Magnus:

Air & Water Cooled Chillers with Turbocor Compressors
220kW - 1,949kW

ics cool energy

ICS Cool Energy

Reliable, Flexible and Economic Cooling

ICS Cool Energy has been supplying heating and cooling equipment to the HVAC and process industries for over 25 years. Through its extensive knowledge and experience, ICS Cool Energy has been able to provide simple, cost effective and highly energy efficient solutions for a wide variety of customer markets including:

- **Factory and Facility**
- **Hospitals and Pharmaceuticals**
- **Data Centres and Server Rooms**
- **Hotels and Leisure**
- **Clean Rooms and Laboratories**

For many years ICS Cool Energy has provided a trustworthy and successful service to its large customer base throughout Europe. With its continual growth and expansion, ICS Cool Energy is always developing ideas in order to expand and improve product ranges and maintain exceptional customer satisfaction.

ICS Cool Energy maintains maximum flexibility for customers; providing standard and packaged units including custom builds, rental solutions and service support to satisfy all site requirements.

All units within the Turbocor range are manufactured to **ISO 9001 , 14001** and **Eurovent** accreditations providing customers with a high level of performance and quality.

"We always look for the best mix of reliability, usability and energy efficiency. Offering you and your customers the most appropriate solution for their needs."

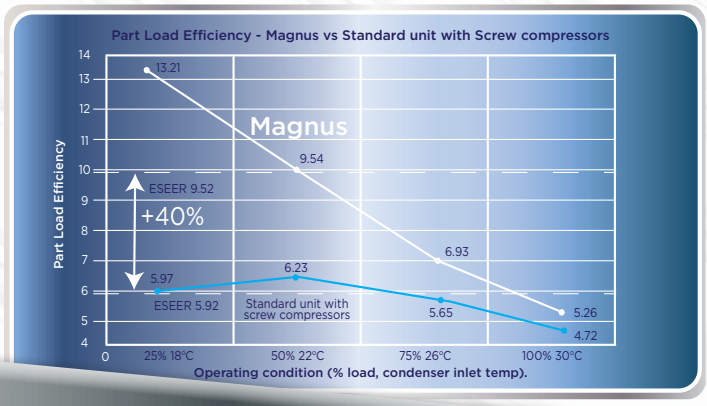
Adam Spolnik,
Director

Contents

Magnus Turbocor Technology

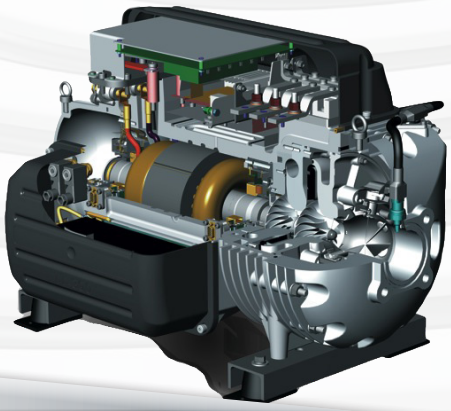
ICS Cool Energy Magnus Turbocor chillers push the boundaries of modern energy efficient cooling with thanks to their innovative centrifugal compressors. These miniaturised compressors work using digital rotor speed control and magnetic levitation, which allows high partial load efficiencies to be achieved.

Even at very low conditions, building requirements can be matched thanks to inlet guide vanes extending the compressor's operational limit. Furthermore, maintenance costs are reduced thanks to the compressor operating without the use of oil, which improves the heat exchanger's performance; significantly reducing vibrations and therefore noise throughout a building or site.



Turbocor is one of the most energy efficient compressors in the world and this achievement comes from several factors:

- **Bearing Technology**
- **Motor Technology**
- **Power Electronics Technology**
- **Compression Technology**
- **All of the above in one product**

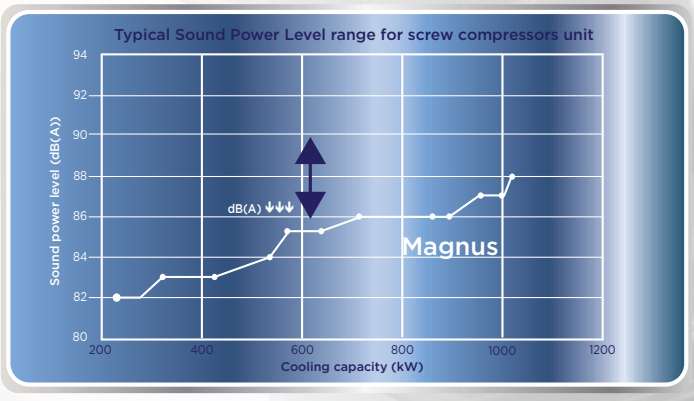


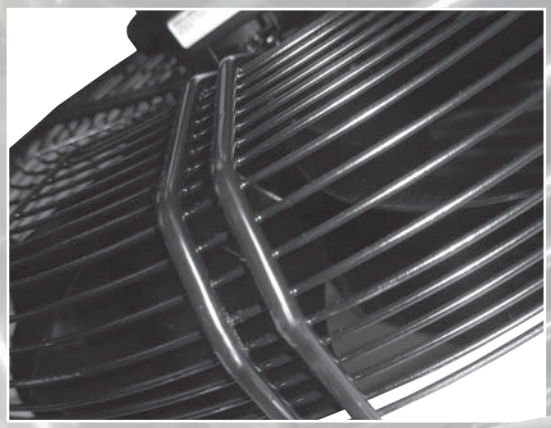
Energy Efficient EC Fans

The efficiency of EC electronic switching fans provides the Magnus range with exceptional energy savings due to their DC brushless motor which improves the chillers' performance allowing it to reach the highest European Seasonal Energy Efficiency Ratio (ESEER) level on the market.

AC motors use copper windings which add energy usage to create a magnetic field by inducing a current in the motor. DC brushless motors use a secondary magnetic field which comes from permanent magnets; therefore using less power.

The main functions of the EC fan include a noise reduction level of 4-5dB(A) as well as an absorbed power reduction by 15%. Furthermore the EC fan offers low inrush currents and can also modulate the rotational speed providing reduced noise emissions and maximum energy consumption.



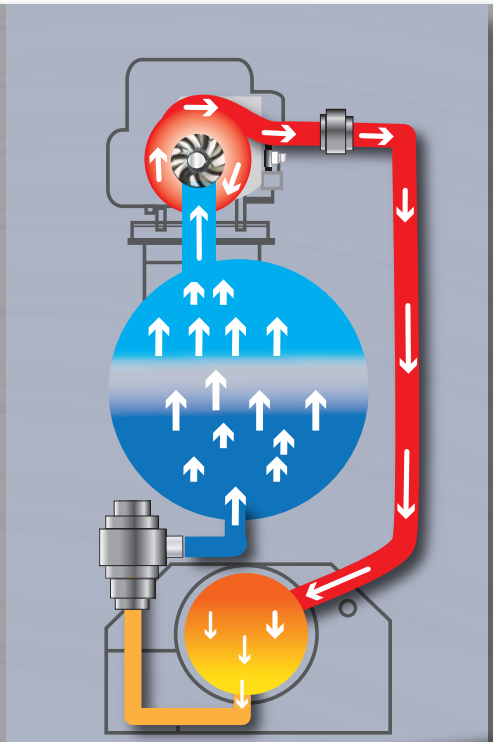


Flooded **Evaporator**

The Magnus unit features an energy efficient flooded type evaporator which maximises heat exchange, and therefore, cooling capacity. The evaporator is further advanced due to the absence of oil in the refrigerant circuits, which optimises the compressor's operational mode.

The flooded evaporator is more energy efficient compared to a shell and tube, direct expansion evaporator due to its clever design. The flooded type is optimised specifically for the ozone friendly R134a refrigerant. Finned tubes and a clever refrigerant level sensor make it possible to take full advantage of the total heat exchange surface area. This assists in generating higher saturated suction gas temperatures and increased Energy Efficiency Ratio (EER) values whilst lowering energy consumption.

In order to comply with F-gas regulations, factory calibrated leak detection systems are available upon request.



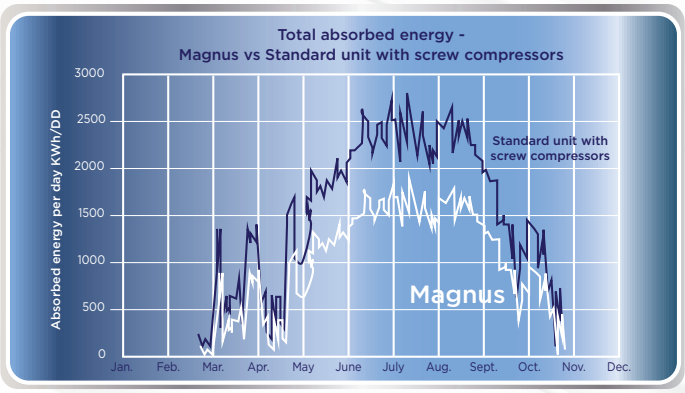
Electronic **Expansion Valve**

The electronic expansion valve (EEV) provides the perfect operation in all conditions. The water-cooled units incorporate a sophisticated detection of refrigerant levels while the air-cooled version is built with a precise measurement of the sub cooling within the condenser coil.

The control system of the Turbocor compressor allows it to use the benefits of EEV to their full potential in order to reduce energy input and increase cooling output.

EEVs offer greater system efficiency due to reduced head pressure at part load.

Furthermore, EEVs allow the condensing temperature to be reduced down to 20°C, compared with 33°C for a standard screw compressor.



Why is the **Magnus Turbocor** right for you?

The topic of sustainable energy within buildings is a highly topical one within our current climate. New builds and retrofit projects now require the latest energy efficient technologies in order to demonstrate that carbon usage is being reduced. With fuel and energy costs continuing to rise and the ever growing concern over global warming increasing; the responsibility to reduce carbon footprints are more important than ever. Therefore, the Magnus Turbocor range of chillers can offer maximum energy savings for an entire building or site.

Outstanding Efficiencies at Part Load

The Magnus range is exceptionally efficient, even at partial loads with 60% higher ESEER values compared to more traditional scroll/screw units. Using the ozone friendly R134a refrigerant, this range maximises efficiency whilst significantly reducing carbon footprints.

Maximum Comfort

The Magnus range guarantees perfect temperature, humidity and air control throughout a building or site. Units can be integrated into a site's existing ventilation system, managing temperatures within warehouse and office areas; maintaining a comfortable environment for personnel and products.

Super Silent Operation

Combining magnetic levitation and the efficiency of the EC fans in the air cooled units, the Magnus offers significantly reduced noise emissions. Due to the innovative Turbocor technology, vibrations are dramatically lowered in a building or site providing a comfortable environment. Compared to a standard screw compressor, the Turbocor can reduce sound emissions by 8dB(A).

Low in-rush Current

A very low in-rush current can be obtained due to the features of the compressor and the start-up of the inverter. This allows for specific protection devices to be placed on the power supply between the transformer and unit.

Simplified Logistics

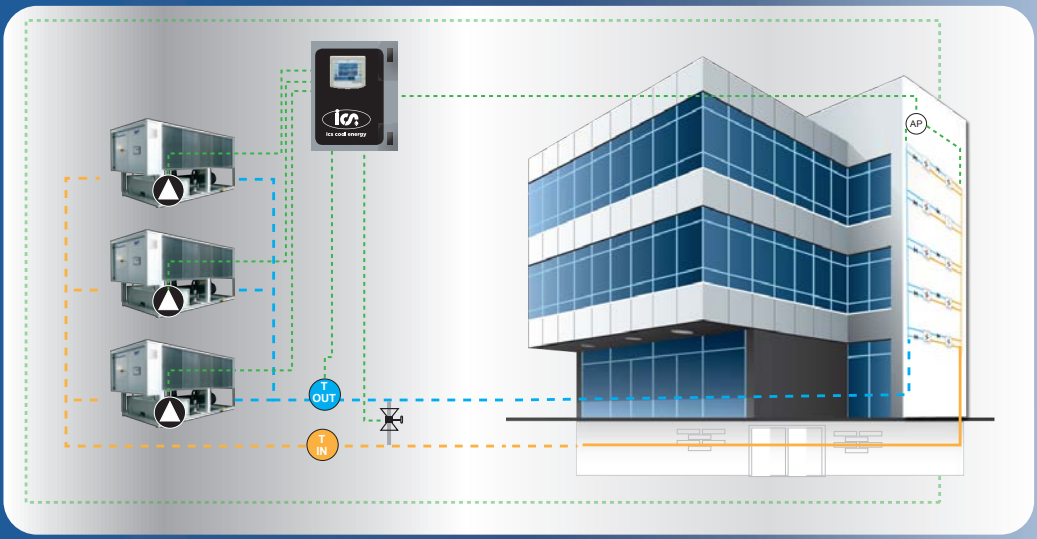
The Turbocor compressor offers smaller footprints thanks to its compact size/weight ratio. This allows for simplified site operations and space optimisation for water units within a building or site. Weighing less than 300lbs it's a fraction of the weight of a conventional compressor with an approximate 50% smaller footprint.

Maximising Systems Efficiency

VPF/VPD - Variable Pump Flow

A chiller plant with variable flow on a secondary side is quite common but variable flow on a primary side is less common.

The difficulty comes in the thermo dynamic performance of the evaporator with reduced flows and stable temperature control of the refrigeration system. Thanks to the sophisticated control algorithms that act on both cooling capacity and pump speed the chillers can make use of cubic law to reduce pumping power when there is reduced demand of the refrigeration system.



A secondary flow rate saves on primary pumping power, up to as much as 35%. However if a primary flow rate satisfies the entire system, savings could be as high as 55% of the installed pumping power.

Intelligent Management Systems

This group regulation device allows the control of four pipe systems with the ability to control both hot and cold water circuits for up to eight units of various sizes. If older units are on site using the CVM 3000 type controller then these can be incorporated in the plant management.

User interface is through a touch screen display. Peak demands can be avoided maximising the most efficient units first and providing the most efficient method of meeting the plant demands. A web manager option is available allowing you to visualise the plant operation on your own network or connect to the outside world with a GPRS modem, PSTN modem or ADSL router.

Pumps are directly managed by the units. Variable pump speed on the primary circuit is possible with the addition of “VPF” control to the units.

BMS interface is optional through BACnet, MODBUS or LON Works.

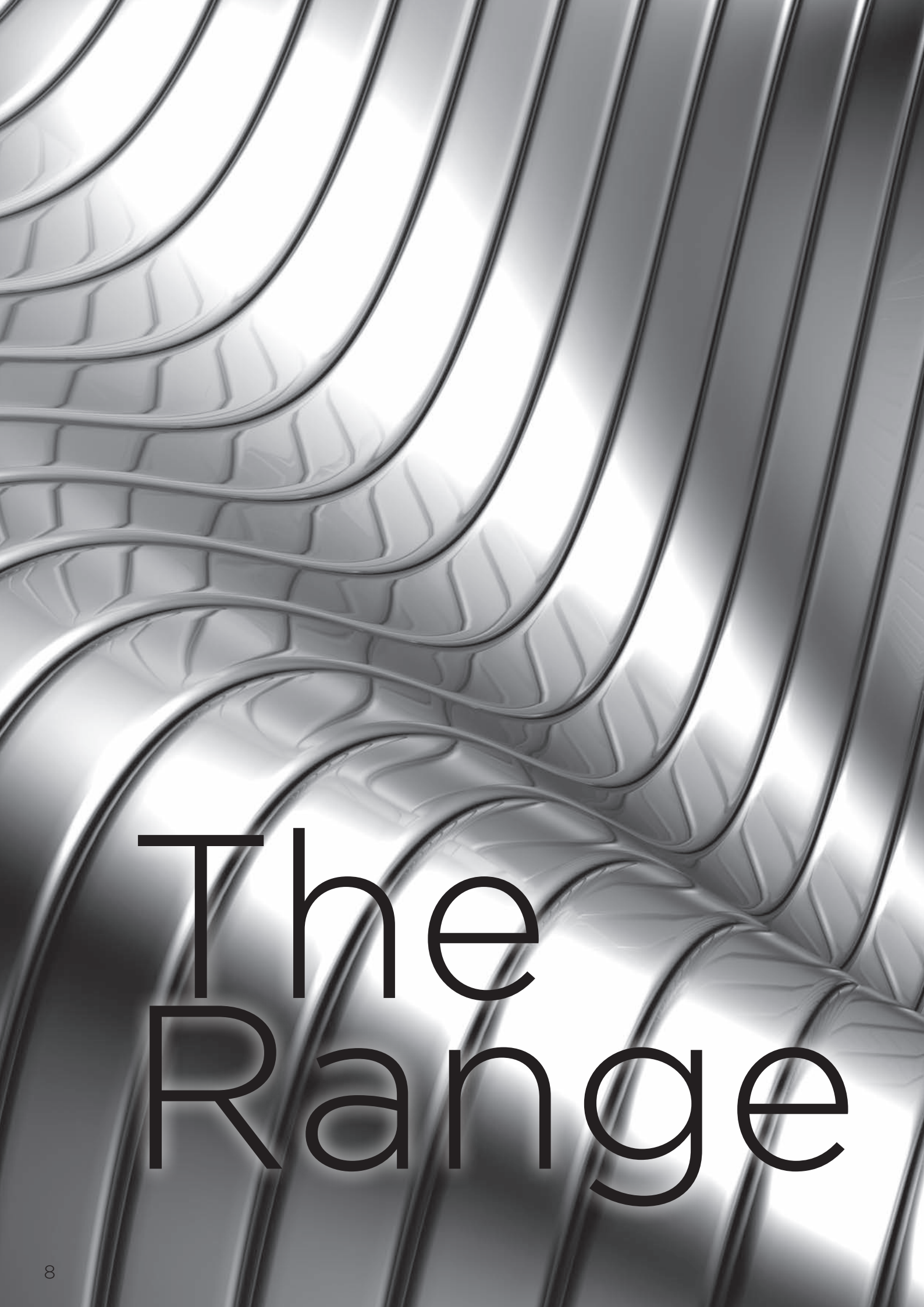
Digital inputs are possible for remote stop start, double setpoint, mode change, or demand limit. Demand limit or set point is possible through a 4 -20ma signal.

Alarms can be logged with the addition of a USB memory stick.

The manager is supplied in an industrial box including all main components except for the serial card which will need adding per unit to be connected.

Common flow and return sensors manage the plant operation.

Setpoint offset can be used based on current ambient temperatures to reduce the heating setpoint or raise cooling setpoint to maximise efficiency.



The Range

Air Cooled **Units**

These air cooled MAGNUS chillers are specifically designed for outdoor installation offering maximum flexibility with a variety of capacities ranging from 220kW - 1325kW with 26 available unit sizes.

MAGNUS air units are available in two different functions:

- **Key Efficiency**
- **Partial condensing heat recovery function**

With three available noise options:

- **SS-CA Super Silent, Class A Efficiency**
- **SS-CA-HE Super Silent, Class A Efficiency, High Efficiency**
- **EL-CA Extremely Low Noise, Class A Efficiency**

The high efficiency version provides maximum energy savings thanks to the adoption of EC fans and generous heat exchanger surfaces.

Adiabatic Cooling Kit

For air conditioning which is required beyond the unit's normal operating limits, ICS Cool Energy can offer an adiabatic cooling kit.

For sites which experience harsh climates and long periods of high ambient air temperature, ICS Cool Energy can offer their adiabatic cooling kit. This special kit regulates the air temperature of the condenser coil when it becomes too high; causing the condensing temperature to go over the compressor's operating limits.

How does it work?

When the condenser reaches a certain set point, the controller opens up a solenoid valve and water is sprayed over a plastic net which allows the air to make contact with the wet plastic which reduces the condenser coil inlet air temperature.

Benefits include:

- **Extended operating limits of 5-6°C, depending on the relative humidity**
- **The high condensing control can be postponed to a higher temperature, benefitting the silent version**
- **Efficiency is increased when the unit is active**

Magnus

Air Cooled Turbocor chillers with magnetic levitation
220kW to 1,325kW

Magnus 'Class A'			Version	1021	1025	1035	2045	2051	2055	2065	2071	3085	3091	3101	4105	4115
Compressors number			SS-CA/ EL-CA	1	1	1	2	2	2	2	2	3	3	3	4	4
Circuits number			SS-CA/ EL-CA	1	1	1	1	1	1	1	1	2	2	2	2	2
Cooling Performances																
Cooling capacity	(1)	kW	SS-CA	233	258	346	442	509	574	650	742	848	904	977	1.065	1.183
			EL-CA	220	254	341	435	526	579	640	739	874	900	972	1.049	1.174
Total absorbed power	(1)	kW	SS-CA	70.2	81.1	110	138	161	174	208	225	269	287	310	336	374
			EL-CA	68.5	79.8	109	137	166	173	206	226	279	290	312	331	377
EER	(1)		SS-CA	3.31	3.18	3.13	3.20	3.16	3.30	3.13	3.30	3.15	3.15	3.15	3.17	3.17
			EL-CA	3.21	3.19	3.12	3.19	3.17	3.35	3.11	3.27	3.13	3.11	3.12	3.17	3.11
ESEER	(1)		SS-CA	4.77	4.87	4.72	5.07	5.17	5.09	5.04	5.16	5.12	5.13	5.09	5.06	5.14
			EL-CA	4.75	4.99	4.84	5.19	5.23	5.17	5.19	5.24	5.24	5.30	5.24	5.19	5.23
Sound power level	(1)	dB(A)	SS-CA	88	88	90	90	90	91	92	92	93	93	93	94	94
			EL-CA	82	82	83	83	84	85	85	86	86	86	87	87	88
Maximum external air temperature	°C			42	42	42	42	42	42	42	42	42	42	42	42	42
Dimensions																
A		mm	SS-CA	3.100	3.100	4.000	4.900	4.900	5.800	7.000	7.000	8.500	9.700	10.600	11.200	11.500
			EL-CA	3.100	3.100	4.000	4.900	5.800	7.000	7.000	7.900	9.400	9.700	10.600	11.200	12.400
B	(1)	mm	SS-CA/ EL-CA	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260
H		mm	SS-CA/ EL-CA	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430

Magnus 'Class A' Enhanced			Version	1021	1025	1035	2045	2051	2055	2065	2071	3085	3091	3101	4105	4115
Compressors number			SS-CA-HE	1	1	1	2	2	2	2	2	3	3	3	4	4
Circuits number			SS-CA-HE	1	1	1	1	1	1	1	1	2	2	2	2	2
Cooling Performances																
Cooling capacity	(1)	kW	SS-CA-HE	229	285	385	455	527	590	703	796	902	969	1.089	1.177	1.325
Total absorbed power	(1)	kW	SS-CA-HE	67.1	81.4	113	134	155	169	204	233	269	279	317	336	383
EER	(1)		SS-CA-HE	3.41	3.50	3.40	3.41	3.41	3.50	3.45	3.41	3.35	3.48	3.42	3.50	3.46
ESEER	(1)		SS-CA-HE	5.27	5.52	5.43	5.79	5.71	5.64	5.77	5.77	5.62	5.79	5.71	5.89	5.75
Sound power level	(2)	dB(A)	SS-CA-HE	88	88	90	90	90	91	92	92	93	93	93	94	95
Maximum external air temperature	°C			42	42	42	42	42	42	42	42	42	42	42	42	42
Dimensions																
A		mm	SS-CA-HE	3.100	3.100	4.000	4.900	4.900	5.800	7.000	7.900	8.500	9.700	10.600	11.200	12,400
B	(1)	mm	SS-CA-HE	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260
H		mm	SS-CA-HE	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430	2.430

Note
(1) Evaporator water (in/out) = 12/7°C; condenser air (in) =35°C.
(2) Sound power based on measurements taken in accordance with standard ISO 3744 and Eurovent.

Water Cooled **Units**

The Magnus water units are specifically designed for indoor installation; providing maximum cost savings and space optimisation in terms of simplified logistics and costs per square metre within plant room areas. The Magnus water units offer a wide range of capacities from 241kW - 1949kW to cater for a variety of applications.

Magnus water units are available in two different functions:

- Key Efficiency
- Heat Pump Reversible

With two available versions:

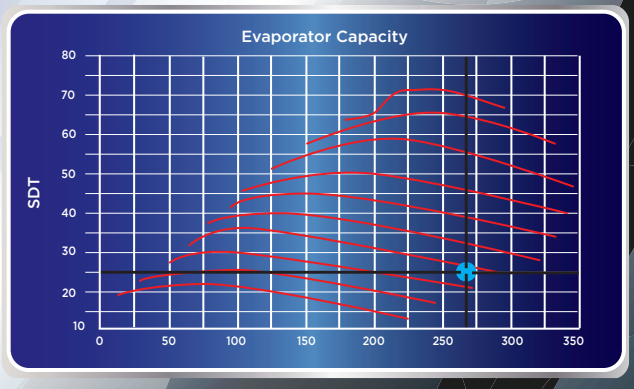
- Low Condensing for applications in which the water cooled unit works with a medium temperature external source such as ground source or cooling towers

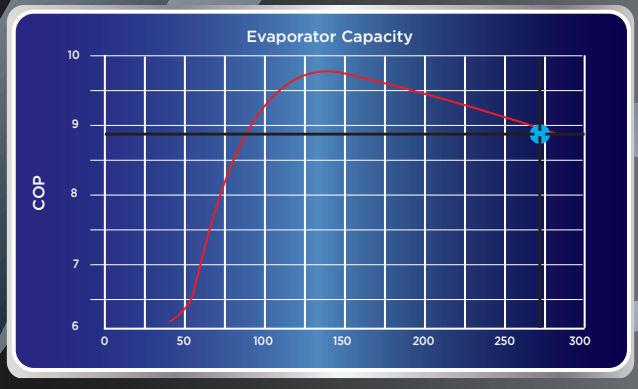
- High Condensing for applications in which the unit is required to work at high condensing levels, for example critical dry cooler installations

Extreme Efficiency

HC High condensing temperatures allow recovered heat to be used elsewhere on a site. Rather than rejecting this through a cooling tower or air blast we can achieve outlet temperatures of 50°C on the water cooled range or use a partial heat recovery system on our air cooled products for temperatures up to 60°C.

	@50% up to 19.0 achievable
*TER values on air cooled range>	@ 100% up to 8.9 available
* *Total Energy Ratio*	
Based on **water cooled>**	@15/20°C chilled water;45/50°C Hot water
Air cooled>	@15/20°C chilled water; 55/60°C hot water; 35°C ambient





Magnus

Water Cooled Turbocor chillers with magnetic levitation
241kW to 1,949kW

Magnus HF/HC			Version	1025	1031	1035	1041	2051	2061	2071	2081	3091	3051	3121	4141	4161
Compressors number			HC	1	1	1	2	2	2	2	2	3	3	3	4	4
Circuits number			HC	1	1	1	1	1	1	1	1	1	1	1	1	1
Cooling Performances																
Cooling capacity	(1)	kW	HC	241	294	359	405	497	558	716	811	881	1.045	1.213	1.405	1.618
Total absorbed power	(1)	kW	HC	46.0	57.0	69.2	78.9	94.8	114	139	156	171	203	237	269	316
EER	(1)		HC	5.24	5.13	5.19	5.13	5.24	5.16	5.14	5.14	5.15	5.15	5.12	5.23	5.13
ESEER			HC	8.70	8.83	8.84	8.95	9.08	9.16	9.04	9.21	9.13	8.96	9.12	9.16	9.20
Heating Performances																
Heating capacity	(2)	kW	HC/HR	287	351	439	500	592	703	877	1.000	1.053	1.279	1.496	1.718	1.995
Total absorbed power	(2)	kW	HC/HR	57	70	89	101	118	140	178	203	210	261	304	346	405
COP	(2)		HC/HR	5.00	5.01	4.95	4.93	5.01	5.02	4.92	4.94	5.02	4.91	4.92	4.96	4.92
Sound power level		dB(A)	HC	91	93	92	94	94	95	94	96	96	96	97	97	98
Maximum condenser outlet temperature		°C	HC	50	50	50	50	50	50	50	50	50	50	50	50	50
Dimensions																
A		mm	HC	2.990	2.990	2.990	2.990	3.490	3.490	3.490	3.490	4.990	4.990	4.990	5.450	5.450
B		mm	HC	950	950	950	950	1.300	1.300	1.300	1.300	1.300	1.300	1.300	1.300	1.300
H		mm	HC	1.900	1.900	1.900	1.900	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.900	1.900

Magnus HF/LC			Version	1051	2091	2101	3135	3145	4185	4195
Compressors number			LC	1	2	2	3	3	4	4
Circuits number			LC	1	1	1	1	1	1	1
Cooling Performances										
Cooling capacity	(1)	kW	LC	488	879	978	1.359	1.461	1.809	1.949
Total absorbed power	(1)	kW	LC	93.5	172	187	258	280	344	373
EER	(1)		LC	5.24	5.12	5.24	5.27	5.22	5.26	5.23
ESEER			LC	9.37	9.19	9.45	9.43	9.41	9.52	9.42
Sound power level	(3)	dB(A)	LC	95	96	97	97	98	99	99
Maximum external air temperature		°C	LC	40	40	40	40	40	40	40
Dimensions										
A		mm	LC	2.990	3.490	3.490	4.990	4.990	5.450	5.450
B	(1)	mm	LC	950	1.300	1.300	1.300	1.300	1.300	1.300
H		mm	LC	1.900	1.800	1.800	1.800	1.800	1.900	1.900

Note
(1) Evaporator water (in/out) = 12/7°C; condenser water (in/out) = 30/35°C.
(2) Condenser water (in/out = 40/45°C; evaporator water (in/out) = 14/7°C.
(3) Sound power based on measurements taken in accordance with standard ISO 3744 and Eurovent

Main Accessories

- Serial cards which are compatible with ModBus, Bacnet, Echelon IonTalk for supervisory systems
- Remote access for up to ten units from a single point
- DEMTRA system provides a report on the unit's main variables; temperature and energy used and absorbed
- EC fans (standard on MAGNUS SS – CA – HE units)
- Enclosed acoustics for a sound reduction of 14 and 18 dB(A)
- Leak detection for refrigerant leakage in close ambient

Service & Emergency Breakdown

Service

ICS Cool Energy provides a 24/7 dedicated customer support service offering emergency breakdown, planned routine maintenance, commissioning and pre-installation water analysis, technical support as well as service contracts and extended warranty.

Supporting a wide network of customers Europe-wide, ICS Cool Energy continues to be the benchmark within the HVAC and process cooling market for quality, service and customer support for all types of air conditioning, refrigeration, process cooling and temperature regulating equipment.

Emergency Breakdown

With a 24-hour a day, 365 days a year fully manned customer service desk and its extensive field service engineering resource, ICS Cool Energy offers a solution to all your temperature control equipment service and maintenance needs. ICS Cool Energy provides support to over 2,000 customers across a wide variety of HVAC and industrial sectors. All engineer's work is allocated and dealt with promptly and efficiently via centralised software which, when a job is identified, sends a detailed job sheet via PDA or laptop and the site location is transferred to the GPS system. All ICS Cool Energy skilled technicians use 170 point monitoring equipment for Turbocor compressors to ensure peak working conditions and early fault diagnosis.

Planned Preventative Maintenance

Routine planned preventative maintenance of your equipment is cost effective and a proven way of limiting production downtime and is absolutely essential where manufacturing is dependent upon continuous operation. Regular maintenance will ensure that high energy costs are reduced and your equipment is running efficiently.

Additional Service Benefits:

- **Service Contracts and Extended Warranty**
- **Commissioning**
- **Parts Direct**
- **Remote Monitoring**
- **Water Analysis/Treatment**

Greener Cooling for a Greener Data Centre

Project:

- Electrical service provider
- Storing 2,000 racks of data
- 15mW of high density power supplying up to 12kW per rack

Requirement:

- Large capacity units to supply precise cooling 24 hours a day 7 days a week
- 7.5mW of cooling capacity at 2N infrastructure chilled water delivery at 6.0°C with an ever changing return temperature
- Precise indoor air conditioning for bespoke built suites which can house 40 racks and 120 racks
- 24/7 service and maintenance support to control the units within the data centre

Inside the data centre, racks are housed in a cold aisle configuration, delivering tempered air and humidity to Ashrae TC9.9 standards. Cooling demands are calculated by maximum cooling of the suite and client IT load and heat gain. Therefore, it depends on how populated the suite becomes as to how much demand there is for cooling.

How did ICS Cool Energy help?

ICS Cool Energy supplied four Ipsum chilled water units providing a cooling capacity of 138kW each. The units feature three energy efficient EC inverter fans, which push the chilled water down underneath the unit using curved plenums up into vents within the cold aisle of the suite. Once the air has made its way up through the racks, it then returns through vents in the wall into the top of the Ipsum units.

For the external site, ICS Cool Energy supplied eight air cooled Magnus Turbocor chillers; two with capacities of 750kW, two with 800kW and four with 1100kW, to supply the chilled water to the indoor close control units within the data centre.

Failure is not an option

The service provider adheres to a 2N+1 device ratio on site and runs all cooling units together, but at a lower load, to maximise energy efficiency. In the case of any issue, this redundancy ensures one unit could potentially require maintenance at any time of the day without impacting on service. This is so important that they operate a 24/7 maintenance crew at their site. To support this critical need, ICS Cool Energy provides a four hour response on site service facility for the chillers and Ipsum units.

"The ICS Cool Energy Turbocor range was an obvious choice with its variable high efficient compressors which are able to operate at a minimum 10% capacity whilst maintaining efficiency."

Mechanical Design Engineer

Temperature Control Savings for a London Bank

Project:

- A well-known London bank
- Re-fitting their UK head office server room
- Using an old R22 system which needed replacing

Requirement:

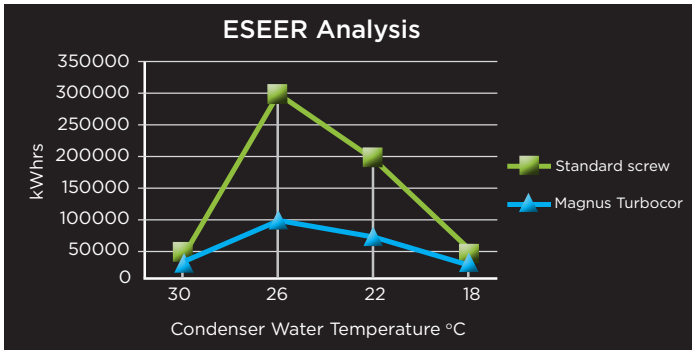
- A small cooling system which could fit inside the rooms of the data centre
- Provide accurate and energy efficient temperature and humidity control
- A cooling system that complies with F-gas regulations
- A low noise system which doesn't disturb office areas and personnel

How did ICS Cool Energy help?

In order to bring the bank into compliance, ICS Cool Energy began with their existing cooling system. The R22 units were replaced with three modern water cooled Turbocor, Magnus units supplying 945kW each. For this particular application, the server room required a supply temperature of 7°C and a return temperature of 12°C.

To work alongside these internal chillers, ICS Cool Energy provided five adiabatic air blast coolers capable of 700kW each located external to the site. These units work using closed circuit cooling only which increase energy savings and production costs. Air blast coolers are manufactured using a non-ferrous water system to ensure a corrosion free process which in turn provides low operating costs. Due to the increase in recent legionella cases, adiabatic units are the ideal solution to ensure uncontaminated cooling is used within processes. In addition, no water treatment or chemical dosing is required which dramatically saves costs.

For internal cooling of the server room, ICS Cool Energy supplied six precise close control Ipsum air conditioners offering 40kW of cooling capacity per unit. These water cooled direct expansion units work using scroll compressors with the economical R410a refrigerant. The units were specifically designed to work using an under airflow option to facilitate the server rooms under floor air cooling methods. For this particular application, the close control units provided a sensible heat ratio of 1.0 with a sensible cooling capacity of 38.8.



Downtime is not an option

Working alongside their services division, ICS Cool Energy provided the bank with a planned maintenance contract which ensures energy costs are reduced and all equipment is running to maximum productivity. ICS Cool Energy engineers are located nationwide with 24/7 guaranteed response times.

Due to the energy efficiency of the ICS Cool Energy solution, the customer is likely to see their investment fully returned within 3 years. These units offered the organisation considerably more energy efficient cooling (especially at part loads), more reliable temperatures, low noise operation and most importantly a legally compliant solution.

Contact us

Group Companies

Head Office South
ICS House
Stephenson Road
Calmore Industrial Estate
Totton, Southampton SO40 3RY
FREEPHONE 0800 169 3861
T +44 (0)23 8052 7300
F +44 (0)23 8042 8366

Midlands

T +44 (0)121 326 7771
F +44 (0)121 327 4114

North

T +44 (0)1274 740877
F +44 (0)1274 391708

Scotland

T +44 (0)1698 744540
F +44 (0)1698 744541

Ireland

T +353 (0)46 92 52934
M +353 (0)87 279 2024

www.icshvac.co.uk
www.icsdatacentrecooling.co.uk

ICS Service • 24/7 Nationwide Support • Emergency Breakdown • 0800 169 3861

ISOQAR REGISTERED UKAS MANAGEMENT SYSTEMS 0026
Certificate Number 6642
ISO 9001, ISO 14001, ISO 18001

ics cool energy

Turbocor Brochure V2 - April 015