

**Revolutionary  
energy savings for  
the built environment.**



**The new range  
of oil-free centrifugal  
chillers from Smardt.**

**SMARTD**

## **The next logical development in chiller technology.**

Smardt Inc. was established to meet an unmet demand for chillers which maximized the customer benefits of the Turbocor oil-free centrifugal compressor technology.

Led by Turbocor's founding CEO Roger Richmond-Smith, the Smardt team, many like production and procurement manager Patrick Légaré with long Turbocor experience, came together to bring a high-performance range of water-cooled oil-free centrifugal chillers to the market in time for operation through the 2005 season. All were installed as replacements for older lubricated chillers so that empirical efficiency comparisons could be made and audited.

Operating energy reductions were extraordinary, to many industry observers – but totally on-line with the range's tight engineering specifications. All used flooded shell-and-tube evaporators with a 1 deg. K approach. All used shell-and-tube condensers. All used electronic expansion valves from Smardt's sister company PowerPax in Australia. And all used the advanced PowerPax controls software to harness the extraordinary capacities of the compressor.

### **Smardt's other first year milestones**

The Compact Modular chiller range won strong support when its component units – specifically designed to move through standard elevators and standard doors to sites where access is difficult or even “impossible” – came together to provide efficient cooling literally within a few days of major equipment breakdowns.

In mid-year, North America's Smardt joined forces to share resources and achieve new economies of scale with PowerPax, winner of the 2005 AIRAH National Award for Refrigeration. The move is already showing benefits for customers of both businesses.

In October, Smardt concluded an exclusive supply and distribution agreement with Direct Energy Business Services for Canada and Texas, enabling major energy conservation benefits for customers in those markets.

In December, Smardt concluded an exclusive relationship with the Kilttech controls group, further extending the functional controls, communication and efficiency benefits delivered to customers.

2006 sees the introduction of Smardt's high-efficiency air-cooled packaged chiller range.

For further news, please check the web site [www.smardt.com](http://www.smardt.com)

# Oil-free compressor technology boosts energy efficiency, cuts operating costs, now well-proven worldwide.

Oil-free centrifugal compressors from Danfoss Turbocor Compressors Inc. use magnetic bearings and variable-speed drive to deliver better IPLV efficiencies than conventional oil-lubricated centrifugal, reciprocating, scroll and screw compressors.

The totally oil-free Turbocor technology, the brainchild of well-known Australian inventor Ron Conry, achieves the highest part-load efficiencies for chillers and chilled water systems (including water-, air-, and evaporatively-cooled applications).

Proprietary *magnetic bearings* replace conventional oil-lubricated bearings, eliminating high friction losses, mechanical wear and high-maintenance oil management systems to deliver chiller energy savings of 35% and more over conventional chillers while ensuring long-term reliability. Over 60,000 magnetic bearing machines are operating in the field, mainly in high-end vacuum pumps and CNC spindles.

Turbocor's one main moving part (rotor shaft and impellers) is levitated during rotation by a digitally controlled magnetic bearing system. Position sensors at each magnetic bearing provide real-time feedback to the bearing control system, 120 times each revolution, ensuring constantly centered rotation.

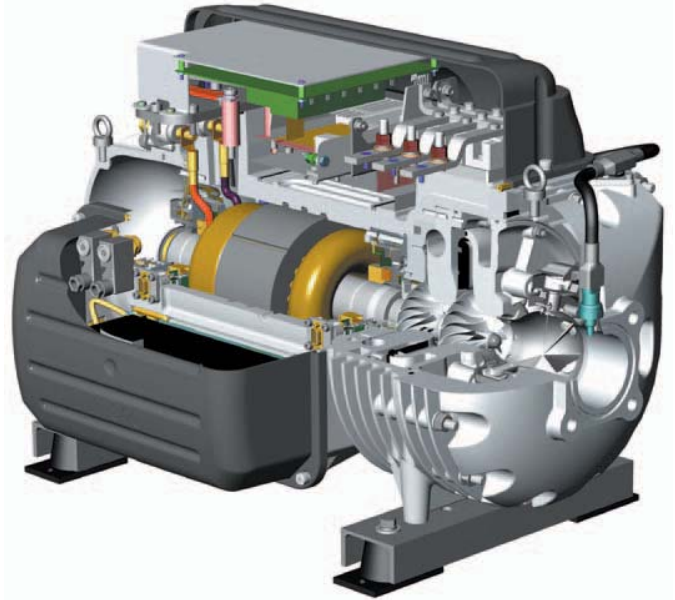
High-speed variable-frequency operation affords outstanding part-load efficiency, compactness and extraordinary soft-start capacity. An inlet guide vane assembly trims low-load capacity and is digitally integrated with the variable-speed control to optimize energy efficiency and compressor performance throughout the full range of load and temperature conditions.

The compressor's onboard digital controller proactively manages compressor operation while allowing external control and web-enabled monitoring of performance and reliability information.

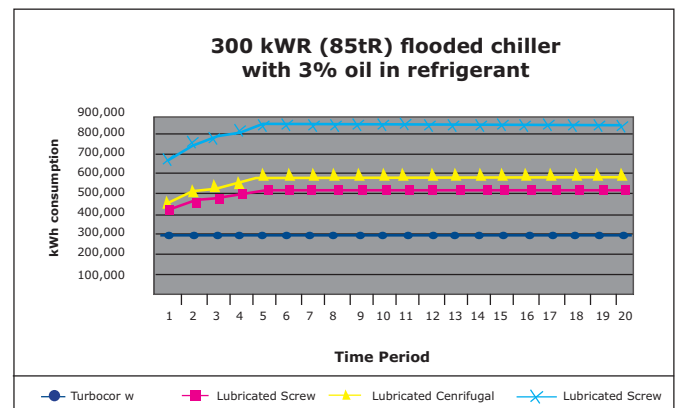
HFC-134a refrigerant cools electronic and electromechanical components to assure maximum efficiency and safe operation. Very low sound and vibration levels eliminate the need for expensive attenuation.

## Oil-free design optimizes heat transfer

The well-known ASHRAE study (Research Project 361) concluded that typical lubricated chiller circuits show reductions in design heat transfer efficiency of 15-25%, as lubricant accumulates on heat transfer surfaces, denatures and blocks normal thermodynamic transfer processes. Logically, no oil in your chiller means no oil contamination over time, so design efficiency is maintained effortlessly.



Smarttr chillers optimize the benefits of the revolutionary Turbocor oil-free centrifugal technology. Above, the TT300 compressor delivers 60 to 90 tr while the TT400 delivers 120 to 165 tr.



As this comparative ARI study showed, over 20% of a lubricated chiller's operating efficiency is routinely lost in its early years as a result of oil clogging of heat transfer surfaces. No oil means no such problem. Count the savings!



Advanced electronics mean that mechanical forces can be managed with extraordinary tolerances, achieving very high reliability. Not a surprise, when shaft position is automatically measured and adjusted 120 times per revolution.

# Water cooled chiller range – 60 tr through 900 tr.

**Smardt's water cooled chillers are designed for a 30-year operating life, with lifetime operating costs the lowest in the market.**

The thinking makes simple sense – with no oil, flooded shell-and-tube evaporation, low power consumption, low maintenance costs (even lower with remote monitoring) and high reliability with only one main moving part.

Smardt works hard to achieve simplicity of design and operation – reflected in low operating costs, and supported by the integration of PowerPax electronic expansion valves and the optional use of load balancing valves at very low loads.

Smardt field reliability has been outstanding – not surprising when you consider that some 80% of all chiller problems in the field are due to failures in compressor oil return. And these chillers use no oil.

The growing fraternity of Turbocor-trained engineers and technicians often suggests that total maintenance costs for oil-free chillers run at well under half the costs of traditional lubricated chillers. This may be very conservative.

## Serviceability

Always important in minimizing operating costs, service access is swift and simple, as is access to operating history through remote monitoring. Operating history, compressor and chiller set points are all accessible remotely by trained and authorized service personnel.

Integration with building management systems is standard, as is connectivity with most industry-standard protocols.

## Custom design and production capacity

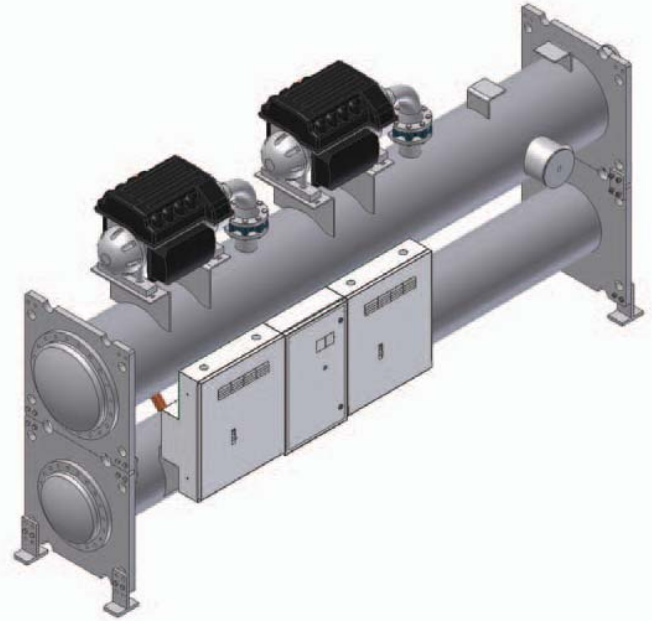
The group's design engineers are happy to resolve special equipment design challenges for you, but please allow some extra time and, possibly, some extra cost for these.

High-efficiency direct expansion condensing units, heat recovery and free cooling applications can all be supplied competitively, as can special materials for use in aggressive environments.

Marine water boxes, corrosion protection and other options are available and can be explored on request.

## Redundancy

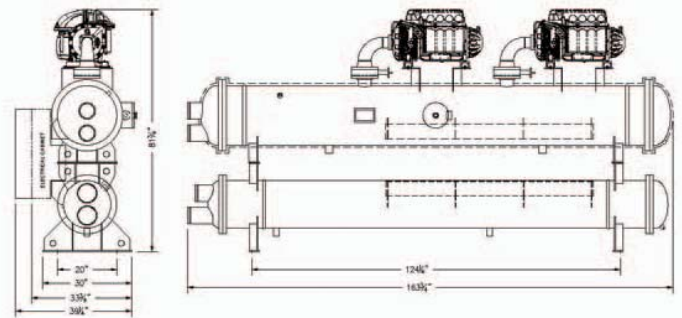
The use of multiple compressors allows unusual redundancy safeguards; however, if multiple circuits are indicated, these can be designed in and supplied.



*Smardt's standard 120tr - 180 tr water-cooled chillers deliver an IPLV of .37 kW/tr under ARI conditions. Compare the energy savings with your currently installed equipment.*



*The Smardt 350 tr water cooled chiller installed at the Sears mall at Halifax, Nova Scotia has been delivering reliable energy savings since the day it was commissioned.*



*Smardt's standard chiller range offers the most economical oil-free option where footprint poses no challenges. In cramped or "impossible" situations, please consider Smardt's Compact Modular range.*



## Compact Modular chiller range – 60 tr through 900 tr.

Like the oil-free centrifugal compressor, the modular chiller concept was also invented by Turbocor's Ron Conry – little wonder that the Turbocor compressor fits so well with modular applications. In fact, Smartd's Compact Modular range finally elevates the modular chiller concept into the real world of high efficiency and low operating cost. No longer does modularity have to be compromised by efficiency sacrifices.

Now you can use the modularity concept to upgrade plant operating efficiency while minimizing plant room access costs– saving the high costs of demolition and crantage. Savings can be enormous, because the Smartd Compact Modular range is designed to move through a standard elevator and a standard door, through to a footprint smaller than any other high-efficiency chiller.

### Access to plant room

Once you have worked out your tightest access constraint and the load limits of your building's elevator, tell us and ask us how we can help.

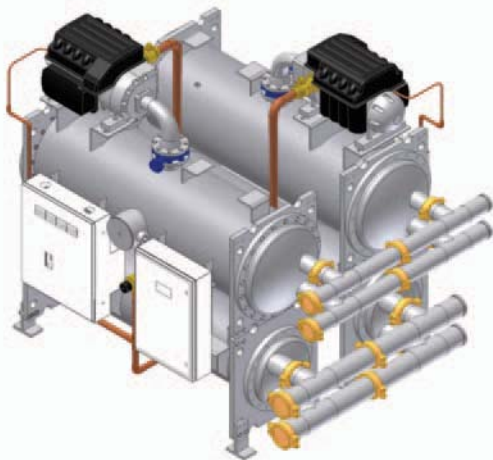
Be prepared for substantial up-front savings as well as long term operating cost reductions.

### Flexibility

Your plant design can use up to six modular water cooled chillers in one bank, in a chiller capacity range from 60 tr all the way to 900 tr. There is no limit to the number of modular banks you can use.

### Efficiency, serviceability, controls, communications.

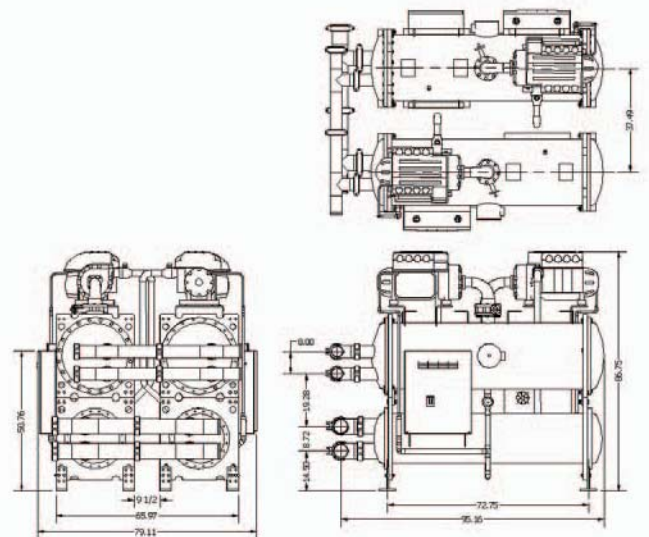
All the advantages of Smartd's standard water cooled chiller range are available in the Compact Modular configuration.



*This Compact Modular range design delivers high IPLV efficiencies in capacities up to 540 tr while minimizing access and other site costs.*



*Over only five days, a total of 400 tr of high-efficiency cooling was installed and commissioned at this downtown Toronto complex, using access only through standard doorways and standard elevators. High-profile tenants were delighted.*



*Where footprint is a challenge, or when access is otherwise impossible, please consider Smartd's Compact Modular range.*

## Air-cooled packaged chiller range – 60 tr to 300 tr.

The Smardt air-cooled range offers the smallest footprint on the market, the quietest operation on the market (in both standard and Whisper™ configurations) and the highest air-cooled operating efficiencies on the market.

Condenser coils use a W configuration to optimize heat rejection and footprint. Coils are baked and double-coated as standard with sealed edges as standard, to extend the coil's physical protection from environmental corrosion towards the inherent long life of the other chiller components.

### Remote air-cooled condensing

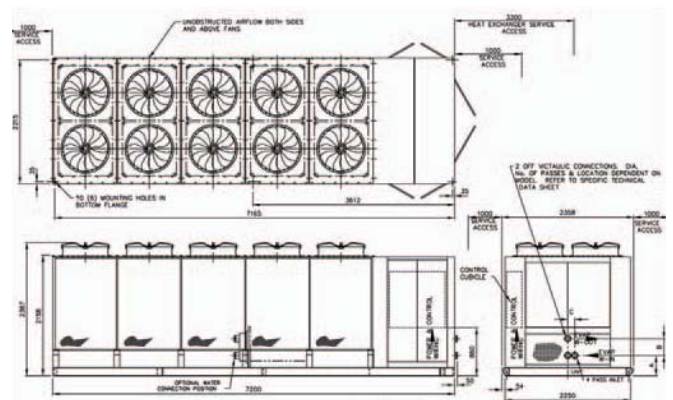
Remote location of the condenser can be a preferred option in many applications. Smardt can supply a full package if desired, or on a condenser-less basis. Either way, full warranty applies to all components supplied and commissioned.

### Evaporative pre-cooling

In many climates, Smardt's evaporative pre-cooling system can minimize air-cooled power consumption. This can be very efficient from both a first-cost and an operating cost perspective. Smardt's reference sites show savings of over 30% for evaporative pre-cooling compared with normal air-cooled operation.



Standard features include state-of-the-art weather protection for W-shaped coils, enhancing the high-efficiency operating life of the total chiller unit.



Air-cooled performance advantages – energy savings, quietness, compactness - are built in and optimized at the design stage.

## Monitoring and communications.

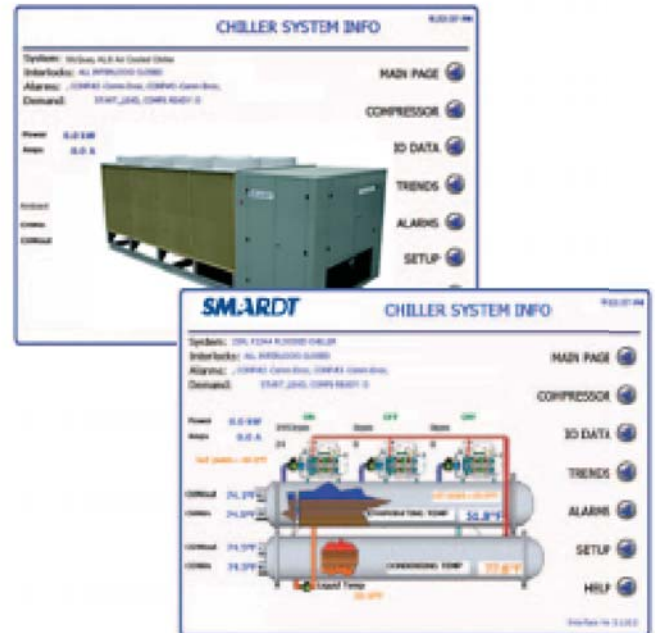
The Smartdt chiller range is managed by one of two controls options.

The PowerPax PLC-based microprocessor system has been used on most of the installed chiller sites so far, demonstrating how well the state-of-the-art controls software maximizes operating efficiencies and minimizes maintenance and operating costs.

This system provides several access levels for plant operators and commissioning, and offers a wide variety of options for flexible operation and optimization of power consumption, maximizing time spent operating at compressor sweet spots.

The Kiltech controls system, available since December 2005, allows optimization of single compressor operation and optimization of multiple compressor operation while enabling a rich array of communication options.

Both PowerPax and Kiltech systems are currently available and will be available and supported for the life of each chiller installed. PowerPax electronic expansion valves and valve controllers are used exclusively throughout the Smartdt chiller range.



A rich array of download information is routinely available, protected by multiple levels of encryption. Remote monitoring adds a new layer of operating protection for the chiller circuit, and at very low cost.

## Calculating payback.

The very simple matrix may help you quickly estimate how rapidly you'll recover your investment in a new Smartdt high-efficiency chiller.

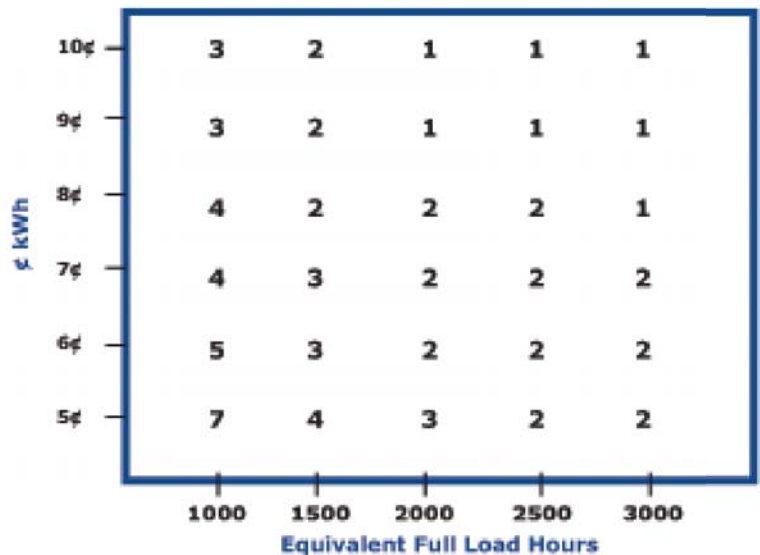
Use the table to compare the financial results of your various options. These may well include (1) Smartdt; (2) conventional lubricated chiller; (3) do nothing.

Be sure that the kWh rate estimate you use applies to when the chiller actually operates – you may be surprised. And remember, rates tend to go up rather than down.

And be conservative when you estimate operating hours – many users are surprised when actual hours add up.

In chiller replacement situations, be sure to add realistic estimates for removal of the old chiller and access (include cranes, demolition and make-good). The Smartdt Compact Modular chiller range enables you to avoid these costs, which can be prohibitive.

Typical Payback Period in Years



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