



# Data Centre Cooling Solutions





## DIGITAL REVOLUTION

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In 2016 we produced as much data as in the entire history of humankind through 2015.

## POWER NEEDS

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It is estimated that 1,5% of globally generated power is used for Data Centre cooling.

## GREEN SOLUTIONS

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AHRI and ASHRAE released standards to make Data Centres more efficient.

ThermoKey is ready to take up this challenge.

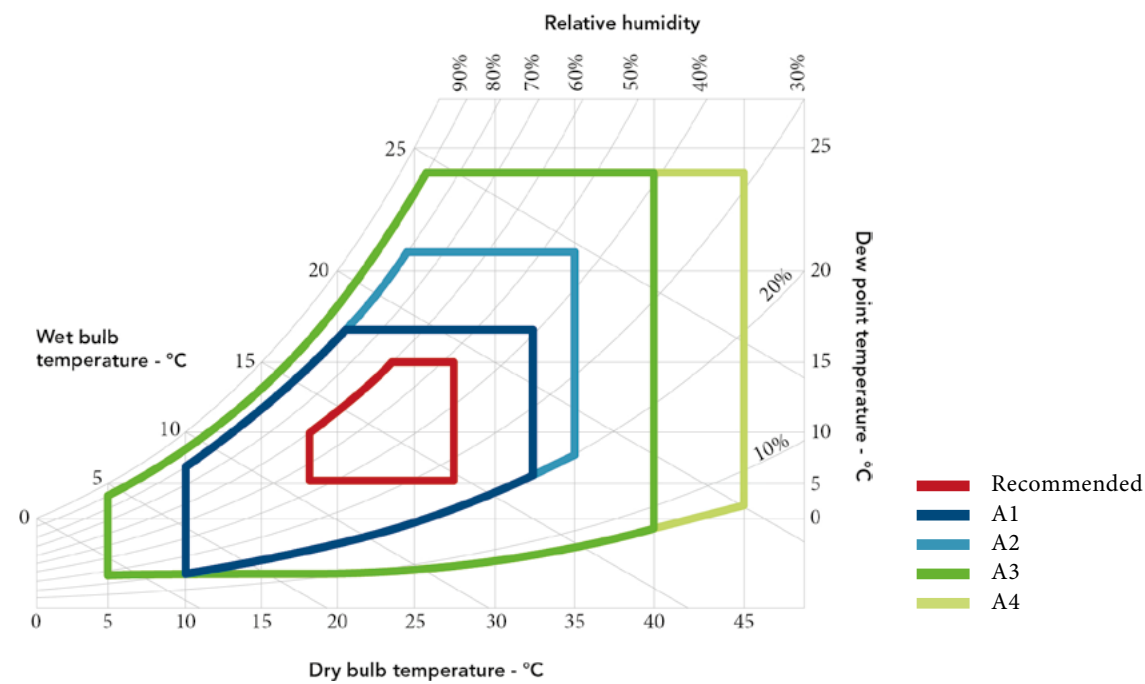
# Product features

**Data Centres** (also referred to as server rooms or IT rooms) and Data Centre Cooling have undergone significant developments since the first introduction of the ASHRAE recommendations and “Thermal Guidelines for Data Processing Environments” in 2004.

The ASHRAE recommendations, are the de-facto standard for thermal management in the Data Centre industry. Evolution of the guidelines aims to **support a more energy efficient cooling of IT equipment, without compromising reliability.**

## ASHRAE ideal working condition for any kind of informatics devices

2011 ASHRAE environmental classes for Data Centre applications.

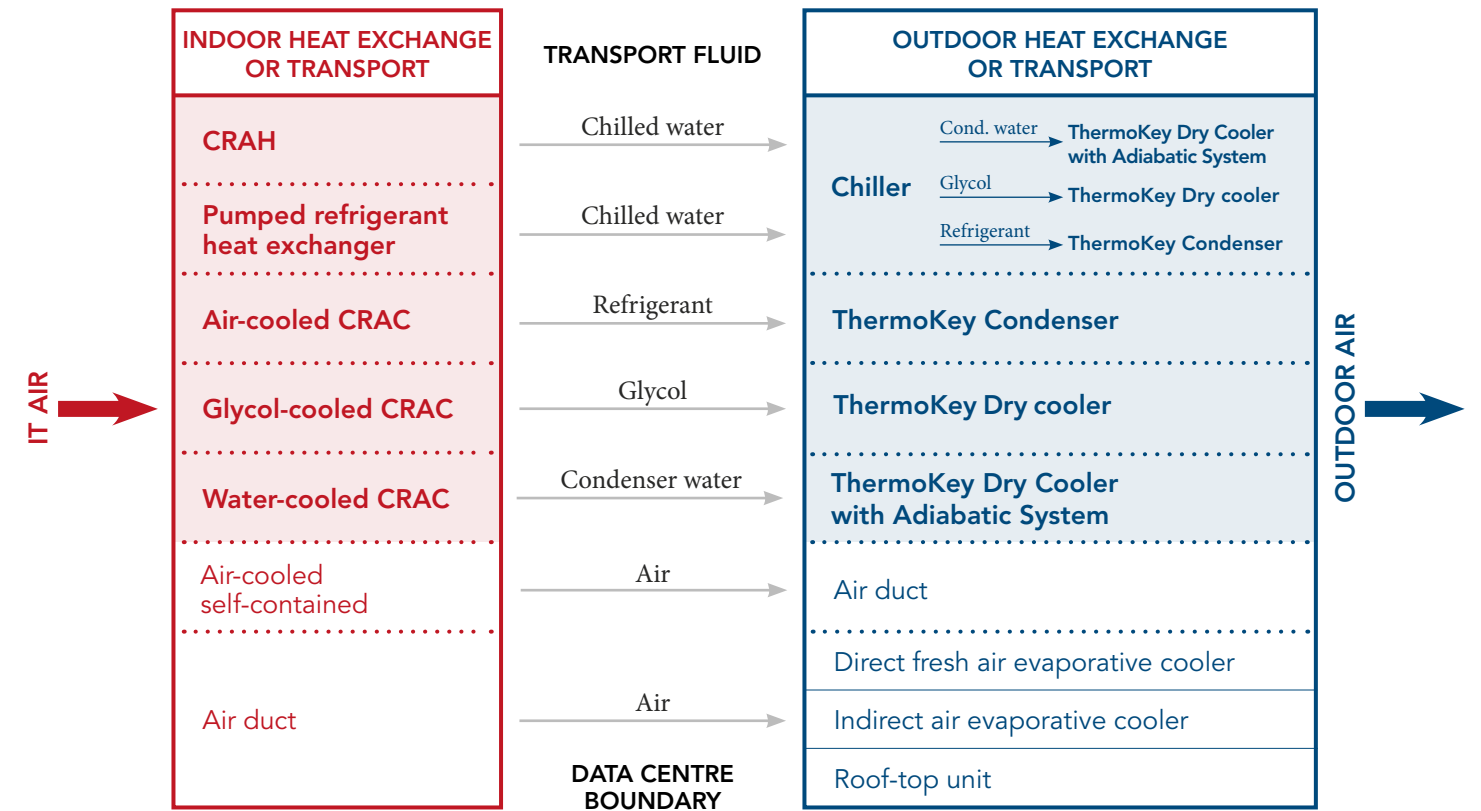


# Heat removal methods in Data Centres

Every element of IT equipment that consumes power produces an equivalent amount of heat in return.

The removal of hot air could be as simple as an air duct, but it is generally achieved by using a heat exchanger to transfer heat from one fluid to another (e.g. from air to water).

One or more methods can be used to cool computer rooms and Data Centres.



## ThermoKey Solutions

- Operational Reliability
- Low Noise Emissions
- Energy Cost Savings
- High-Quality Components
- Controlled Unit Operation
- Customized Special Needs

## Remote condensers

**Example:** Air cooled CRAC with integrated compressor.

Heat removal from the server room using a remote condenser installed outside.

**Application of use:** Medium and small wiring cabinets, computer rooms and Data Centre with moderate requirements (lower than 200KW).



### MICROCHANNEL CONDENSERS (MPE 25mm, 32mm)

**Area of use** Gas condensation

**Performance range** Capacity from 5 to 560 kW (R404A, Tc= 40 °C, T1= 25 °C)  
**TKSmart** Capacity from 13 to 98 kW (R404A, Tc= 40 °C, T1= 25 °C)

**Fans** Diameter Ø 300, 400, 450, 500, 630, 800, 900 mm, AC or EC motor  
**TKSmart** Diameter Ø 400, 500, 630 mm, AC or EC motor

**Benefits** Innovative high efficiency microchannel heat exchanger  
 +30% capacity vs same foot-print traditional condenser  
 Modular design, 1-8 fans (mpe 32 mm)  
 Reduced dimensions and weight  
 No galvanic corrosion through Long-Life-Alloy  
 Reduced refrigerant charge  
 Low noise and low electrical power consumption  
 Complete range of accessories (mpe 32 mm)  
**TKSmart** Modular design, 1-3 fans (mpe 25 mm)  
**TKSmart** Accessories: wiring, shock absorber



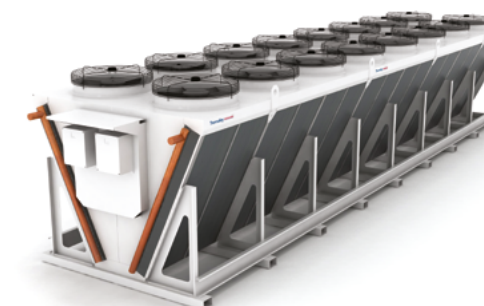
### TURBO-LINE CONDENSERS

**Area of use** Gas condensation

**Performance range** Capacity from 10 to 1200 kW (R404A, Tc= 40 °C, T1= 25 °C)

**Fans** Diameter Ø 500, 630, 800 mm, AC or EC motor

**Benefits** High efficiency geometry  
 Modular design, 1-16 fans  
 Piping in copper or stainless steel AISI 304  
 Finned pack available in a wide range of materials  
 Complete range of accessories, 8 sound levels  
 Premium series available for fans Ø 500 and 630 mm  
 Casing in galvanized steel, powder painted



### TURBO-J CONDENSERS

**Area of use** Gas condensation

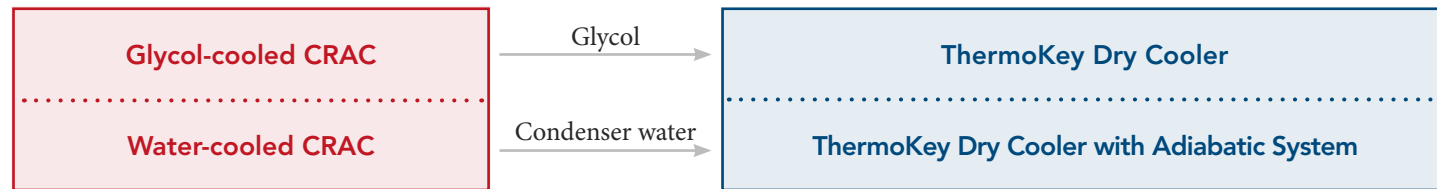
**Performance range** Capacity from 100 to 1915 kW (R404A, Tc= 40 °C, T1= 25 °C)

**Fans** Diameter Ø 900 mm, AC or EC motor

**Benefits** Maximum performance, minimum footprint  
 High efficiency geometry  
 Modular design, 2-16 fans  
 Piping in copper or stainless steel AISI 304  
 Finned pack available in a wide range of materials  
 Complete range of accessories, 8 sound levels  
 AFS (Air Fresh System), WFS (Wet Fin System) and EPS (Evaporative Panel System) available upon request  
 Casing in galvanized steel, powder painted

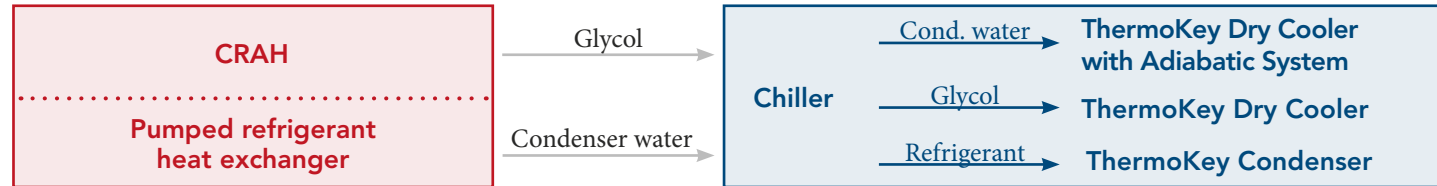
## Dry Coolers without chiller

**Example:** Glycol (or water) cooled CRAC with a pump.  
Heat removal from the server room using a drycooler installed outside.  
Instead of the drycooler, an adiabatic cooler can be used when the external ambient conditions or efficiency permit it.  
**Application of use:** In computer room and medium Data Centres (30-1000KW).



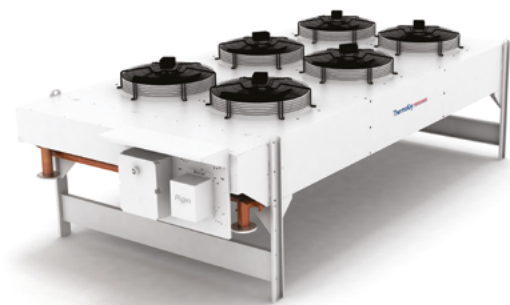
## Dry Coolers with chiller

**Example:** Computer Air Handling Unit (CRAH) combined with a Chiller Water System that can be accordingly connected to a drycooler or a hybrid cooler or a condenser. Instead of CRAH it is also possible to use a Pumped Refrigerant System with a Cooling Unit installed in the ceiling.  
**Application of use:** In a 200KW or larger Data Centre.



### POWER-LINE DRY COOLERS

**Area of use** Heat rejection  
**Performance range** Capacity from 8 to 1100 kW  
(Ethylene glycol 35%, Tw1= 40 °C, Tw2= 35 °C, T1= 25 °C)  
**Fans** Diameter Ø 500, 630, 800, 900, 1000 mm, AC or EC motor  
**Benefits** High efficiency geometry  
Modular design, 1-16 fans  
8 sound levels  
Piping in copper or stainless steel AISI 304 or AISI 316L  
Finned pack available in a wide range of materials  
Complete range of accessories  
Casing in galvanized steel, powder painted



### POWER-J DRY COOLERS

**Area of use** Heat rejection  
**Performance range** Capacity from 70 to 1600 kW  
(Ethylene glycol 35%, Tw1= 40 °C, Tw2= 35 °C, T1= 25 °C)  
**Fans** Diameter Ø 800, 900, 1000 mm, AC or EC motor  
**Benefits** High efficiency geometry  
Modular design, 2-16 fans  
8 sound levels  
Piping in copper or stainless steel AISI 304 or AISI 316L  
Finned pack available in a wide range of materials  
Complete range of accessories  
AFS (Air Fresh System), WFS (Wet Fin System) and EPS (Evaporative Panel System) available upon request  
Casing in galvanized steel, powder painted



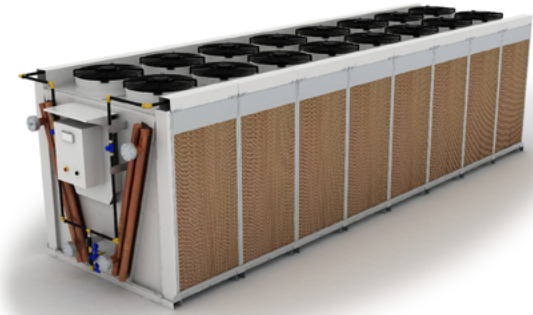
### SUPER POWER-J DRY COOLERS

**Area of use** Heat rejection  
**Performance range** Capacity from 290 to 2220 kW  
(Ethylene glycol 35%, Tw1= 40 °C, Tw2= 35 °C, T1= 25 °C)  
**Fans** Diameter Ø 800, 900, 1000 mm, AC or EC motor  
**Benefits** Maximum performance, minimum footprint  
High efficiency geometry  
Modular design, 8-20 fans  
8 sound levels  
Piping in copper or stainless steel AISI 304  
Finned pack available in a wide range of materials  
Complete range of accessories  
AFS (Air Fresh System), WFS (Wet Fin System) and EPS (Evaporative Panel System) available upon request  
Casing in galvanized steel, powder painted



### POWER-J (V-TOWER) DRY COOLER

<b>Performance range</b>	Capacity from 290 to 2219 kW*
<b>Fans</b>	Diameter Ø 800, 900, 1000 mm, AC or EC motor
<b>Modules</b>	From 1 to n
<b>Benefits</b>	<ul style="list-style-type: none"> <li>EPS (Evaporative Panel System)</li> <li>Maximum performance, minimum footprint</li> <li>High efficiency geometry</li> <li>Modular design, 8-20 fans</li> <li>8 sound levels</li> <li>Piping in copper or stainless steel AISI 304 or AISI 316L</li> <li>Finned pack available in a wide range of materials</li> <li>Complete range of accessories</li> <li>AFS (Air Fresh System) or WFS (Wet Fin System) available upon request</li> </ul>



### TKMICRO H<sub>2</sub>O MODULAR LIQUID COOLER

<b>Area of use</b>	Heat rejection
<b>Performance range</b>	Capacity for each module up to 120 kW*
<b>Fans</b>	Diameter Ø 800 mm, AC or EC motor
<b>Modules</b>	From 1 to n
<b>Benefits</b>	<ul style="list-style-type: none"> <li>Modularity</li> <li>Compactness (maximum length of 2245 mm)</li> <li>Low installation costs</li> <li>Regulation or partialisation of the whole unit</li> <li>Lower environmental impact</li> <li>Less weight</li> <li>Less fluid use</li> <li>Easy-to-clean microchannel core</li> <li>Core coating possibility in case of aggressive ambient</li> </ul>



# Adiabatic systems

**AFS** Air Fresh System

**WFS** Wet Fin System

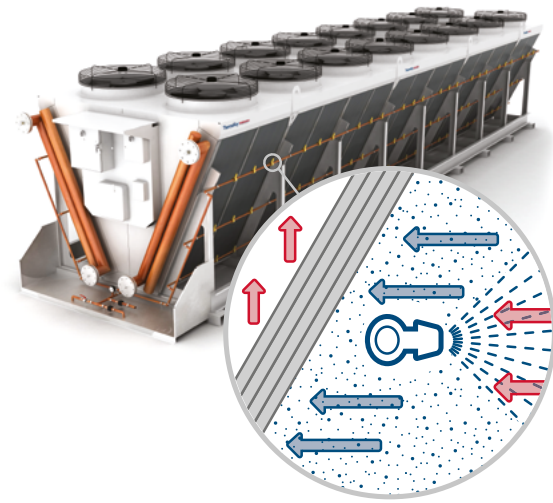
**EPS** Evaporative Panel System

The adiabatic system applied to Dry Coolers and large remote condensers are activated in order to increase the air relative humidity that passes through the heat exchanger so as to reduce the temperature and increase the heat exchange.

The physical principle is that of the latent heat of evaporation: by evaporating the water absorbs heat from the air entering in the heat exchanger and lowers its temperature.

ThermoKey has developed different adiabatic system to be effective and efficient under certain environmental conditions.

(\*) **Standard conditions** - ethylene glycol 35%, Tw1=40°C, Tw2=35°C, T1=25°C



**AFS AIR FRESH SYSTEM**

ThermoKey adiabatic cooling system equipped with special high-pressure nozzles, which allows to compensate for the peaks of power to be dissipated, with minimum water consumption for a maximum of 500 hours per year.

The combination of high pressure water, the nebulization effect of nozzles (MISTING effect) and a specially designed electronic control system represent the innovative principle of AFS system.

It uses only the quantity of water necessary to obtain the desired adiabatic effect.

**Tüv Certified: “No danger in correlation with the risk of legionnaires’ disease”.**

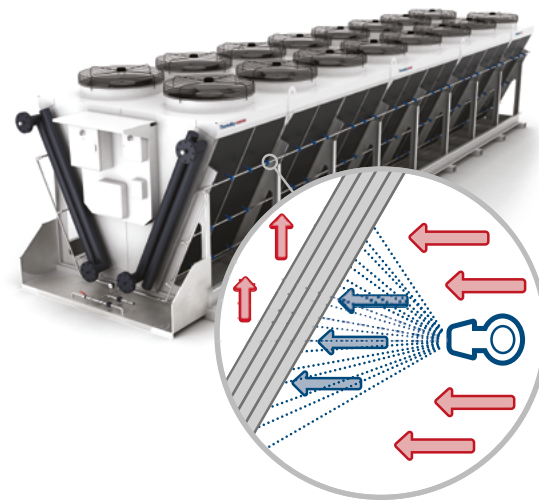
**WFS WET FIN SYSTEM**

It is ThermoKey hybrid cooling system which allows a complete flexibility of operation, working at low pressure (2-3 bars) and for a very high number of hours per year (up to 1000).

The user can choose whether to prioritize the consumption of water or electricity. Thanks to the misting effect and to the increased exchange efficiency, the WFS system allows to reach higher saturation levels.

Since WFS systems use water for a high number of hours per year, a black double-layer fin is provided in order to improve the protection of the finned pack.

**Mainz Universitätsmedizin Laboratory certifies that the WFS meets the standard VDI 2047 part 2 securing hygienically sound operation.**



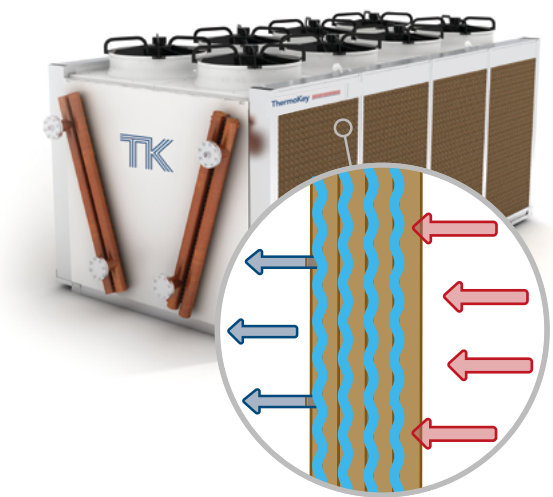
**EPS EVAPORATIVE PANEL SYSTEM**

The evaporative panel system completes ThermoKey’s offer for adiabatic cooling. Thanks to a homogeneous and adjustable distribution of water on the panels this system allows to reach a high saturation level and therefore an efficient capacity increase with low water consumption (hours per year 8000).

EPS has been designed for seasonal working cycles without any specific time limitation and can be completely disassembled for cleaning and maintenance operations.

Thanks to the evaporation contained in the panel there is no need of any protective treatment for the heat exchanger. It is possible to use the water distributed by the common water supply network.

**Mainz Universitätsmedizin Laboratory certifies that the EPS meets the standard VDI 2047 part 2 securing hygienically sound operation.**



# Energy efficiency of cooling

In order to optimize consumption and efficiency of the Chiller it is possible to adopt different solutions by using an external Dry Cooler.

**LOWEST POSSIBLE CONDENSING TEMPERATURE**

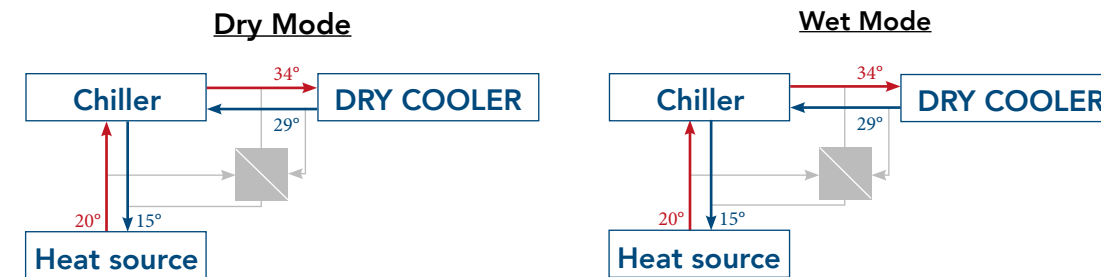
With using a high capacity or efficiency Dry Cooler it is possible to obtain a lower outside fluid temperature.

**THE BENEFIT OF AMBIENT TEMPERATURES**

Using a Dry Cooler with high capacity or efficiency in order to minimize or even switch off the Chiller during the free cooling mode.

**CHILLER OPERATION**

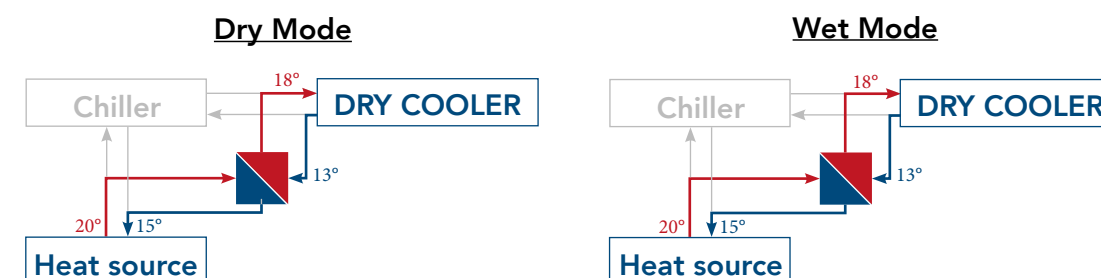
When the ambient temperature is high, the refrigeration chiller works in combination with the adiabatic system that works in dry mode.



**CHILLER OPERATION**  
with ThermoKey adiabatic system Dry Cooler.

**FREE COOLING MODE**

When the ambient temperature is low, the refrigeration Chiller can be switched off and the Dry Cooler will dissipate the entire capacity.



**FREE COOLING OPERATION**  
with ThermoKey adiabatic system Dry Cooler.  
▪ **Energy saving**

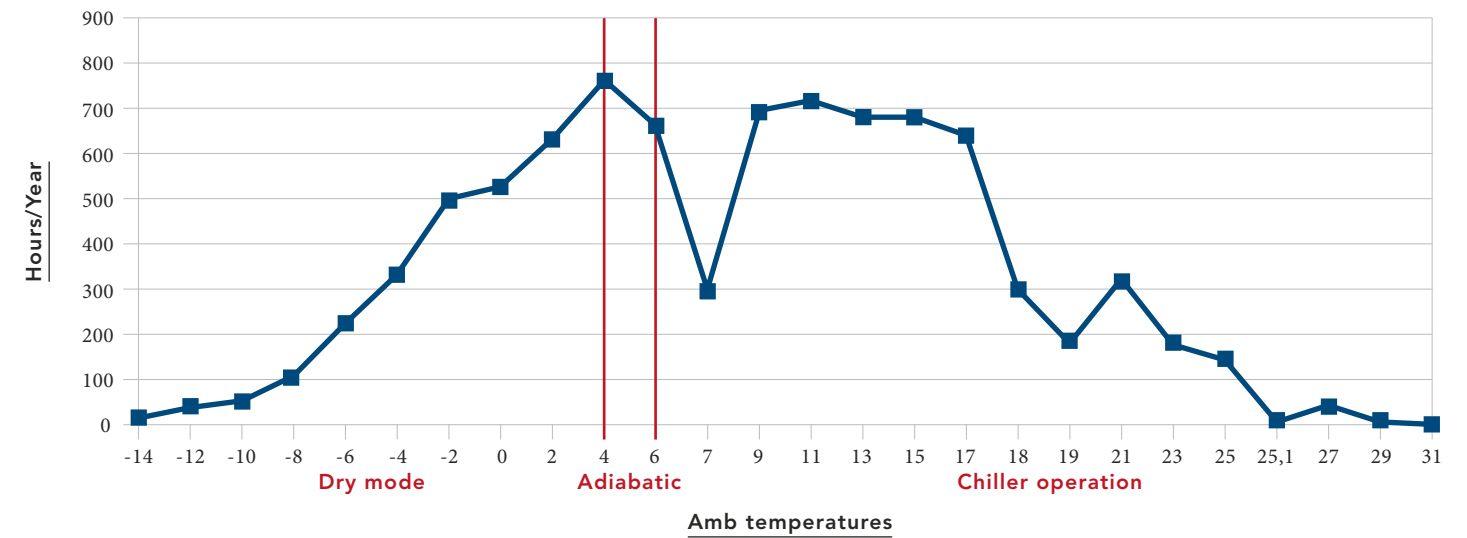
# Simulation

Considering a typical range of temperatures at a **Data Centre in London** and combining a 166KW Chiller and a 1000KW Power J. Dry Cooler (our model: JGQ2790B1 with wet fin system), it is possible to distinguish the free cooling mode and chiller mode throughout the year.

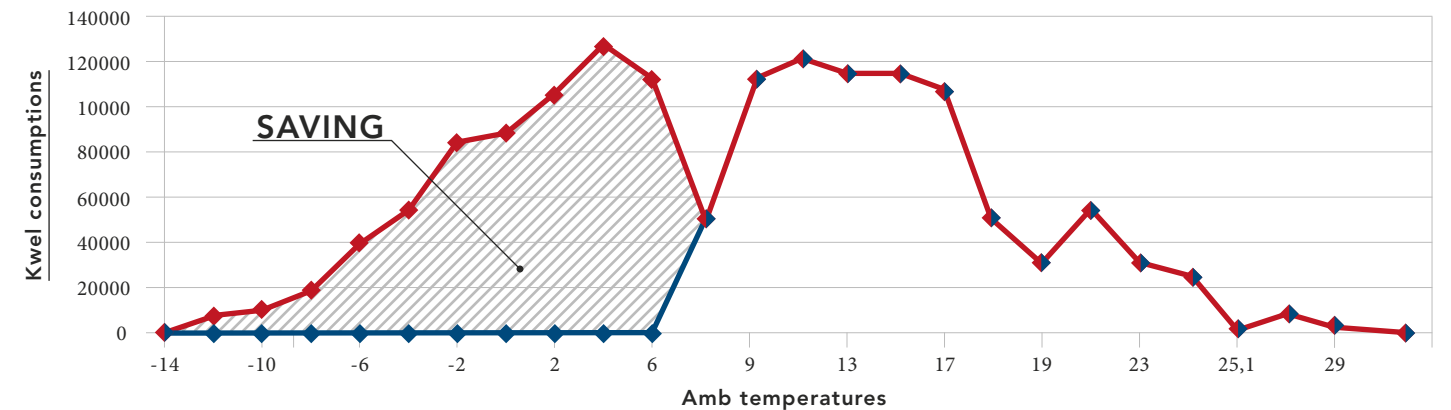
Drycooler mode	Ambient condition London	Cooling water in	Cooling water out	Hours/year	Dry Cooler			Chiller		
					Make up water	Fan velocity	Energy consumption	Energy consumption (Chiller with free cooling)	Energy consumption (Chiller without free cooling)	
JGQ2790B1 (EC)(WFS)	°C	°C	°C	h	m3	RPM%	Kwh	Kwh	Kwh	
dry	-14	18	13	14	0	31%	13	0	2324	Winter/Free Cooling period 18-13° C
dry	-12	18	13	39	0	36%	47	0	6474	
dry	-10	18	13	53	0	40%	79	0	8798	
dry	-8	18	13	105	0	44%	194	0	17430	
dry	-6	18	13	227	0	49%	522	0	37682	
dry	-4	18	13	329	0	56%	1151	0	54614	
dry	-2	18	13	500	0	65%	2700	0	83000	
dry	0	18	13	527	0	87%	4796	0	87482	
dry	2	18	13	632	0	98%	10681	0	104912	
wet	4	18	13	764	1960	65%	4126	0	126824	
wet	6	18	13	666	1709	87%	6061	0	110556	
dry	7	34	29	296	0	36%	414	49136	49136	Summer/Chiller Operation 34-29° C Dry Cooler
dry	9	34	29	695	0	42%	1181	115370	115370	
dry	11	34	29	721	0	47%	1529	119686	119686	
dry	13	34	29	682	0	54%	2182	113212	113212	
dry	15	34	29	682	0	63%	3342	113212	113212	
dry	17	34	29	643	0	76%	5337	106738	106738	
dry	18	34	29	297	0	100%	10395	49302	49302	
wet	19	34	29	180	462	40%	270	29880	29880	
wet	21	34	29	323	829	44%	610	53618	53618	
wet	23	34	29	179	459	51%	465	29714	29714	
wet	25	34	29	144	369	58%	562	23904	23904	
wet	25	34	29	4	10	59%	16	664	664	
wet	27	34	29	45	115	69%	288	7470	7470	
wet	29	34	29	10	26	84%	113	1660	1660	
wet	31	34	29	3	8	0%	0	498	498	
<b>Year total consumption</b>				<b>8760</b>	<b>5947</b>		<b>57074</b>	<b>814064</b>	<b>1454160</b>	

## -20% cost reduction

Chiller consumptions in free cooling mode at standard London temperatures.



Temperatures distribution London



KWEL CONSUMPTION CHILLER YEAR

- Energy consumption (Chiller with Freecooling)
- Energy consumption (Chiller without Freecooling)
- Energy savings in free cooling model

The lower the average annual temperatures are the higher the annual savings can be.

Partial free cooling: depending on plant overall costs, ambient temperatures, desired capacity it is possible to partially use the Chiller system and Free Cooling units and therefore achieve further cost reductions.



# TK Accessories

ThermoKey offers various solutions for the electrical and regulation components. Here are some of our main components:



### W1E - JUNCTION BOX FOR 400V-3-50HZ EC FANS

Electric box for EC fans with plastic casing.



### W2E - JUNCTION BOX FOR 400V-3-50HZ EC FANS

Electric box for EC fans with plastic casing and fan switches (1x2).



### W3E - THREE-PHASE ELECTRICAL PANEL FOR 400V-3-50HZ EC FANS

Electrical panel for EC fans with plastic casing, fuse protection for groups of fans and external control 0-10V.



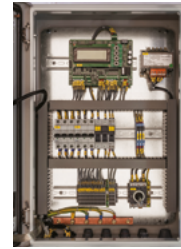
### W4E - THREE-PHASE ELECTRICAL PANEL FOR 400V-3-50HZ EC FANS

Electrical panel for EC fans with plastic casing. Protected by automatic switches (circuit breakers) connected to group of fans. External control 0-10V.



### Q1E - THREE-PHASE ELECTRICAL PANEL FOR 400V-3-50HZ EC FANS

Electrical panel for EC fans with paint coated metal casing. Protected by automatic switches (circuit breakers) connected to groups of fans, external control 0-10V.



### Q2E - THREE-PHASE ELECTRICAL PANEL FOR 400V-3-50HZ EC FANS

Electrical panel for EC fans with paint coated metal casing, controller mounted inside the box, protected by automatic switches (circuit breakers) connected to groups of fans, fan regulation control MODBUS RS485.



### Q3E - THREE-PHASE ELECTRICAL PANEL FOR 400V-3-50HZ EC FANS

Electrical panel for EC fans with paint coated metal frame, controller mounted inside the box, protected by automatic switches (circuit breakers) connected to groups of fans, fan regulation control MODBUS RS485, internal anti condensate heating element.



### Q4E - THREE-PHASE ELECTRICAL PANEL FOR 400V-3-50HZ EC FANS

Electrical panel for EC fans with paint coated metal casing, controller mounted inside the box, protected by automatic switches (circuit breakers) connected to groups of fans, fan regulation control MODBUS RS485. Panel-mounted switches (1 switch every 2 fans) (1x2).

## REGULATION FOR DRYCOOLERS AND CONDENSERS EC FANS

### EB - EC BASIC SPEED CONTROLLER

The EC BASIC Eb is a multifunction and multiple-input unit for the regulation of speed of three-phase electronically commutated motors installed on axial fans, which is designed to regulate different EC motors, in a simultaneous and coordinated way, using programmable input signals.

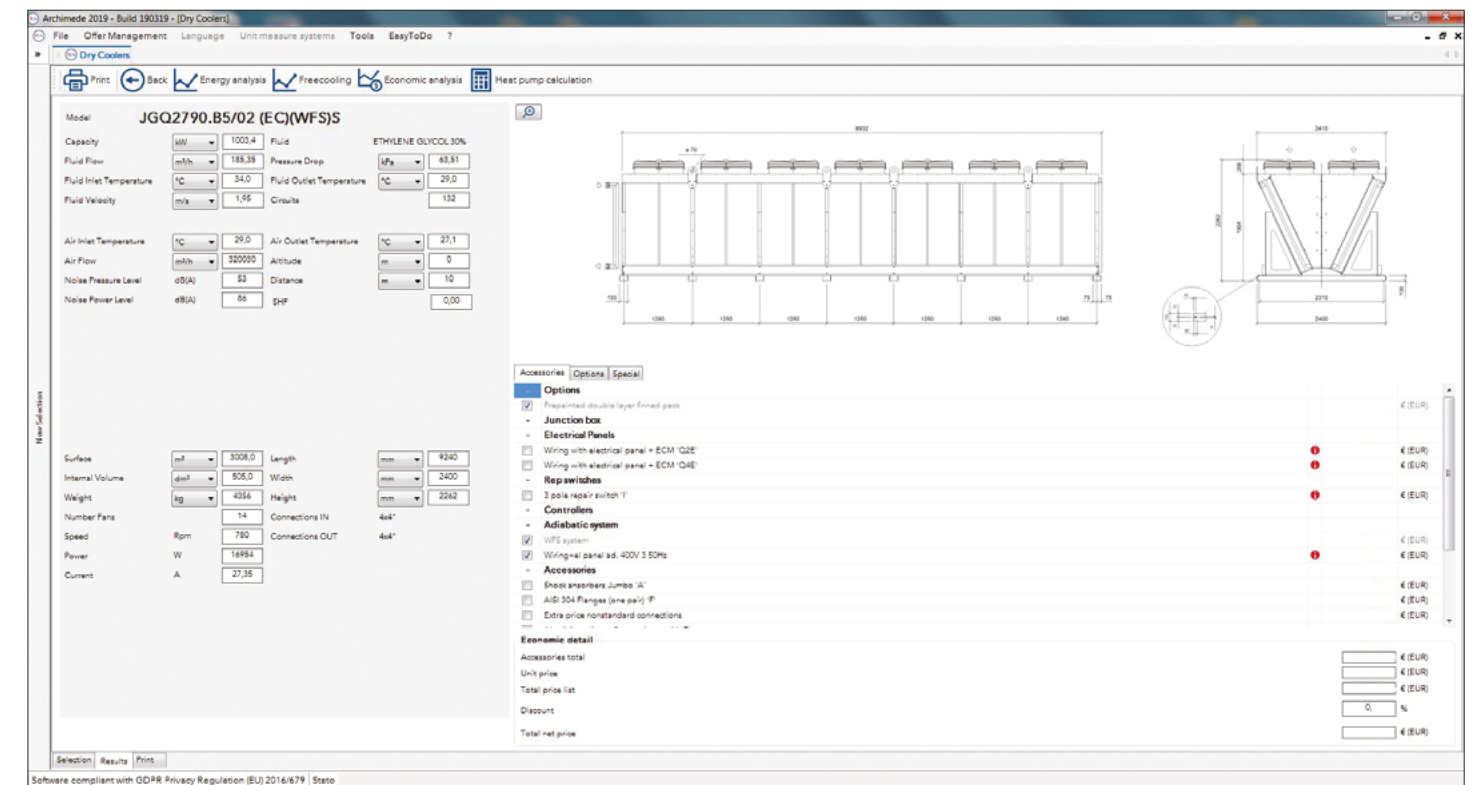
### EP - EC PLUS SPEED CONTROLLER

The EC PLUS Ep is a multifunction and multiple-input unit for the regulation of speed of three-phase electronically commutated motors installed on axial fans, which is designed to regulate different EC motors, in a simultaneous and coordinated way, using programmable input signals.

## ThermoKey "Archimede" tool

With integrated climate data of no less than 537 cities from around the world, ThermoKey software "Archimede" offers:

- **Economic Analysis:** calculates running costs and pay-back time on the investment.
- **Energy Analysis:** verifies Energy consumptions and noise levels.



### FREE DOWNLOAD

Scan the QR code or visit the website [www.thermokey.it/download/software](http://www.thermokey.it/download/software)

## Case studies



### Data Centre 6.1 MW

The Dry Coolers have been specifically designed to provide the best and most efficient solution.

**NEED**

Cooling down one of the biggest Data Centres (6.1 MW) in a particularly aggressive environment like the coastal one.

**SOLUTION**

16 V-Type Dry Coolers model **JGH2390CZ2/6QIEMAF(EC)(AFS)S** and 2 V-Type Dry Coolers model **JWQ1290A3/8QIEMAF(EC)(AFS)S** with electronic fans, adiabatic and self-cleaning system.



### Server in Basel (Switzerland)

ThermoKey Dry Coolers have been produced to ensure durability and reduced energy consumption.

**NEED**

Cooling down 4.5 MW Total Capacity in a small footprint area.

**SOLUTION**

3 **JGL2790BY AFS**, V-Type Dry Coolers with AFS adiabatic system, corrosion protection of finned pack, electronic fans and electrical parts and 1 **JGL2790BY**, V-Type Dry Cooler with electronic fans and electrical parts.



## Data Centre 5.5 MW

ThermoKey è stato scelto per la sostituzione di 3 dry cooler esistenti di un altro brand per il raffreddamento di un Data Center ad Amsterdam.

### NEED

Rimozione del calore dalla stanza del server

### SOLUTION

3 Dry cooler a tavola dotati di 6 ventilatori EC ciascuno – Spessore aletta 0,15 mm



## We design customized products to meet every need

We at ThermoKey know that specific contexts require specific solutions, we are happy to help you to identify the best solution to your needs.



## Our technicians assist the customer in the choice

Our technical staff is at your complete disposal to identify the best heat exchanger for you. We individually analyse your specific needs and the context in which the heat exchanger will be installed for your needs.



## After sales

ThermoKey stays at your side throughout the product life cycle for spare parts replacement and technical assistance

Direction  
Acrobatik  
—  
DC0422EN



**ThermoKey®**  
Heat Exchange Solutions

**ThermoKey Spa**  
via dell'Industria, 1 - 33061  
Rivarotta di Rivignano Teor (UD) - Italy

**T.** +39 0432 772300  
**F.** +39 0432 779734  
info@thermokey.com  
www.thermokey.com

