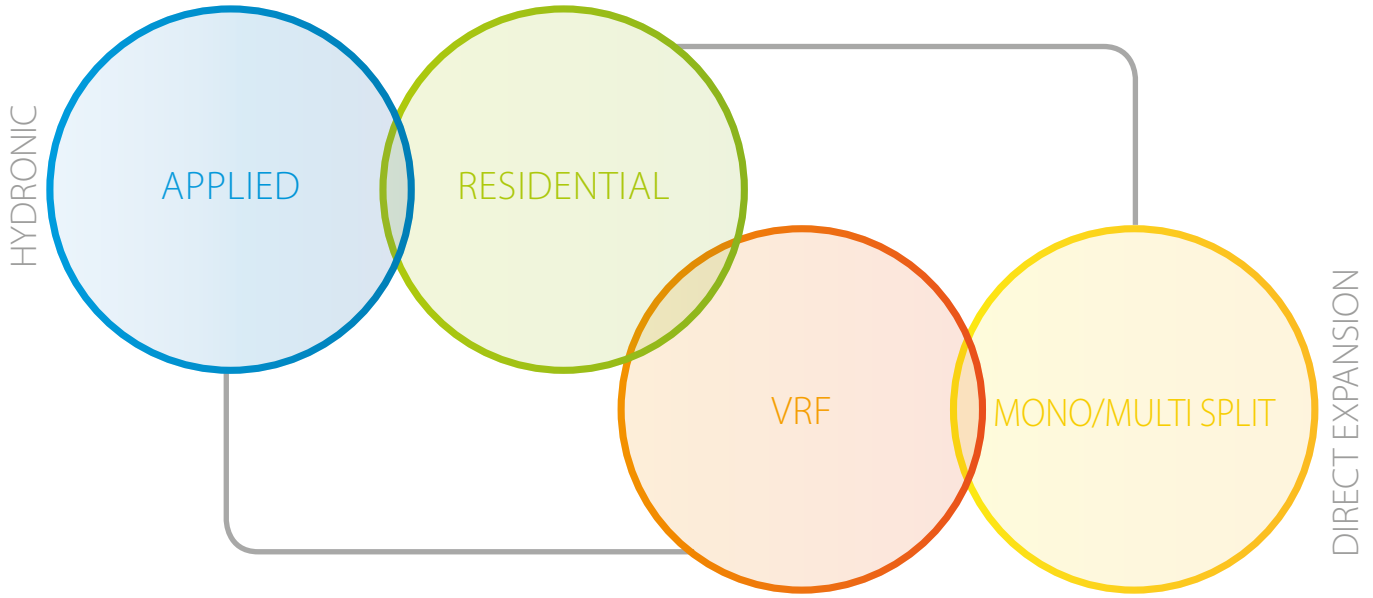
WTAT TURBOSmart

Air cooled chiller
featuring oil-free magnetic levitation VSD compressor
for outdoor installation

CLIVET®

Clivet. Change things



Solutions to ensure sustainable comfort and the well-being of people and the environment

In 30 years of working on the design, manufacturing and distribution of air conditioning and handling systems, combining high efficiency with minimal environmental impact, Clivet has developed solutions to ensure sustainable comfort and the well-being of people and the environment.
Designing and developing year-round air conditioning solutions with innovative technologies are part of Clivet's DNA, which means the company has always been ready for the future.

TURBOSmart range
Lower running costs and higher performance

TURBOSmart from Clivet is the most energy efficient chiller of its type on the market today, reducing energy costs by up to 50% compared with traditional chillers which use screw or reciprocating compressors.

As well as its ultra efficient performance, TURBOSmart improves comfort levels and productivity in buildings due to its advanced design and step-less control.

With its oil-less magnetic bearings, service and maintenance costs are dramatically reduced.

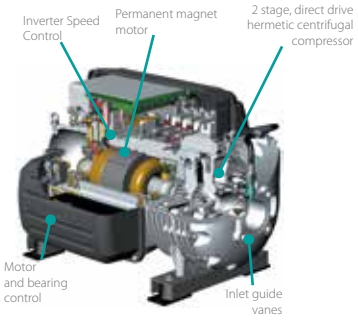
Oil-Free Magnetic Levitation VSD Compressors

The use of magnetic bearings, variable speed motors and sophisticated electronic control technology in centrifugal compressors has resulted in a revolutionary compressor, not requiring any oil. Indeed it is the first refrigeration compressor in the world which is completely oil free. There are no oil pumps, no oil filters, no crankcase heaters, no oil pressure switches and no oil management system; the technology is very clean and efficient and significantly reduces maintenance requirements.

Advanced electronic technology ensures the highest level of efficiency for all applications in the HVACR sector. Its advanced design means it is 1/5th weight and half the size of an equivalent capacity screw or reciprocating type compressor.

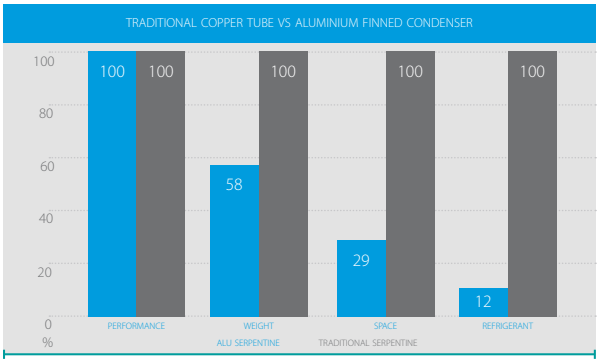
The compressor TURBOSmart ensures:

- Incredible energy efficiency
- Long life with minimal maintenance
- Digital control for precise capacity control
- Compact design
- Built in soft start (5 Amps)
- CE Certification
- Very low noise level



Micro-channel Condenser

Micro-channel condensers are designed to offer the best results in terms of performance, compactness, lightness and durability. They are made entirely of aluminium, treated with cataphoresis with epoxy-polyester powder coating weighing 60% less than traditional copper tube condensers and are fully recyclable. Micro-channel coil construction/configuration reduces air side pressure drop resulting in smaller sized, lower power fans, achieving quieter operation. This technology improves heat exchange by up to 45% compared to traditional condensers made of copper tubes and aluminium fins.



Flooded Evaporator

Flooded evaporators used by Clivet are robust contruction and designed to ensure the highest EER values possible. Minimal difference between refrigerant evaporating temperature and chilled water/glycol outlet temperature (i.e. 1-1.5 °C) results in outstanding efficiency. Heat exchange between refrigerant and water/glycol is excellent because the heat exchanger tubes are totally immersed in refrigerant.

EC fans

The main features of these fans adopted by Clivet for the TURBOSmart range are compactness, low noise level and exceptional efficiency. The variable speed drive fans react continuously to load variations ensuring maximum efficiency especially at partial loads. Compared to conventional fans energy savings of 30% can be achieved.

Electronic expansion valve

Clivet has chosen to use expansion valves which guarantee a very precise control of superheat. In this way, the evaporator is always filled with the optimal amount of refrigerant, even in the presence of significant variations in load.
This is possible because the current value of superheating in the evaporator is continuously detected by a pressure transducer and a highly sensitive temperature sensor that transmit information relating to the regulator in real time.
This means low superheat, use of the maximum evaporation pressure and therefore can improve the COP and energy efficiency.

Switchboard

The switchboard is completely wired inside a watertight steel box IP54, produced according to the strictest European norms. Power circuit designed for 400/3/50 V/ph/Hz) supply, with fuse protection, counters, thermal relays for each compressor.

The control circuit is supplied by 230/1/50 V/ph/Hz, and includes all control devices, including the thermostatic compressor insertion system. All switchboards are equipped with an IEC socket for service supply on the field. Moreover, the multi-compressor unit is provided with a thermostat-run ventilation and heating system.

All models are controlled by a unit with MicroSmart 16 bit microprocessor. Programming and parameter setup are done directly on the display module, positioned outside the switchboard.

TURBOSmart advantages

Reduced energy conumption

Outstanding energy efficiency reduces operating budgets and helps reduce a facility's carbon footprint, thanks to annual energy usage 30% to 50% less than conventional screw compressors chillers. Exceptional Energy Efficiency Ratios (EER) and Seasonal Energy Efficiency Ratio (SEER) are assured.

Reduced refrigerant leakage

Refrigerant leaks are a consequence of poor design and/or maintenance of plant. The TURBOSmart is designed to minimise or avoid leaks altogether, through reducing the number of components and joints in the system.

Reduced maintenance

As a result of the oil-free design and limited number of moving parts, the TURBOSmart requires no oil changes and much reduced servicing to ensure efficiency and reliable running. The technology is highly reliable and proven to save the end user cost and reduce down time.

Compact and lightweight

The TURBOSmart packs a lot of cooling power into a small space. The compressor weighs just 125 kg compared with 600 kg for typical screw compressor chillers. This frees up plant rooms, reduces loading on rooftops and enables chillers to be sited in spaces considered too tight for standard chiller technology.

Excellent part load efficiency

The use of a variable speed drive enables chiller output to be finely controlled between 15% to 100% of capacity, enabling cooling to be matched precisely to load. Given that Clivet chillers operate at part load the bulk of the time, this helps significantly reduce energy consumption and ensure effective cooling.

Very quiet operation

Noise is a growing issue, particularly with the introduction of air conditioning to buildings in built-up and residential areas. The TURBOSmart addresses this through exceptionally quiet operation. Due to its design, the TURBOSmart chiller is also virtually vibration free.

Low start-up current

Conventional chillers may require up to 600 Amperes starting current, putting a huge draw on a building's electricity supply, and sometimes requiring an expensive upgrade of the sub-station. TURBOSmart compressors only need 5 Amps to start, saving costs and maintaining headroom for other essential services.

A revolutionary technology
Ultra-efficient chillers range from Clivet

THE TURBOSmart CHILLER IS BASED ON A COMBINATION OF TECHNOLOGIES, DESIGNED TO REDUCE ENERGY CONSUMPTION, MINIMISE OR AVOID LEAKS, REDUCE REFRIGERANT CHARGE, ENSURE RELIABLE OPERATION AND DELIVER QUIET RUNNING:

- Inverter-controlled magnetic bearing compressors whose output
- can be precisely matched to load.
- Micro-channel aluminium condensers, that reduce refrigerant
- charge while increasing the effectiveness of heat exchange.
- Flooded evaporators that ensure optimum heat transfer between refrigerant and water.
- Inverter driven condenser fans to match performance to demand and reduce energy consumption.
- A sophisticated chiller control system that integrates with that of the onboard integral compressor control to optimise performance of the system as a whole.

Saving Energy

Efficiency, sustainability, applicability: the Clivet's milestones developing oil-free compressor technology

Energy efficiency, running cost savings and minimal environmental impact: this is the philosophy behind Clivet's TURBOSmart series.

All TURBOSmart chillers have ultra efficient performance and are ideal for commercial and industrial cooling, airports, hotels, hospitals, offices and data centres.

The oil-free compressor is the heart of every TURBOSmart unit, thanks to its intelligent control technology fully integrated with the compressor control: this approach ensures maximum EER is delivered at all times, optimising chiller performance in response to changing ambient temperature and load.

Each and every unit is designed and built to perform to customer's specifications, cross referencing all the data with prevailing conditions of the site where the unit will be installed.

HFO-1234ze
The innovative low GWP refrigerant

R-1234ze

Clivet has always offered solutions for sustainable comfort and well-being of people and the environment. The TURBOSmart series is also available with the new HFO-1234ze refrigerant.

HFO-1234ze offers excellent performance, efficiency, serviceability and safety, and a close to zero GWP.

The HFO refrigerant can be used instead of natural refrigerants, avoiding flammability risks. In addition, it is possible to oversize the machine to achieve even higher efficiency. And the lower power means lower running costs, and thus lower carbon emissions.

A complete proposal

TURBOSmart guarantees high efficiency, using the best components available on the market today. The wide range of accessories and functionalities supplied as standard, make TURBOSmart the technological reference for the market.

Standard features of Clivet chillers

- Variable speed Centrifugal Compressors with magnetic levitation device and digital control
- Full aluminum micro-channel coils treated with cataphoresys with epoxy-polyester powder coating
- Flooded shell and tube heat exchanger
- High efficiency EC axial fans
- All stainless steel nuts and bolts
- Evaporator antifreeze protection with electric heater
- Fully automatic adaptive microprocessor control
- GSM Gateway remote monitoring system
- Constant monitoring of compressor current
- Compressor overload protection
- Fan overload protection
- Fan speed control
- Water flow control
- High pressure switch with manual reset
- High / low pressure transducers;
- High / low pressure analogic manometers
- Double set-point pressure valves
- Electronic expansion valve
- Discharge/suction valves
- Main switch
- Liquid line valve
- High/liquid/suction pressure socket
- Liquid/moisture indicator
- EMI and EMF filters mounted to reduce harmonics
- Coil protection grills

Customization

All chillers can be manufactured also in versions different from standard

- Special dimensions
- Silenced and super-silenced acoustic configurations
- Low temperature chilled water/glycol down to -3 °C
- Structure and panels made of special materials
- On/Off and inverter pumps with low, medium, high head
- Special design for industrial and process applications
- Direct or indirect free-cooling versions

Applications

Hospitals

Ensuring a stable and reliable environment for hospitals is vital for patient and staff safety and comfort, and for ensuring that delicate treatment and monitoring systems function as intended. The stability of environments in critical facilities such as operating theatres is crucial. This requires the use of proven and reliable cooling equipment, customised to ensure it delivers the precise conditions required in a given application, and supported with 100% back-up. The fine control offered by the TURBOSmart chiller ensures the indoor hospital environment is maintained within predefined temperature and humidity limits, and that there is no magnetic interference from VSDs that could affect sensitive hospital equipment. With EMF and EMI filters fitted as standard, TURBOSmart achieves all of these requirements with its state-of-the-art controls.

Plastic Industry

In this highly competitive market, a key challenge facing plastics manufacturers is to deliver the most efficient and cost-effective product to the market place at all times. This means optimising production processes - and cooling is a vital component in this.
With its high efficiency compressors and exceptional control, the TURBOSmart chiller enables plastics producers to significantly reduce their manufacturing costs by cutting power consumption for cooling in half. This gives a valuable market advantage to plastics processors, as they can use the lower production costs to improve their profit margin or increase their competitiveness in the market to win more work.

Pharmaceutical and Chemical Industry

Control of space temperature and humidity is vitally important in this industry. Clean rooms in particular must be designed with utmost care and have to be cooled reliably and efficiently. TURBOSmart is the perfect solution with its variable speed oil-free magnetic bearing compressors, total immersion evaporators, micro-channel condenser coils and over-arching intelligent controls. It is clean technology perfectly designed for the Pharmaceuticals industry.

Food & Beverage

Production of food and drink requires reliable and efficient cooling especially in this day and age when the security and quality of the finished product are paramount. TURBOSmart provides a steady supply of chilled water or glycol at design temperatures +/- 0.5 °C to cool the food and beverage process equipment. TURBOSmart has the advantage that it does not require potentially expensive oil and filter changes and there are no oil pumps or heaters to worry about. It is a clean technology perfectly designed for the food and drinks industry.

Car Manufacturing Industry

Paint shops, wind testing tunnels and environmental test chambers all require cooling of one type or another. TURBOSmart can be effectively applied no matter what type of cooling system is required, be it air cooled, water cooled, remote air cooled etc. There is also the possibility of heat recovery to further increase energy savings and reduce the carbon footprint of the factory.

Commercial Buildings

Minimal running costs and extremely low start-up current are just two reasons that favour using TURBOSmart in commercial buildings. In the case of comfort cooling, TURBOSmart ensures high level energy efficiency ratio (EER) and with control optimisation of the condenser fans, energy savings up to 50% can be achieved. Large commercial buildings in built up areas are often penalised by stringent maximum load tariffs, and it is often the chiller plant that causes the maximum limit to be reached resulting in high cost penalties for the owner/ occupier. A conventional compressor on a chiller plant can have a peak starting current of 600 amps or more, whereas a TURBOSmart compressor has a starting current of only 5 Amps reducing the risk of hitting the maximum demand meter dramatically.

Data Centres

Data Centres require high power to cool their servers and support equipment and owner/operators are constantly looking at ways to reduce power and improve reliability. Chillers are used extensively on data centres and there are usually one or more back-up chillers to minimise the risk of the data center shutting down due to overheating. TURBOSmarts are the ideal solution because they are reliable and efficient and do not require as much maintenance compared with screw or reciprocating compressor based chillers. Because data centers have a steady heat load 365 days per year, energy and carbon savings achievable using TURBOSmart are dramatic! In many cases 50% energy savings are easily achieved when traditional screw compressor chillers are repalced with a TURBOSmart

Technical Data

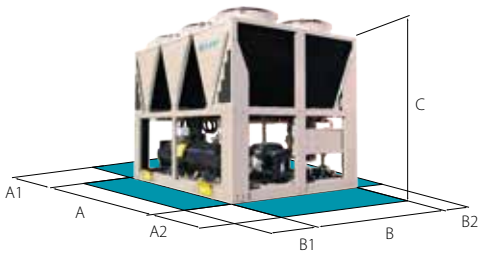
Size - WTAT				300	350	450	500	550	700	840	900	960	1000	1100	1200
Cooling capacity (EN14511:2013)		(1)	kW	285	385	465	527	600	730	800	900	964	1090	1200	1330
Total power input (EN14511:2013)		(1)	kW	78,9	109	131	151	172	209	218	266	282	314	352	388
EER (EN14511:2013)		(1)	-	3,61	3,53	3,55	3,49	3,49	3,49	3,67	3,38	3,42	3,47	3,41	3,43
SEER		(2)	-	5,79	5,42	5,67	5,57	5,71	5,65	6,04	5,75	5,77	5,64	5,68	5,71
Water flow rate (user side)		(1)	l/s	13,6	18,4	22,2	25,2	28,7	34,9	38,2	43,0	46,1	52,1	57,3	63,5
Exchanger pressure drop (user side)		(1)	kPa	21	30	47	59	42	50	37	46	60	62	55	77
Refrigeration circuits			Nr	1											
No. of compressors			Nr	1	1	2	2	2	2	2	2	3	3	3	3
Type of compressors		(3)	-	CFGio											
Refrigerant			-	R-134a											
Power suppply			V	400/3/50											
ST	Sound pressure level @10m	(4)	dB(A)	59	61	61	62	62	64	65	65	64	66	66	66
SC	Sound pressure level @10m	(4)	dB(A)	57	58	59	59	60	61	62	62	62	63	63	64

Notes:

The Product is compliant with the Erp (Energy Related Products) European Directive. It includes the Commission delegated Regulation (EU) No 2016/2281, also known as Ecodesign LOT21

(1) Data calculated in compliance with Standard EN 14511:2013 referred to the following conditions: Internal exchanger water temperature = 12/7°C. External exchanger entering air temperature = 35 °C
(2) Data calculated according to the EU 2016/2281 Regulation
(3) CFGio = Oil-free magnetic levitation VSD compressor
(4) Sound levels refer to full load units, in test nominal conditions. The sound pressure level refers to 10 m from the standard unit outer surface operating in open field. Measurements are carried out according to the UNI EN ISO 9614-2 standard, in compliance with the EUROVENT 8/1 certification. Data referred to the following conditions: Internal exchanger water temperature = 12/7°C; External exchanger entering air temperature = 35°C

ST Standard acoustic configuration (Standard)
SC Acoustic configuration with compressor soundproofing



Size – WTAT			300	350	450	500	550	700	840	900	960	1000	1100	1200
A - Length	mm		3460	4510	4510	5560	5560	6610	8710	8710	9760	9760	10810	12910
B - Width	mm		2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250
C - Height	mm		2525	2525	2525	2525	2520	2525	2525	2525	2525	2525	2525	2525
A1	mm		2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
A2	mm		2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
B1	mm		2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
B2	mm		2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
ST	Operating weight	kg	2259	2647	3026	3484	3818	4354	5707	5707	6072	6477	6983	7881
SC	Operating weight	kg	2559	2947	3626	4084	4418	4954	6307	6307	6972	7377	7883	8781

The above mentioned data are referred to standard units for the constructive configurations indicated. For all the other configurations, refer to Clivet Presales.

ST Standard acoustic configuration (Standard)
SC Acoustic configuration with compressor soundproofing

DF19A068GB-02

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