

Case story | Danfoss Inverter Scrolls

A major solution provider in information and communication opts for Danfoss inverter scrolls

Which leads to huge energy savings, higher sustainability and process reliability.



32%

energy savings,
accelerates ROI and
reduces carbon
footprint by 60%.

invertercompressor.danfoss.com

Addressing high energy costs and the data center industry's increasing demand for energy efficiency, a leading global information and communication solution provider prescribed Danfoss inverter compressor and drive for its close controls in data centers. The benefits are as much energy savings as sustainability and process reliability. Have a deeper look in the vision of this global key player.

Growing pressure on energy efficiency in data centres globally

With the rapid growth of data centres, the energy consumed in cooling the servers is almost several hundred times more than the energy used in offices. It can equal to 1.5% of the electricity used by a whole country, or the yearly energy consumption of a city like Tianjin in China. According to other estimates, it represents 2% of the greenhouse emissions. The trend is the same all over the globe, in India, in Europe and in America. Increasing the efficiency of data centers is no longer an option.

The cooling requirements of servers account for the majority of power consumption – between 35 to 40%.

Reduce energy consumption and meet the new energy standards

Due to variations in the external ambient temperature and also fluctuations in the operations in server rooms, the air-conditioning is most of the time operating in part-load conditions. This is where variable-speed technology makes a dramatic difference compared to other modulating technologies. Capacity modulation is a way to match cooling capacity to cooling demand. Modulation with variable-speed technology is the most accurate and efficient method. The inverter drive slows down or accelerates the compressor motor speed. This method varies the refrigerant flow by actually changing the motor speed inside the compressor.

Variable-speed technology can greatly reduce energy consumption in systems working under part-load conditions. A 35 kW precision air-conditioning system using a 13 TR VZH088 inverter scroll compressor can under typical conditions provide a reduction of 8,000 to 10,000 kWh per year, which represents a drop of 32% of energy when compared with a 12 TR fixed-speed compressor. This corresponds to annual reduction in CO₂ emissions of 2740 kg per unit (-64%).

The energy offset obtainable with variable-speed technology is well known by all the stakeholders, from the OEMs to the end-

users. However, the awareness about the other benefits is much lower. Return on investment of using variable-speed technology can be lower than 3 years. On top of this, meeting the new energy standards is made easy with inverter technology.

Reliability 365 days per year

Contrary to general comfort air conditioning, IT hubs work 24 hours per day and 365 days per year. Heat is generated and radiated in large quantities by equipment in the server rooms. There is therefore a need to remove heat, accurately control the temperature and humidity levels and to filter air in an efficient way. VZH inverter compressors first modulate the motor speed of the compressor and then adjust output to help the system maintain operations, which ensures the reliability of the cooling system and the stable operation of the servers. The Danfoss pre-qualified inverter scroll compressors and drives help getting products to market faster and enhance overall system efficiency.

Danfoss variable speed drives also simplify the communication with the system controller via Modbus RTU which allows setting or operating



Variable speed technology helps reduce the size of power backup systems.

parameters, accessing error information, understanding the operational state of the compressors and also making maintenance and service easier. This will save end-users millions of US\$.

Quick and accurate temperature control makes the process reliable and adds to energy savings

Test data show that while a data center is in operation, an increase of 1°C above the ideal temperature of the chips' operating environment can increase the chips' energy consumption by 0.5%. The accuracy of the Danfoss VZH compressor temperature control reaches $\pm 0.3^\circ\text{C}$, thereby avoiding extra costs caused by temperature fluctuations. This accurate, smooth and reactive temperature control can't be achieved in a traditional start/stop cycling system. This is one of the reasons why the specifications of the new close control units include a temperature control as precise as $\pm 0.5^\circ\text{C}$. The use of such equipment in very different climatic areas also adds a level to the design complexity. Having the inverter technology provides a versatile unit, appropriate for very varied climatic conditions.

Supporting the grid contributes to making the process reliable

Electric currents are high during the start-up of traditional air-conditioners without inverter technology, causing strong shocks to the electrical networks and computer room UPS backup power systems. This may even cause grid failure affecting the normal operation of servers. Danfoss inverter scroll compressors VZH not only meet the requirements for adjusting temperatures and energy efficiency but also perform outstandingly well in EMC** wave filtering and reducing start-up current shock.

The start-up current of units with Danfoss inverter scroll compressors is 70% lower than one of a unit using a fixed-speed compressor enhancing the overall efficiency of the system. In addition, the fan-cooled inverter drive provides various protections to the compressor, such as current or discharge temperature monitoring.

In parallel, the potential electromagnetic interference of the drive with the grid is fully managed by Danfoss prequalified inverter drives. The power factor of Danfoss inverter solutions is close to one and the solution has received EMC certification.

VZH – 4-7TR
Release in 2014



VZH – 13-26TR

The only inverter scroll qualified for hybrid configurations provides 52TR in tandem



* Evaporation 8°C, condensing 48°C, superheat 2 K, subcooling 6 K; system operating conditions based on simulations of annual temperature conditions in the Guangzhou area in China.

** Electro Magnetic Compatibility.

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