

# NAVAL EQUIPMENT AND SYSTEMS

## HSCC CHILLER UNITS



After a long period of intensive testing Van Halteren Special Products launches a new, in the broadest sense, high performance, range of chillers, specially designed for several marine applications. The new range chilled water units with the multiple award winning oil-free, high efficient Turbocor compressors are especially designed to perform extremely well under the harsh marine circumstances.

The lay-out of the components, lines and controllers of the chillers has been established with great care. With the HSCC chiller line Van Halteren Special Products accomplished to find an optimum in the ever contradicting triangle: compactness, serviceability and efficiency, without making the slightest concession to one of these issues.

Internationally recognised high quality and robust industrial components in combination with sturdy line and component supports ensure the availability of the chillers on the long term which is necessary in this market segment, where a lot of critical onboard systems need cooling for proper functioning and therefore depend on the availability of the chiller at all times. Van Halteren Special Products years of experience in building reliable and solid chilled water units are now combined with the exceptional characteristics of the Turbocor compressor. Keywords as extreme energy efficiency, environmental friendly, comfort and cost savings can be added to reliability, serviceability, durability and availability to typify the HSCC-chiller range. The best which is available on the market for marine and yacht applications today.

### THE COMPRESSOR AT A GLANCE

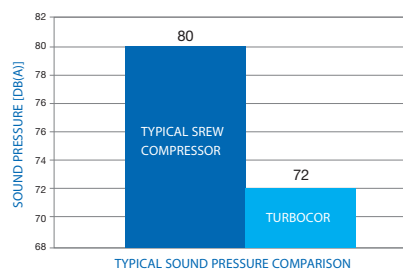
The Turbocor compressor is a highly innovative application of active magnetic bearing technology and is the worlds first totally oil free compressor. The compressor has been designed and brought to market by Danfoss Turbocor for use primarily in the refrigeration field where it has major advantages over the current commonly used vapour compression technologies. The compressor features a two stage centrifugal pump and spindle levitated in active

magnetic bearing. Power is supplied to the motor by a DC inverter and the whole system is controlled by an onboard microprocessor.

The frictionless centrifugal compressor when driven at variable speeds offers the most efficient operation of all compressor technologies available today. In a fully optimised refrigeration system the energy savings can be substantial, reducing costs and global warming emissions.

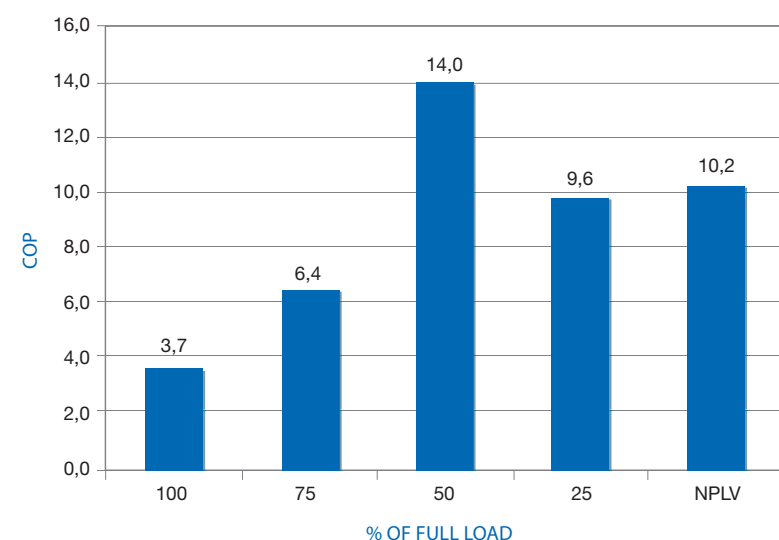
**UNPRECEDENTED PARTIAL LOAD ENERGY EFFICIENCY**

Reducing energy consumption is an important way to address global warming and reduce fuel consumption, increasing the action radius. Since the systems on board are operating most of their lifetime under reduced operational circumstances it is important to evaluate their energy consumption across the entire operating range. Contrary to conventional chillers the energy efficiency (COP) of the HSCC chillers provided with Turbocor compressor rises at part-load operation.



**SOUNDS LIKE A WHISPER**

At an operating sound level the compressor is so quiet that, given typical equipment background noise, one literally cannot hear it run. This makes that the chiller can be installed on board without taking all kind of additional



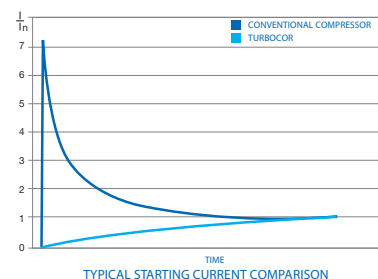
measurements to meet the air- and structure born noise requirements.

**THE ULTIMATE SOFTSTART**

Only 5 amps inrush is needed compared to typical 250 and 500 amps required by conventional chillers. This means the electrical supply network remains stable at all times. Failures in case of limited shore power are history.

**REDEFINES THE TERMS 'COMPACT' AND 'LIGHT WEIGHT'**

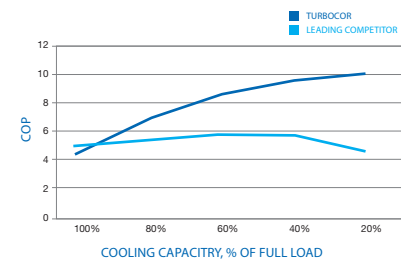
Turbocor compressors weigh 120 to 132 kg, approximately 1/8th the weight of conventional compressors at equivalent capacities. Further, this compressor only requires about half the space of a traditional compressor.



**COST SAVING MAINTENANCE**

The lightweight compressor is compact and easy to handle, featuring electronic

diagnostics and the potential for web based monitoring of critical compressor and system parameters. The compressor has only one moving part assembly and has no wearing surfaces subject to lubrication problems. By eliminating the need for oil to lubricate and provide compression sealing, the HSCC chillers avoids all of the problems associated with oil systems typical for conventional chillers. Low maintenance costs are a direct benefit achieved by eliminating the need for servicing refrigerant oil or repairing systems with chronic lubrication problems. History has shown that about 80% of all service or breakdowns of chillers are due to oil related problems, something the Novek HSCC chillers do not suffer from. In oil lubricated chillers, oil migrates to the evaporator and condenser, coating the internal surfaces and reducing the ability to transfer heat, thus degrading the energy efficiency. Friction also takes its toll causing bearing and gear wear. High friction damage and the maintenance intensive oil management, hardware and controls associated with conventional oil-lubricated bearings are now totally eliminated with proven magnetic bearing technology, enabling outstanding energy efficiency and reliable, long life operation.



**ENVIRONMENTAL CONSIDERATIONS**

The hermetic construction and practically vibration-free operation reduce the possibility of refrigerant loss.

**INTELLIGENT CONTROL**

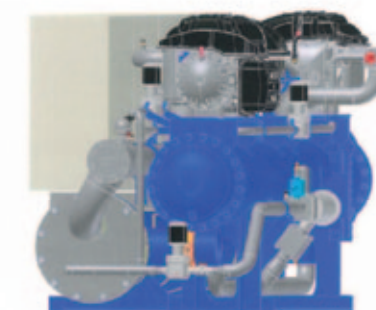
The chillers of the HSCC-line are equipped with the best controller available for the use on chillers with Turbocor compressors. The controller is a direct product of Danfoss. It is developed in close collaboration with Turbocor and optimized during testing at Novek.

Where competitive controllers can suffer from adequate operation mainly during start-up and load-sharing, the Danfoss controller shows a superior efficient, smooth and failure-safe operation of the chillers in their entire operating range.



**VITAL BYPASS**

Each compressor is standard equipped with a hot-gas-bypass installation for quick start-up at extreme high condensing pressures. The value of the stepless motor becomes clear when it is used for capacity control. Its operation is very smooth and precise at impressive low partial loads.



**LINE DIMENSIONING AS IT SHOULD BE**

Since oil return issues do not have to be taken into account, the attention of refrigerant line run and dimensioning is fully focussed on efficiency.

**ELECTRONIC EXPANSION VALVES**

Unlike thermostatic expansion valves, electronic expansion valves do not need to keep the condensing pressure artificially high when operating at low seawater temperatures. The rule of thumb: if the condensing temperature can be reduced by one degree Kelvin, the energy consumption will be reduced by proximately 1,5%. Therefore the HSCC chillers are by standard equipped with electronic expansion valves.



**HSCC-250/HSCC-350**

Novek was able to develop a very compact and light weight line of chillers in the capacity range 250 to 350 kW with great respect to serviceability and low refrigerant content. The limited dimensions and weight allows the chiller to fit through doorways. It can easily be transported and it saves precious space in machinery rooms.



**Modular design**

The lay-out of these chillers makes them not only able to operate as stand alone systems, but also excellent for use in modular installation. Favourable in marine and industrial applications, so a constant source of available cooling is guaranteed. After all, independent operation increases reliability

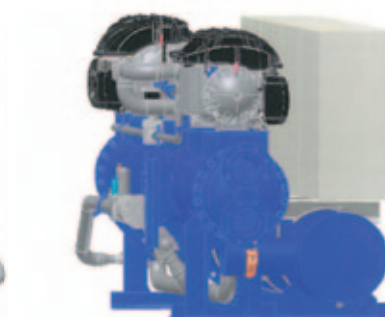
**Beneficial heat exchangers**

The use of stainless steel brazed plate evaporators with optimized refrigerant distribution measurements for high performance operation in this series contributes to a low refrigerant content and a light weight. In combination with the use of electronic expansion valves these chillers can operate extremely efficient in their entire operation range.



**HSCC-500/ HSCC-700**

The 500-700 kW range HSCC chillers are equipped with shell and high performance copper tube evaporators. The use of shell and tube heat exchangers in combination with a low centre of gravity makes this HSCC series very sturdy and robust.



HSCC			250	350	500	700
Nominal cooling capacity <sup>1</sup>		[kW]	250	350	500	700
Capacity steps <sup>2</sup>		[%]	step less 10-100			
Compressor starting current		[A]	<5.5			
Dimensions (lxwxh)	length	[mm]	1800		3475	3475
	width	[mm]	925		1230	1230
	height	[mm]	1625		1300	1450
Weight	operational	[kg]	1200	1350	3175	3975
Compressor	type		centrifugal			
	quantity		1	1	2	2
Evaporator	type		brazed plate		shell and tube	
	material		Alloy 316/ Cu		CS (shell)/ Cu (tube)	
Condenser	type		shell and tube			
	material		CuNi 90/10			
Electromagnetic compatibility according to			IEC61800-3 C3			
Refrigerant			R134a			
Power supply			440V/ 60 Hz/3ph or 400V/50 Hz/ 3ph			

<sup>1</sup> Nominal capacity based on 12/6 evaporator and 32/38 condenser water temperature [°C].

<sup>2</sup> Based on one compressor usage.

#### STANDARD

- seawater resistant shell and tube condenser with high performance tubes and liquid accumulation line
- Danfoss control system
- regulated cold water outlet temperature
- control cabinet with circuitbreaker and power switch
- HMI user interface
- evaporator frost protection
- pressure safety control
- motorized bypass valve
- electronic expansion valve
- safety relief valves with dual stop valve
- refrigerant R134a
- dx cooling system
- chilled water temperature monitoring
- continuously-variable regulation of the cooling capacity by the speed control

#### OPTIONAL

- Modbus compressor to PLC interface
- web based monitoring
- seawater regulating valve
- economizer
- chilled water pump
- sea water pump
- various power supply
- compliancy to more demanding EMC directives
- shock tested

#### QUALITY ASSURANCE

The unit shall be rated in accordance with ARI Standard 550/590 and construction shall comply with relevant directives as PED and Lloyds

