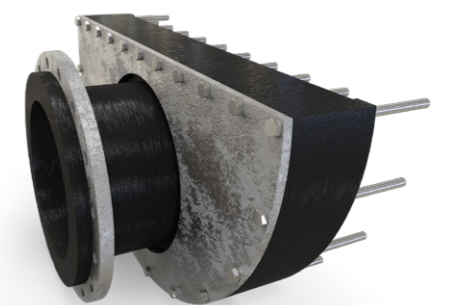
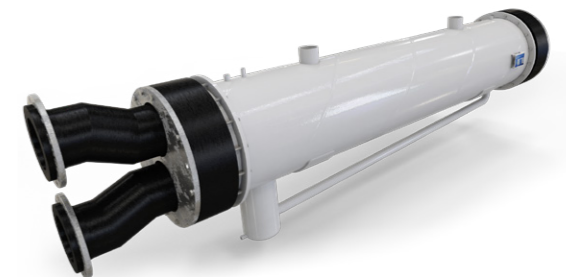
CONTROL SYSTEMS

- FrioLogica touch screen control system for user-friendly operation
- Temperature logging and valve control can be integrated in the software



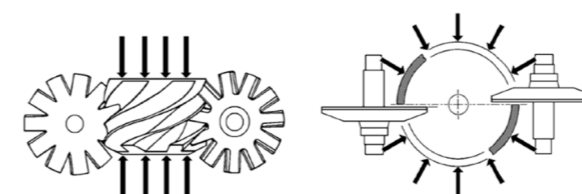
TITANIUM HEAT EXCHANGERS

- Titanium tubes and tube sheets
- The tubes are welded to the tube sheets to avoid risk of leakage
- 10-year corrosion warranty
- Corrosion-free PE water heads
- Large connection pipes for low pressure drop



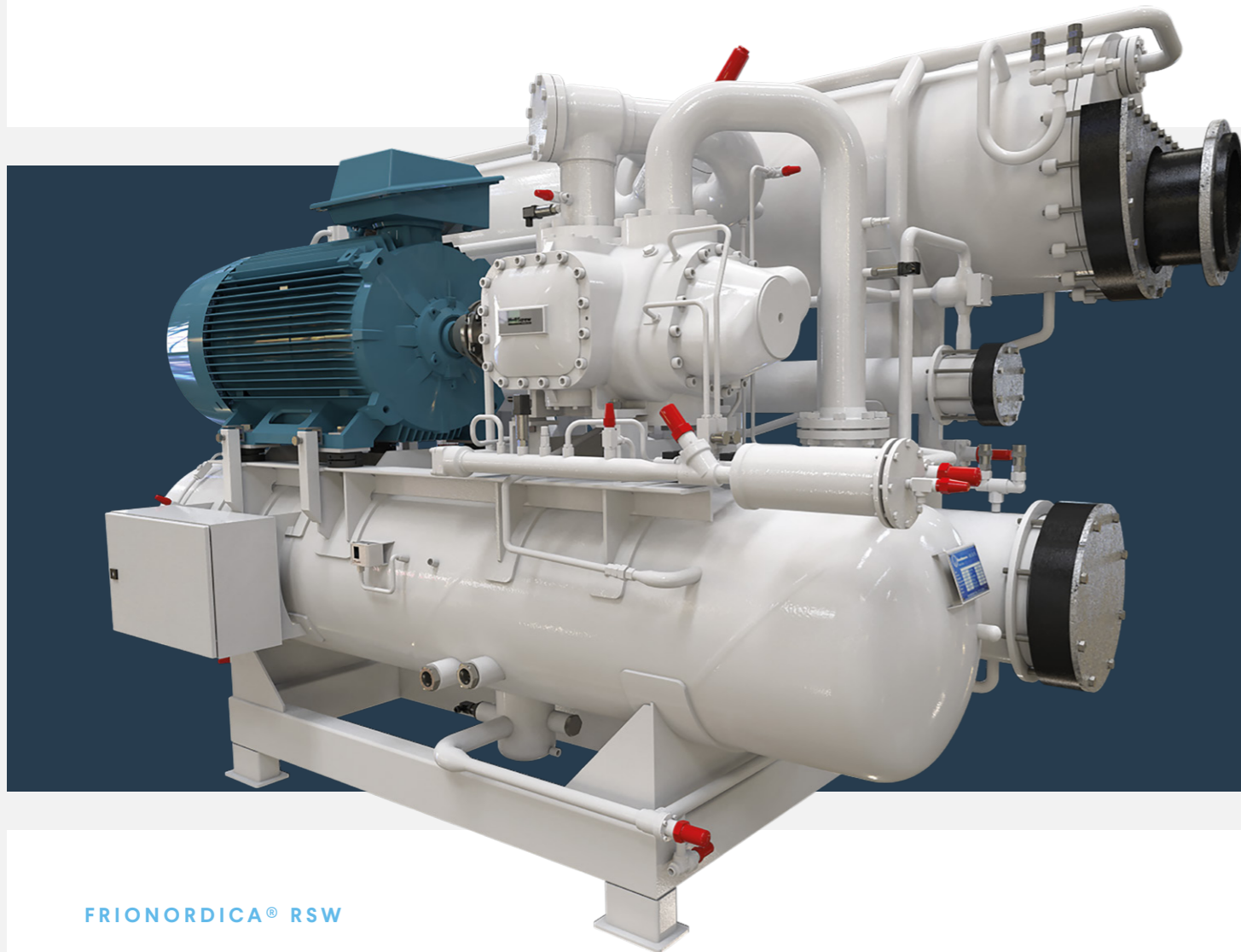
J & E HALL SCREW COMPRESSOR

- Very simple design with few components
- Balanced compression with little load on rotating parts and bearings
- Bearing life of 100 000 hours
- Low power consumption with compression conditions which suit heat pumps/RSW systems



RSW systems

Compact and complete systems for efficient chilling of seawater and fish



FRIONORDICA® RSW

- Reduced size – space-saving installations
- Improved performance at high temperatures – shorter pull-down time
- 80 per cent reduction of the refrigerant charge
- Reduced freezing risk – the tubes are not submerged in liquid refrigerant if the pump stops
- Erosion-proof design allows water velocities of more than three metres per second to reduce fouling

Our RSW systems are based on the best available materials for seawater service.

This new generation of space-saving RSW plants are based on modern technology which offers improved efficiency.

Chilling capacities range from 50-2500kW.

All units are offered as factory-assembled and skid-mounted (saving installation time and errors).

The dominant refrigerants are ammonia and CO₂.

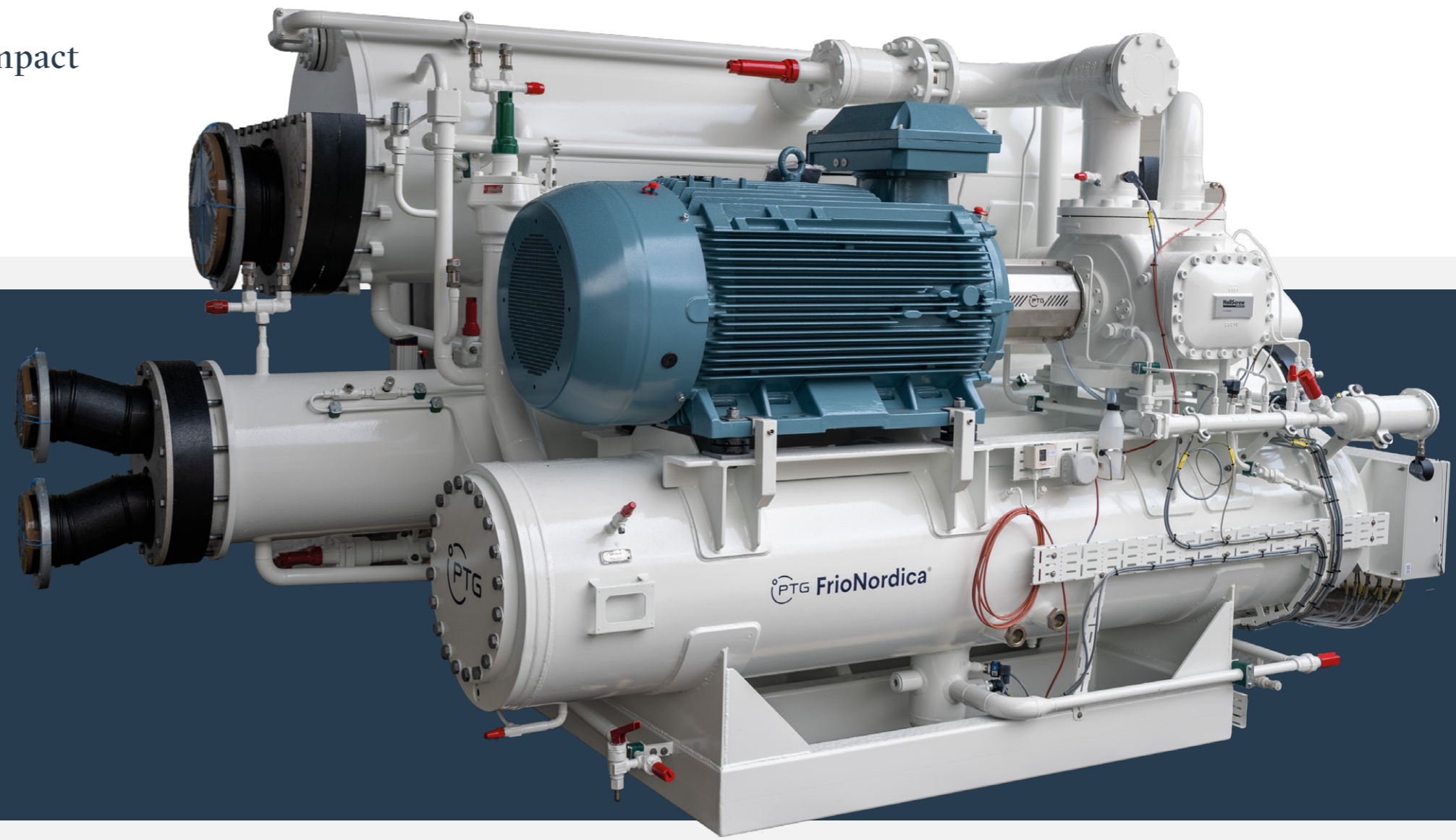


SEACO₂OL® RSW

- Small refrigerant charge
- Continuously variable control
- Capacity range from 80-470kWh
- RSW cooler and condenser with titanium tubes and fibreglass heads, 10-year corrosion warranty
- Opportunities for heat recovery with water temperatures up to 80°C
- Compact and complete on base frame
- Low maintenance costs
- Natural refrigerant and no EX requirements
- Frost-proof

Heat pumps

Efficient heating and cooling with our compact heat pumps for land-based aquaculture



FRIONORDICA® HEAT PUMPS

- Very high coefficient of performance (COP)
- Heat pump systems for large water flow and small temperature rise
- Water flow between 500 and 40 000 litres/minute
- System heating capacity 0.3-26 megawatts
- Ultra high heat pump COP typically between 9-13
- System COP up to 40
- We deliver complete energy systems comprising heat pumps, heat exchangers, pumps and control systems
- Advanced automation and controls also allow us to achieve an even higher COP on part load. That has a big effect on annual consumption, because plants often run on part load for much of the time

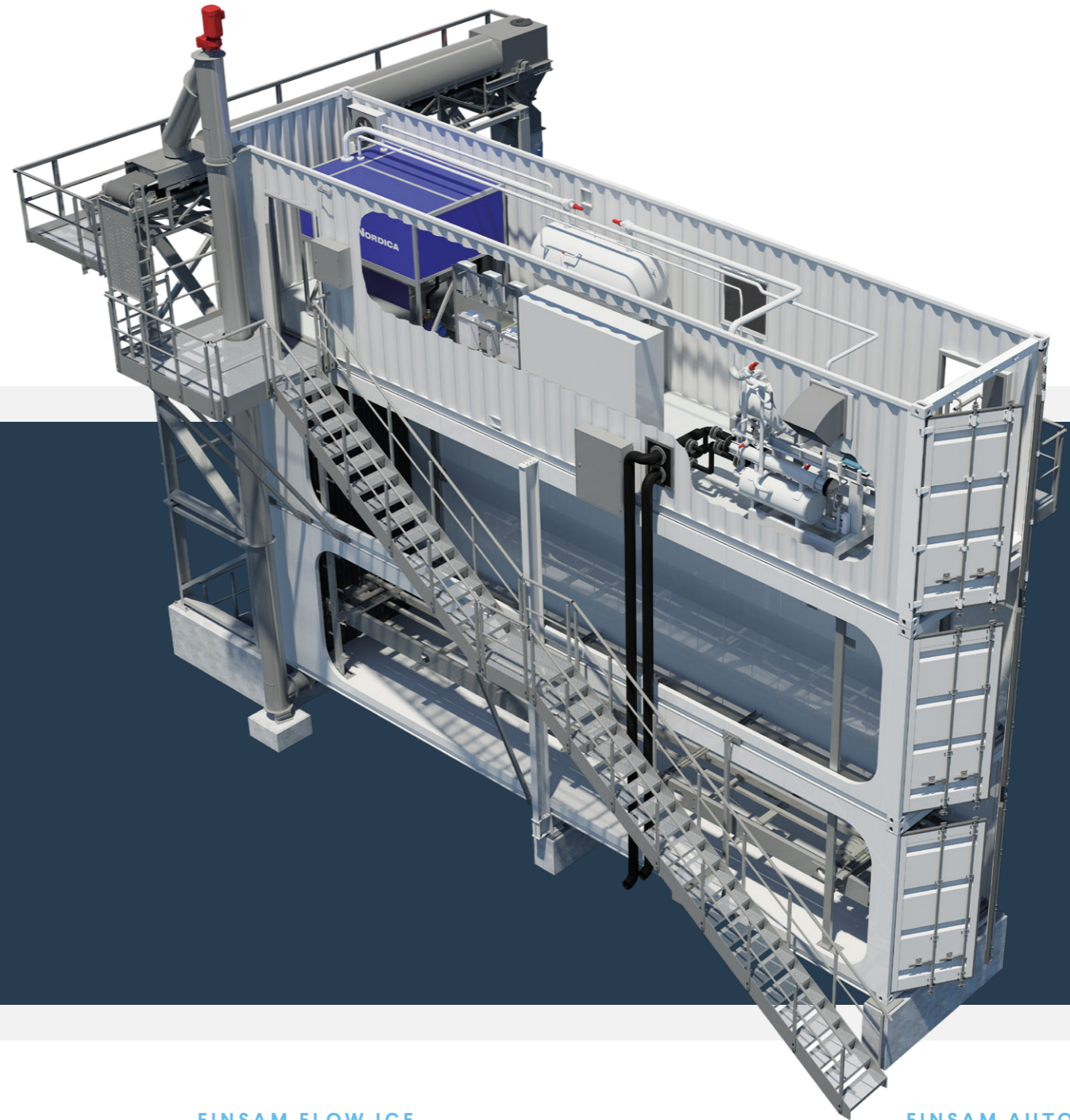
SUPERHEAT™ HEAT PUMPS

- Heat pump with CO₂ as refrigerant
- Can deliver water temperatures up to 80°C
- Can be combined with traditional refrigeration systems, where we use the heat pump to increase water temperature
- The same unit can deliver several water temperatures, easy to combine heating systems for buildings and hot water, for example
- Natural refrigerant
- Continuously variable control
- Good COP
- Can be delivered complete with energy system and buffer tanks for hot water



Ice systems

Ice is the perfect chilling medium for fish and other seafood. We deliver container-based ice plants, ice machines and slurry ice production



FINSAM ICE PLANTS

- Well-proven technology, unbeatable benefits
- Finsam ice plants can provide automatic delivery to boats, trucks, bins, production lines and ice slurry production
- Finsam ice plants are based on the well-proven ice rake concept delivered to ports and factories all over the world
- Containerised for easy installation or build at site for larger capacities

FINSAM PLATE ICE

- From -15 °C evaporating temperature for low power consumption
- Moderate subcooling with wet surface
- Sub-cooled dry ice for long-term storage and hot climates
- Versatile – the Finsam ice machine produces ice of adjustable thickness and crushing grades
- Less damage – flat and parallel surfaces without sharp edges mean no ice damage to goods being cooled

- Easy to convert to pumpable slurry ice



FINSAM SLURRY ICE

- Ice slurry made from crushed plate or flake ice
- Ice stored in dry condition or as mixed slurry
 - Ice slurry and conventional ice from the same plant
 - Possible to control salinity



FINSAM FLOW ICE

- Rapid chilling owing to large ice surface
- Soft and gentle to the fish
- Pumpable for easy distribution
- No fresh water required
- Compact design
- -10 °C evaporating temperature for low power consumption
- Complete flow ice plants including pumps and controls.
- Flow ice racks for integrating into existing refrigeration systems
- Ice generators for other system integrators



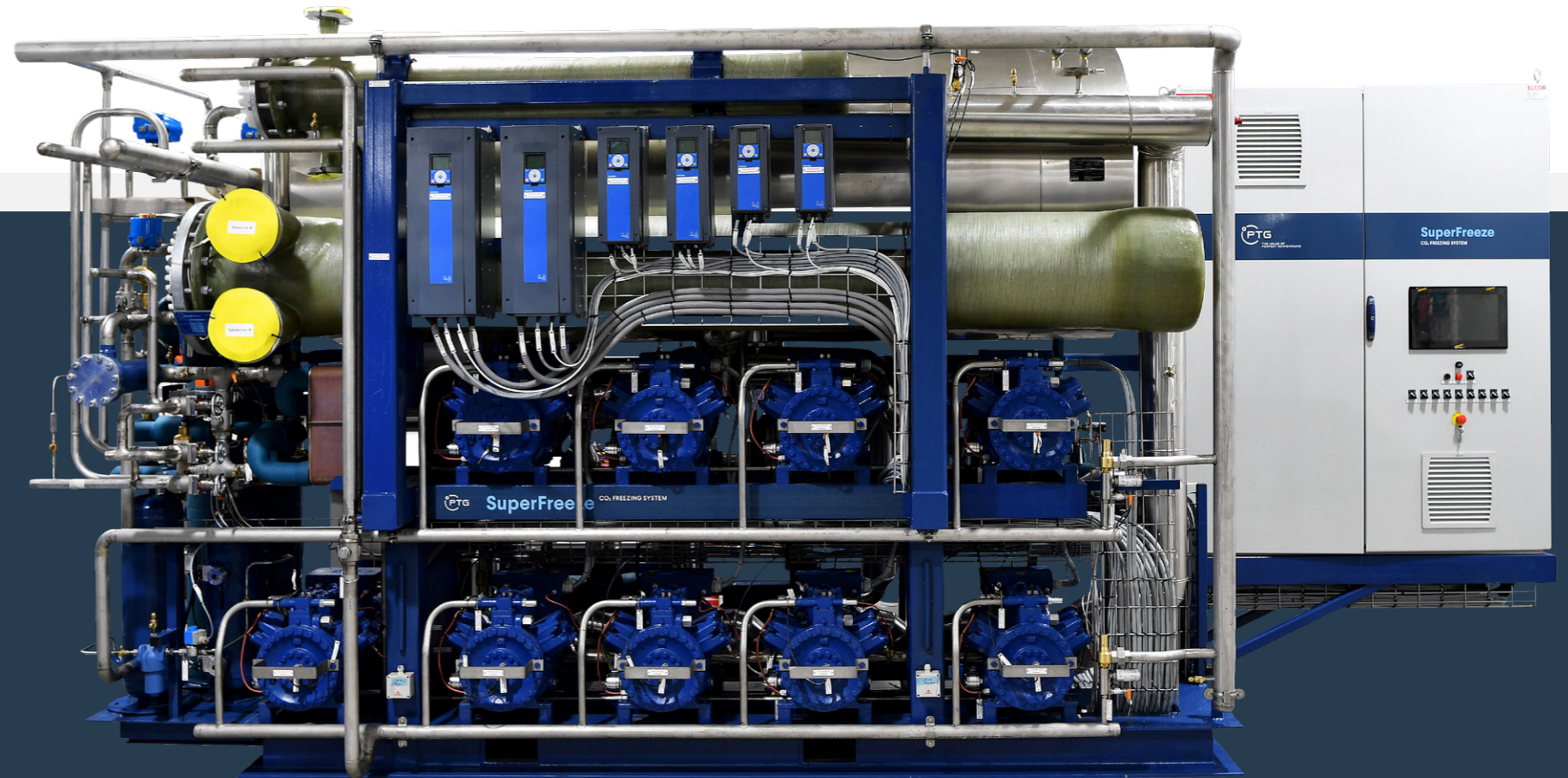
FINSAM AUTO-ICE SYSTEMS

- Self-service ice delivery system with a card/code system
- Customer database with records of delivered ice. Data can be transferred to administrative systems
 - The control system for automatic ice plants features touch screen display for easy operation



Freezing plants

Enhances freezing efficiency and preserves the original quality of the fish from the time it comes on board until it lies on the consumer's plate



INDUSTRIAL REFRIGERATION SYSTEMS

- All our freezing plants are designed as robust industrial installations
- Pump-circulated or DX systems
- Can be connected to all types of freezer applications, such as tunnel, plate and IQF freezers, cold stores and ice machines
- Can be delivered as combined plants with RSW/cooling at the intermediate stage, or as pure refrigeration systems
- Short installation time at the site, can be delivered from our works as a complete system with such necessary components as a compressor and liquid separators on a shared frame
- Hot gas defrosting
- Opportunities for heat recovery

SUPERFREEZE®

- Temperatures down to -50°C
- Compact, small footprint
- Continuously variable control
- Initial freezing 25 per cent more efficient
- Effective hot gas defrosting
- Natural refrigerant – CO₂
- No EX requirements
- User-friendly, low maintenance costs

FRIOCOMP NH₃

- J & E Hall screw compressors, mono-screw with long service intervals of up to 100 000 hours
- Three-step oil separator with coalescer filter
- Oil carry-over to less than five ppm
- Energy-saving titanium oil cooler
- Continuously variable capacity control
- Natural refrigerant – NH₃
- User-friendly, low maintenance costs

PERFECT THAWING

- Heat pump and refrigeration plant for quick and careful thawing of frozen fish in a water bath
- Careful thawing
 - Energy savings up to 400 per cent
 - Efficient
 - User-friendly
 - Low maintenance costs
 - Stepless regulation
 - Freezeproof
 - CO₂ – a natural refrigerant

Control systems

Tailored solutions for automation and monitoring which give you full control and big energy savings

We deliver control systems for refrigeration and heat recovery plants large or small, and for other processes. With a high level of expertise and a wide range of products, we can tailor an optimal solution for all purposes.

Monitoring and remote operation represent a natural part of our solutions. We can supply automated systems for new plants as well as modernisation and automation of existing facilities. That includes tailoring a variety of

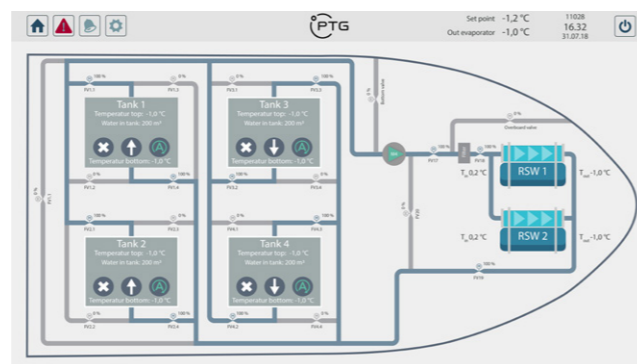
solutions, from simple notification by text message to more advanced systems with opportunities for remote control over the internet.

Our automation department has expertise with a number of control and monitoring systems. We always offer the most advantageous solution in terms of price and functionality. And we use only quality machinery and components from reputable manufacturers.



FRIOLOGICA CONTROL

FrioLogica Control is an electronic PLC-based monitoring and control device for refrigeration plants and connected processes. It is easy to operate through a touchscreen display and on-line information about relevant conditions, such as pressure, temperature, flow, running hours, percentage capacity, safety controls and alarm history. The system can communicate over the internet and with central control systems, as well as with tablets, smart phones or computers.



FRIOLOG

- Friolog is a module-based add-on to FrioLogica for logging temperatures in the fish holds for traceability purposes
- Each module can handle four temperature probes. The number of modules is unlimited

FRIOVALVE

- FrioValve ensures easy-to-use operation of valves for the fish tanks
- Eltorque valves are controlled by CanBUS communication

cCON COMPRESSOR CONTROL

Innovative compressor control based on the well-known FrioLogica platform.

- Industry 4.0 ready
- App connection, both IOS and Android
- Opportunities for IOT cloud connection
- Top system/SD integration (Ethernet IP, Modbus TCP, OPC, UA)
- Refrigeration/heating/freezing applications
- Simple and favourably priced retrofit with sensor and input signal package
- Master-slave (operation equalisation, alarm handling, etc)
- Self-diagnosis with alarm, restrictions and alerts
- Slave display in several sizes up to 21-inch
- System language Norwegian, English, Spanish



FRIOECO DX AMMONIA RSW AND HEAT PUMPS

- Ultra low ammonia charge $\lt; 100 \text{ g/kW}$. 14 kg for a RSW of 150 kW
- These systems have less requirements for installation and machine rooms
- Compact unit, easy to install
- Significant lower power consumption compared to other refrigerants. (30–50% lower)
- Ammonia is the most environmentally friendly refrigerant available with excellent technical properties for RSW/HP operation with a zero climate impact
- 10 years corrosion warranty for parts in contact with sea water
- J&E Hall rotary compressor of single screw design. Balanced compression which cancels out radial forces on the main bearings. Overhaul intervals of 100 000 hours gives very low maintenance cost for the compressor
- Titanium tubes and tube sheets in all heat exchangers. Tube joints are expanded and welded giving a leak proof solution. Water heads are PE
- DX chiller with titanium tubes and plastic shell with no freeze-up risk
- FrioLogica controller offering automatic operation and monitoring of parameters. Remote support via internet
- The heat exchangers and units are designed and produced in the PTG Frionordica factory in Norway
- Including effluent energy recovery heat exchangers, an aquaculture heat pump system typically gives a COP over 30

FrioEco DX ammonia RSW and heat pumps



MARKET AREAS

We help to cut energy consumption, reduce emissions and increase profitability for our customers. That is the value of perfect temperature.



Marine

Chilled and frozen with top taste and nutrient content

We know that the end-product value increases when fish are chilled and frozen while at their freshest and when their nutrient content is at its best. Our solutions also improve operating economics by cutting fuel consumption and working time. In partnership with our customers, we identify the perfect temperature and solutions which are cost-efficient and environment-friendly.

Our marine customers

White fish vessels, pelagic vessels, well boats and suppliers of factories and processing plants.



Industry

Efficient processing and high quality

Our knowledge of efficient production and high quality provide customers with the perfect temperature and the best results. Seeing the overall picture in close cooperation with customers allows us to help enhance end-product value.

Our industrial customers

Aquaculture, processing of white and pelagic fish (filleting, packing and freezing), abattoirs, bakeries, food on the go, studies and research, power generation, breweries, and suppliers of factories and processing plants.

SERVICES

Planning and advice

Good planning is important for achieving the best results. All our customers are welcome to seek obligation-free advice from our specialists and engineers.

Design and delivery

We have long and broad experience with design and delivery of refrigeration plants and associated systems.

Turnkey deliveries

As a turnkey supplier, we take responsibility for the whole construction process. Our experienced project managers are also happy to accept responsibility for sub or side contracts related to your project.

Service and maintenance contracts

A maintenance agreement gives you, as the customer, a single point of contact, and all servicing is concentrated in a single contract.





THE VALUE OF
PERFECT TEMPERATURE

Our service – your security

We are Norway's largest centre of expertise for temperature management, and offer complete refrigeration, freezing, air conditioning and heating solutions for the international market.

Manufacturing in Norway and a comprehensive service network allow us to look after customer requirements for quality and delivery precision. We are represented along much of the Norwegian coast, in the UK and in Chile. Get in touch, and we will make sure you get the best service and follow-up.

We have taken the PTG name from the initials of our holding company, Perfect Temperature Group, and adopted the group's slogan – the value of perfect temperature.

