

## Adiabatic Cooler

### Water Conservation is a MUST

The growing global scarcity of water had inspire us to design ECODRY: the most efficient Adiabatic Cooler available today. In fact, extremely large amounts of fresh water are consumed everyday caused by "evaporative" heat rejection of Cooling Towers.

The use of this new technology may save up to 95% of it. Water cost is also increasingly becoming an important economic factor when operating a Cooling Tower, but is not the only one.

A large list of advantages makes this new technology an unbeatable alternative to them, achieving:

- **better cooling performance** with increased heat transfer efficiency;
- **outstanding operating costs savings**, resulting in a low total cost of ownership;
- **new standards in terms of Environmental Impact**, from both water footprint and total emissions.

Ecodry is an Adiabatic Cooler. It is installed outdoors in order to reject to ambient the heat extracted from processes, providing precise cooling conditions even in extreme ambient temperatures (up to 50°C) delivering clean water at the right temperature year round with unbeatable efficiency.



## Main features

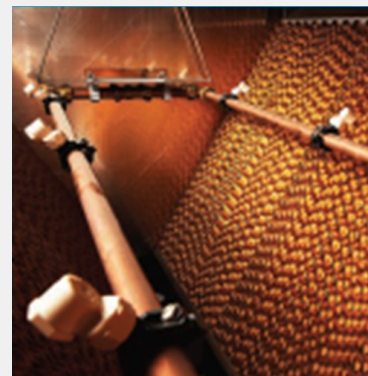
The Adiabatic Cooler ECODRY combines:

### Dry Cooler

- Low pressure loss heat exchangers with high performance copper/aluminum finned coil and stainless steel headers
- Axial fans in die-cast aluminum, with individual inverter driven brushless EC (variable speed fan motors) or EZ (brushless variable speed fan motors with exhaust diffusers) motors
- Self-Draining by gravity coil configuration for glycol-free operation
- Stainless steel frame and support structure and aluminum access panels

### Adiabatic chamber

- Unique Adiabatic Chamber (internationally patented) enclosed with cellulose pads and equipped with high efficiency air humidification spray nozzles, designed for air pre-cooling based on variable flow of a thin water mist



### Intelligent Control System

- PLC hardware based on digital control and on-demand managing logics of the entire system
- Fan speed management: system always delivers the minimum air flow required, according to real load demand and actual ambient temperature
- Dry – Adiabatic – Booster switch: system automatically commutates from one mode to the other according to real load demand and actual ambient temperature
- Water consumption management in Adiabatic Mode controls water evaporation according to the real demand
- Process pump management: system automatically controls the actual pumping capacity according to the real demand of process water flow
- Complete set of sensors and anti-freeze self-draining software

### Structure

- The metal structure is in AISI430 stainless steel. If there are particular applications in areas where the atmosphere is somewhat corrosive for steel in order to avoid possible presence of rust stains, it is recommended to request a specific surface structures and/or treatment



## Advantages

### Lower Water Consumption

- High humidification efficiency of sprayed mist of water in the “adiabatic chamber”
- Lower approach to WB of precooled air with less water usage
- Proven performance in extreme weather conditions, up to 50°C
- Intelligent Management System automatically adjusts the lowest water consumption according to actual conditions

### Lower Energy Consumption

- Unbeatable efficiency with Electronically Commutated (EC) fans as standard
- Reduced fan consumption through low air pressure drop cellulose pads
- Easy removal of pads during DRY operation periods
- Less pumping energy consumption thanks to low coil pressure losses
- Less pumping losses caused by filtering of process water flow
- Free Cooling: the same system may have ability to automatically replace, partially or totally, “mechanical refrigeration systems” operating as a dry-cooler during winter time

### Lower Maintenance Costs

- Minimal ongoing water treatment and filtration required (except for high concentrations of limestone)
- No risk of coil corrosion and scaling - coils are always kept completely dry
- Extended life of humidifying pads thanks to water nebulization instead of being soaked with water
- Extended legs to avoid dust intake
- Maintenance-free fan motors
- Easy access for cleaning of coils and adiabatic chamber

### Glycol-Free Operation

- 100% reliability in extreme weather conditions down to -40°C
- Better heat transfer efficiency
- Less environmental impact
- Less pumping energy consumption

### Clean Water to Processes

- Close loop circuit - guarantees always uncontaminated clean water to process
- No surface fouling, constant efficiency of heat transfer with processes
- Minimal ongoing chemical treatment required



**Water Savings**

Minimized Water Footprint

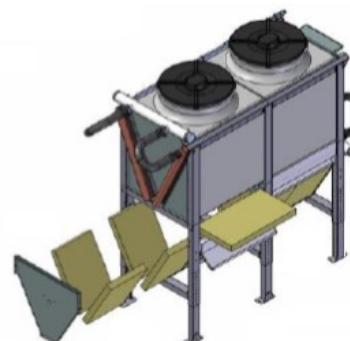
**-95%**



**Energy Savings**

Reduced Operating Costs

**-40%**



**Maintenance  
Costs Savings**

Reduced “Carbon Footprint”

**-40%**

## Advantages

### Compact Design

- Optimized shipping dimensions
- Air intake from underneath
- Favourable capacity/footprint ratio with 35% less footprint required between units
- No air flow recirculation between units

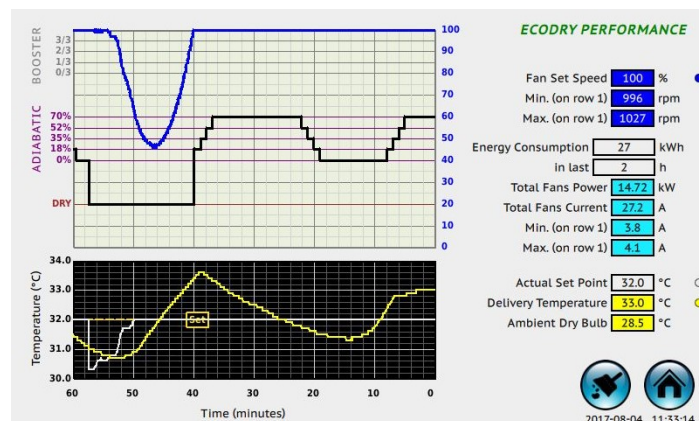
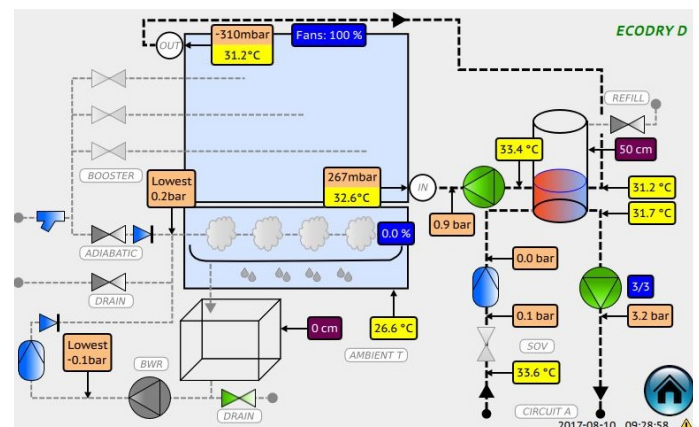
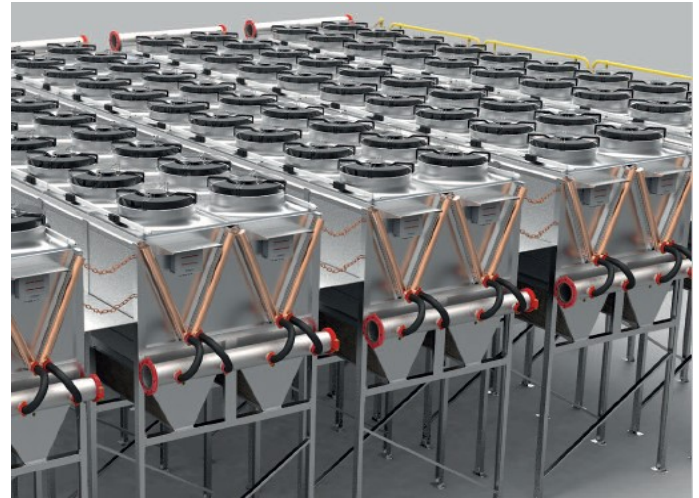
### Total Modularity, High Reliability & 100% Rust-Free

- Easy to expand at anytime to meet growing needs
- Electrical redundancy with individually wired fans
- Reduced installation costs - preassembled stainless steel manifolds for interconnection
- Stainless steel structural frame and aluminium panels
- Copper coils and aluminium fins with hydrophilic protection
- Rigid structure, resistant to deflection - high level of static stability

### Intelligent Management System

- Control guarantees an efficient operation and compliance with the predicted consumption values
- The control continually monitors all the significant parameters and automatically adapts the operating mode to the current system requirements
- Intelligent control of fan speed and wetting
- Complete set of sensors and anti-freezing software
- Siemens PLC hardware to manage the entire system from a single location
- External communication via Modbus RTU over Ethernet TCP/IP network
- Preventive maintenance and failure pinpointing
- Remote web monitoring connection
- Allows Frigel service technicians to monitor and troubleshoot from locations worldwide
- Communication with building management systems
- Easy to install, supplied ready for connection
- Compact, adaptable and expandable

## >Ecodyry - 3DK





## Operating Principles

### Dry Mode

The unit operates like a conventional finned dry cooler. Heat is dissipated to the ambient air via convection. The speed control of EC fan motors keeps coolant at a pre-programmed minimum setpoint, saving energy. During long winter periods, accessing panels may be removed, in order to improve air flow and reduce even more the fan energy consumption.

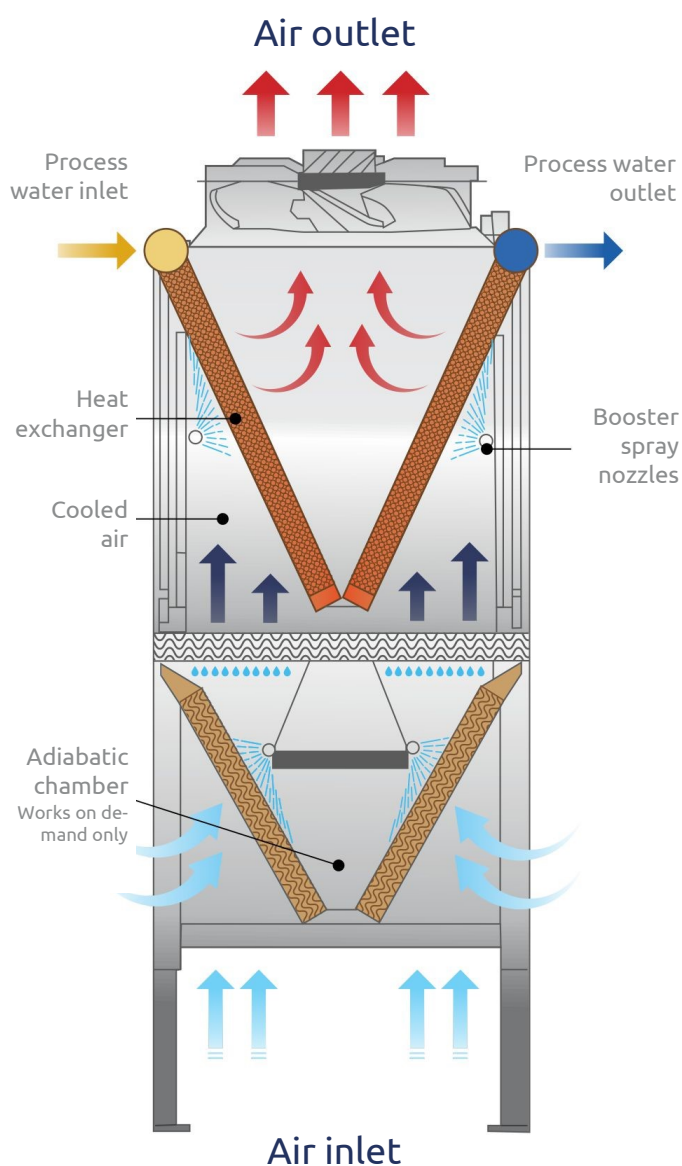
### Adiabatic mode

During high ambient temperature conditions, thanks to the **Adiabatic Chamber** and an **Intelligent Management Control System**, the coolant temperature is kept at a pre-programmed maximum setpoint.

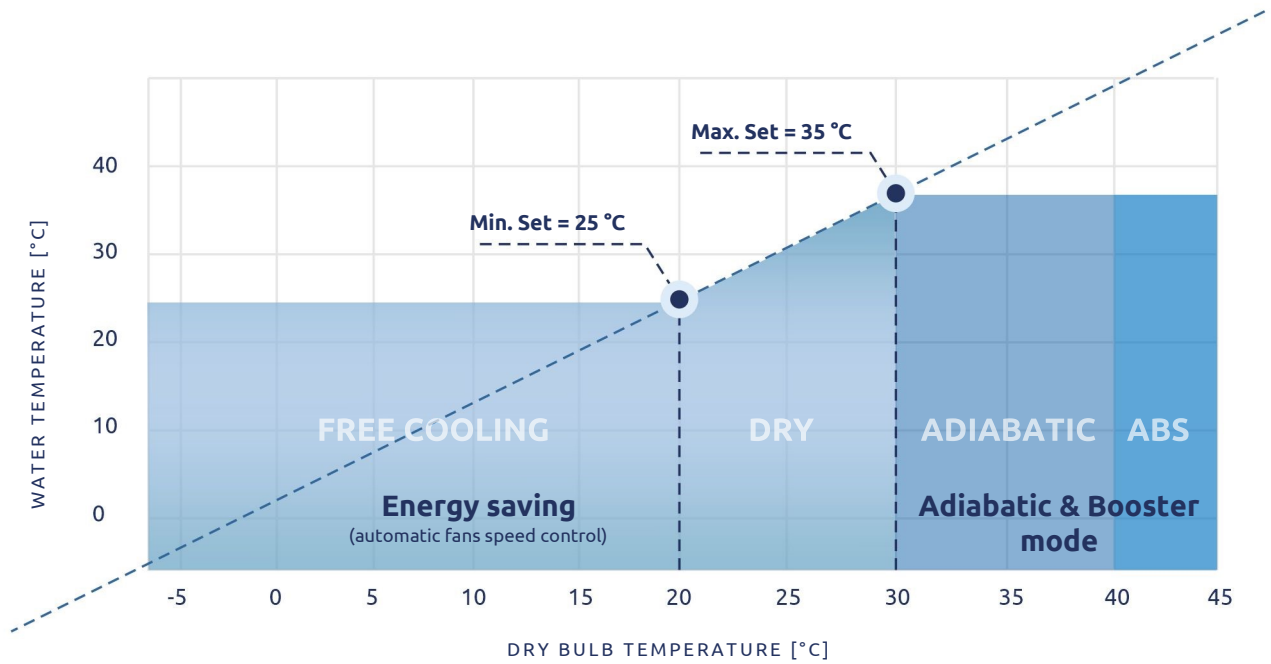
- The ambient air at high temperature passes through the “adiabatic chamber”
- In the chamber, spray nozzles create a thin mist of water from an external source
- The humidification of the air drops its temperature before it reaches the coils
- The amount of water consumed is automatically controlled by microprocessor
- To ensure consistent cooling, the control system continuously adjusts the amount of water sprayed
- Chamber design avoids water drift outside the chamber preventing heat exchanger scaling

### Booster mode

- Available adiabatic booster for situations where set point cannot be maintained due to extremely high ambient temperatures and/or where an extremely low temperature is required (typically less than 30°C)
- With the adiabatic chamber in full operation, the 3PR control system will sequentially activate solenoid valves to completely flood of the coil surfaces
- Unlike other systems, this flooding process prevents evaporation on the coil surfaces
- The coils are coated with hydrophilic paint to additionally prevent pitting of the surfaces
- Normally the booster system is used as an emergency for a few hours of the year
- Continuous and Homogeneous Waterfall on Hydrophilic Coated Exchangers; typical operating situation:
  - INLET: 100 litres of water with 10 g of calcium carbonate (hardness 10°F)
  - OUTLET: 30 litres of water into the exhaust air (useful effect), 70 litres of water + 10 g of calcium carbonate dropping in the adiabatic chamber (adiabatic useful effect), 0 g of calcium carbonate on the exchanger’s fins



## Operating Principles



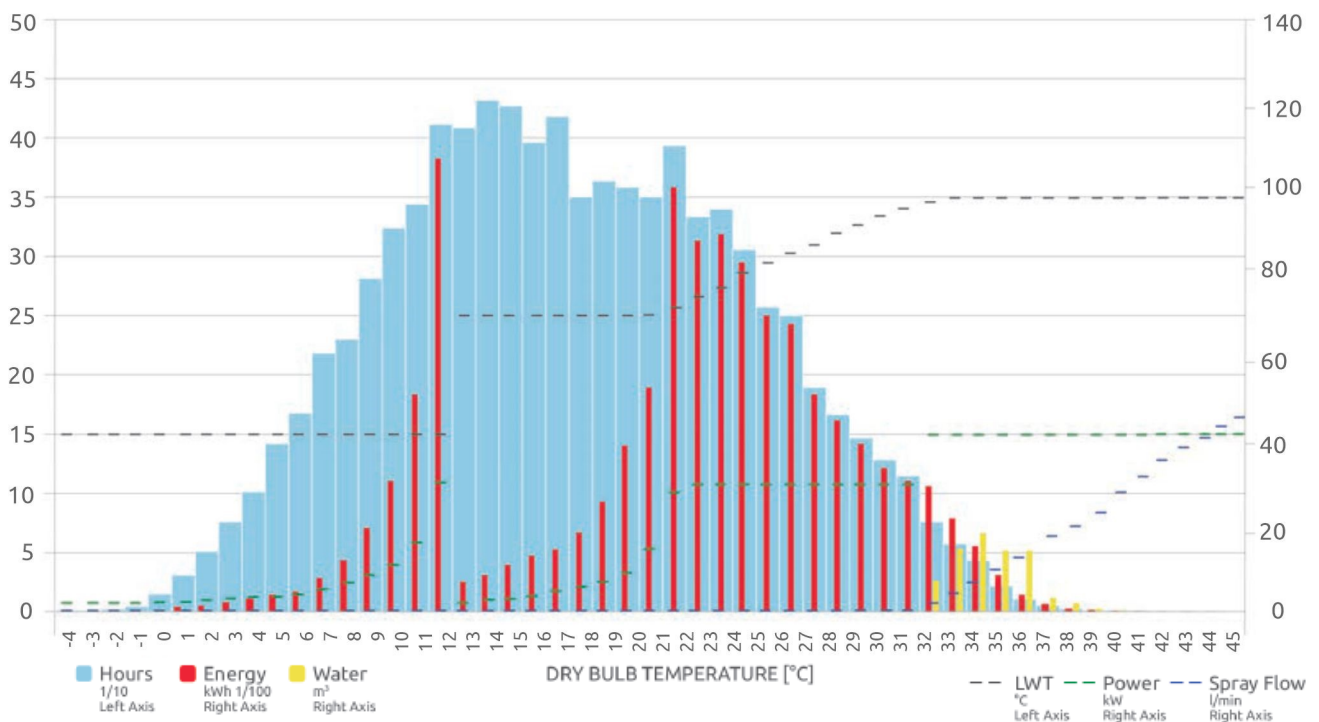
**Dry**



**Adiabatic**



**Booster (ABS)**



## Options

### Special Epoxy Coil Coating

- Polyurethane heat exchanger coil coating to provide an even higher level of protection in adverse climate conditions
- Life of these heat exchangers can be significantly increased by using epoxy-coated fins for higher strength and chemical resistance

### Fan Exhaust Diffusers

- Prevent exhaust air flow from being drawn back into the adiabatic chamber at the bottom of the unit
- Reduce significantly noise emissions

### Roof Panels

- Avoids exhaust air from recirculating between units down into the adiabatic chamber
- The panels allow multiple units to be positioned closely together

### Extended Legs

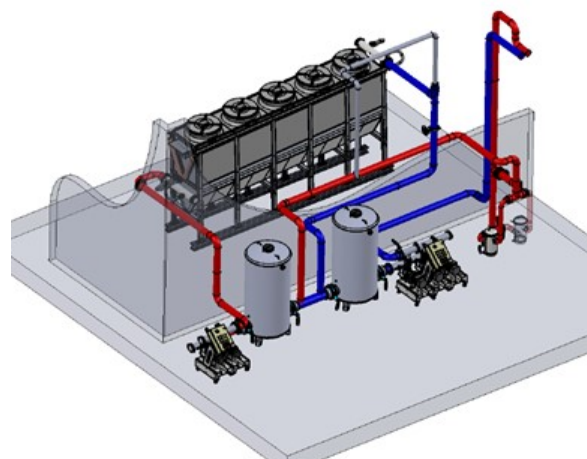
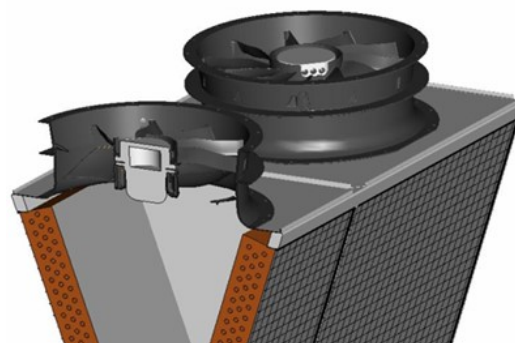
- Extended legs can easily raise the units to facilitate airflow from underneath in tight spaces
- Simplifies pitch installation for "Self-Draining Configuration"

### Self-Draining Configuration (Glycol-Free Operation)

- Automatic self-draining by gravity with no valves or moving parts
- Complete set of sensors and anti-freezing software
- Special anti-freeze stainless steel preassembled manifolds

### Integrated Pump Station

- Design according to actual requirements and engineered for easy modular growth for future expansions
- Preassembled and factory tested before shipping
- Stainless steel reservoirs and stainless steel filters
- Self-draining configuration optimizes performance involving non-glycol applications in freezing climates



## Parallel Coil Configuration (P)

Glycol system or water system (no glycol) in non-freezing climates

Model	Rows	Fans per row	Total fans	Power input		Victaulic™ Connections mm (in) (***)	Internal volume liter	Approximate weights		Sound level dB(A) @10 m		Dimensions (mm) (*)				
				EC fans per unit (kW)	EZ fans per unit (kW)			Shipping kg (****)	Operating kg (*****)	EC fan	Ez fan	A	B	C (**)	C (+40) (**)	C (+84) (**)
3DK11P	1	1	1	2,10	1,75	DN100 (4)	70	365	500	51	49	1.127	2.523	2.923	3.323	-
3DK21P	1	2	2	4,20	3,50	DN100 (4)	120	565	700	54	52	1.127	3.643	2.923	3.323	-
3DK31P	1	3	3	6,30	5,25	DN100 (4)	140	725	900	56	54	1.127	4.743	2.923	3.323	-
3DK41P	1	4	4	8,30	7,00	DN150 (6)	160	940	1.200	57	55	1.127	5.902	2.929	3.329	-
3DK51P	1	5	5	10,50	8,75	DN150 (6)	180	1.145	1.400	58	56	1.127	7.020	2.929	3.329	3.769
3DK71P	1	7	7	14,70	12,25	DN200 (8)	255	1.630	1.900	60	58	1.127	9.225	2.987	3.387	3.827
3DK101P	1	10	10	21,00	17,50	DN200 (8)	350	2.275	2.700	61	59	1.127	12.525	2.987	3.387	3.827
3DK22P	2	2	4	8,40	7,00	DN100 (4)	235	1.040	1.300	57	55	2.235	3.643	2.923	3.323	-
3DK32P	2	3	6	12,60	10,50	DN100 (4)	275	1.285	1.600	59	57	2.235	4.743	2.923	3.323	-
3DK42P	2	4	8	16,80	14,00	DN150 (6)	315	1.640	2.000	60	58	2.235	5.902	2.929	3.329	-
3DK52P	2	5	10	21,00	17,50	DN150 (6)	360	1.970	2.400	61	59	2.235	7.020	2.929	3.329	3.769
3DK72P	2	7	14	29,40	24,50	DN200 (8)	510	2.815	3.400	62	60	2.235	9.225	2.987	3.387	3.827
3DK102P	2	10	20	42,00	35,00	DN200 (8)	700	3.895	4.700	64	62	2.235	12.525	2.987	3.387	3.827

Power supply voltage and frequency: 380-480±10%/3/50-60Hz

Do **NOT** use the data in this document for construction purposes. Specifications are subject to change without notice.

Max working temperature: 8 bar (Italian manufacture) - 10 bar (Thai manufacture)

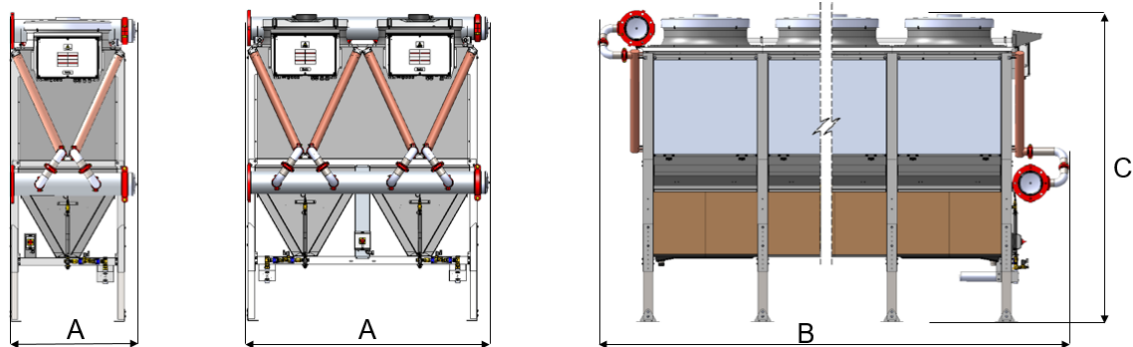
(\*) Extended support leg requirements (+40 cm or +84 cm) are determined by Frigel.

(\*\*) Add 28 mm for models with EZ Fans (21, 22, 31, 32, 41, 42, 51 & 52)

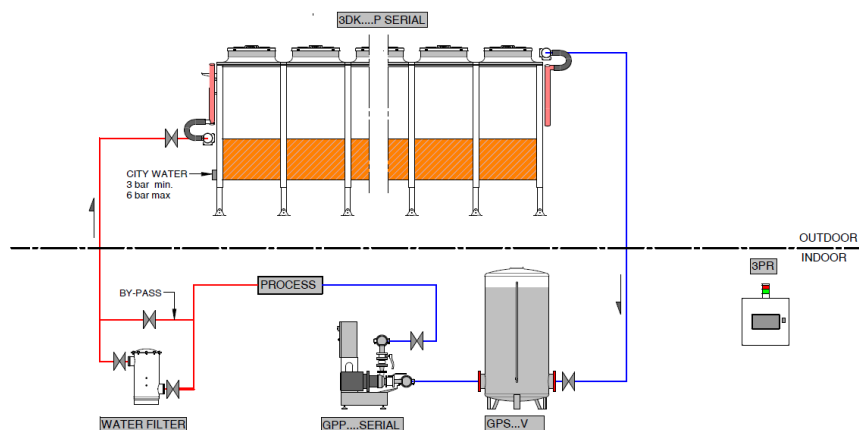
(\*\*\*) Adiabatic chamber spray connections: 1" GAS-F per row. Unused connections must be plugged. Adiabatic chamber drain connections: 1" hose barb.

(\*\*\*\*) This is also the approximate rigging weight, excluding the additional weight of the optional extended support legs.

(\*\*\*\*\*) Operating weights do not include external flooded piping or support steel structures.



Application diagram  
Ecodyry P version  
with pumping station in  
serial communication





## Series Coil Configuration (S)

Glycol system or water system (no glycol) in non-freezing climates

Model	Rows	Fans per row	Total fans	Power input		Victaulic™ Connections mm (in) (***)	Internal volume liter	Approximate weights		Sound level dB(A) @10 m		Dimensions (mm) (*)				
				EC fans per unit (kW)	EZ fans per unit (kW)			Shipping kg (****)	Operating kg (*****)	EC fan	Ez fan	A	B	C (**)	C (+40) (**)	C (+84) (**)
3DK11S	1	1	1	2,10	1,75	DN65 (2½)	70	320	400	51	49	1.127	1.722	2.925	3.325	-
3DK21S	1	2	2	4,20	3,50	DN100 (4)	120	565	700	54	52	1.127	3.322	2.925	3.325	-
3DK31S	1	3	3	6,30	5,25	DN100 (4)	140	735	900	56	54	1.127	4.422	2.925	3.325	-
3DK41S	1	4	4	8,30	7,00	DN150 (6)	160	940	1.200	57	55	1.127	5.580	2.925	3.325	-
3DK51S	1	5	5	10,50	8,75	DN150 (6)	180	1.205	1.400	58	56	1.127	6.680	2.925	3.325	3.765
3DK71S	1	7	7	14,70	12,25	DN200 (8)	255	1.630	1.900	60	58	1.127	8.924	2.925	3.325	3.765
3DK101S	1	10	10	21,00	17,50	DN200 (8)	350	2.270	2.700	61	59	1.127	12.224	2.925	3.325	3.765
3DK22S	2	2	4	8,40	7,00	DN100 (4)	235	1.040	1.300	57	55	2.235	3.322	2.925	3.325	-
3DK32S	2	3	6	12,60	10,50	DN100 (4)	275	1.195	1.500	59	57	2.235	4.422	2.925	3.325	-
3DK42S	2	4	8	16,80	14,00	DN150 (6)	315	1.655	2.000	60	58	2.235	5.580	2.925	3.325	-
3DK52S	2	5	10	21,00	17,50	DN150 (6)	360	1.965	2.400	61	59	2.235	6.680	2.925	3.325	3.765
3DK72S	2	7	14	29,40	24,50	DN200 (8)	510	2.830	3.400	62	60	2.235	8.924	2.925	3.325	3.765
3DK102S	2	10	20	42,00	35,00	DN200 (8)	700	3.895	4.700	64	62	2.235	12.224	2.925	3.325	3.765

Power supply voltage and frequency: 380-480±10%/3/50-60Hz

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Max working temperature: 8 bar (Italian manufacture) - 10 bar (Thai manufacture)

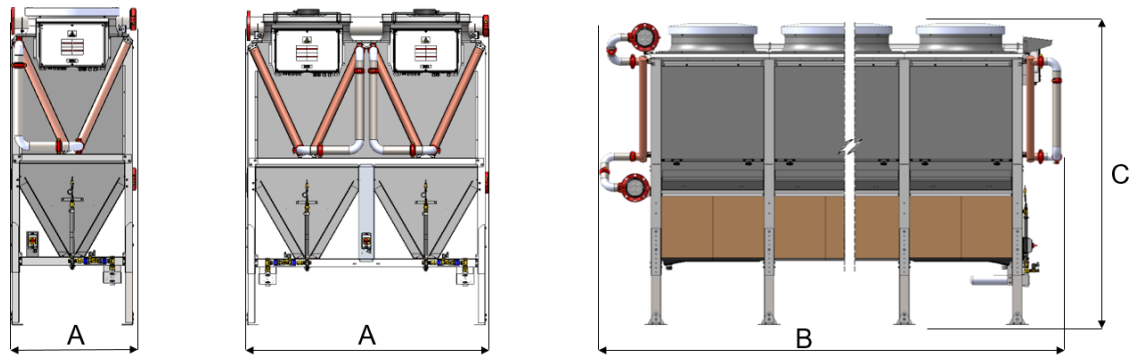
(\*) Extended support leg requirements (+40 cm or +84 cm) are determined by Frigel.

(\*\*) Add 52 mm for models with EZ Fans (11, 21, 22, 31 & 32).

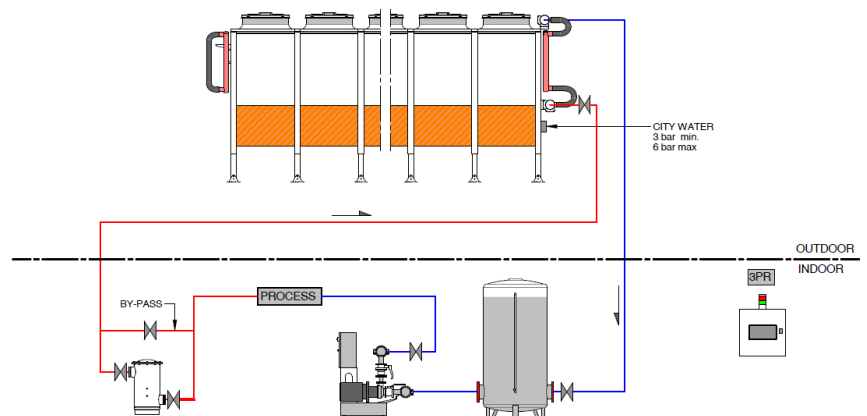
(\*\*\*) Adiabatic chamber spray connections: 1" GAS-F per row. Unused connections must be plugged. Adiabatic chamber drain connections: 1" hose barb.

(\*\*\*\*) This is also the approximate rigging weight, excluding the additional weight of the optional extended support legs.

(\*\*\*\*\*) Operating weights do not include external flooded piping or support steel structures.



Application diagram  
Ecodyry S version  
with pumping station in  
serial communication





## Self-Draining Configuration (D)

### Water system (no glycol) with recirculation pump stations for freezing climates

Model	Rows	Fans per row	Total fans	Power input		Victaulic™ Connections mm (in) (***)	Internal volume liter	Approximate weights		Sound level dB(A) @10 m		Dimensions (mm) (*)				
				EC fans per unit (kW)	EZ fans per unit (kW)			Shipping kg (****)	Operating kg (*****)	EC fan	Ez fan	A	B	C (**)	C (+40) (**)	C (+84) (**)
3DK21D	1	2	2	4,20	3,50	DN150 (6)	120	605	800	54	52	1.127	3.607	3.019	3.419	-
3DK31D	1	3	3	6,30	5,25	DN150 (6)	140	780	1.000	56	54	1.127	4.708	3.063	3.463	-
3DK41D	1	4	4	8,30	7,00	DN150 (6)	160	980	1.200	57	55	1.127	5.809	3.107	3.507	-
3DK51D	1	5	5	10,50	8,75	DN150 (6)	180	1.190	1.400	58	56	1.127	6.910	3.151	3.551	3.991
3DK71D	1	7	7	14,70	12,25	DN200 (8)	255	1.630	1.900	60	58	1.127	9.157	3.297	3.697	4.137
3DK101D	1	10	10	21,00	17,50	DN200 (8)	350	2.275	2.700	61	59	1.127	12.460	3.429	3.829	4.269
3DK22D	2	2	4	8,40	7,00	DN150 (6)	235	1.040	1.300	57	55	2.235	3.607	2.925	3.419	-
3DK32D	2	3	6	12,60	10,50	DN150 (6)	275	1.355	1.700	59	57	2.235	4.708	2.925	3.463	-
3DK42D	2	4	8	16,80	14,00	DN150 (6)	315	1.750	2.100	60	58	2.235	5.809	2.925	3.507	-
3DK52D	2	5	10	21,00	17,50	DN150 (6)	360	2.095	2.500	61	59	2.235	6.910	2.925	3.551	3.991
3DK72D	2	7	14	29,40	24,50	DN200 (8)	510	2.855	3.400	62	60	2.235	9.157	2.925	3.697	4.137
3DK102D	2	10	20	42,00	35,00	DN200 (8)	700	3.910	4.700	64	62	2.235	12.460	2.925	3.829	4.269

Power supply voltage and frequency: 380-480±10%/3/50-60Hz

Do **NOT** use the data in this document for construction purposes. Specifications are subject to change without notice.

Max working temperature: 1,5 bar

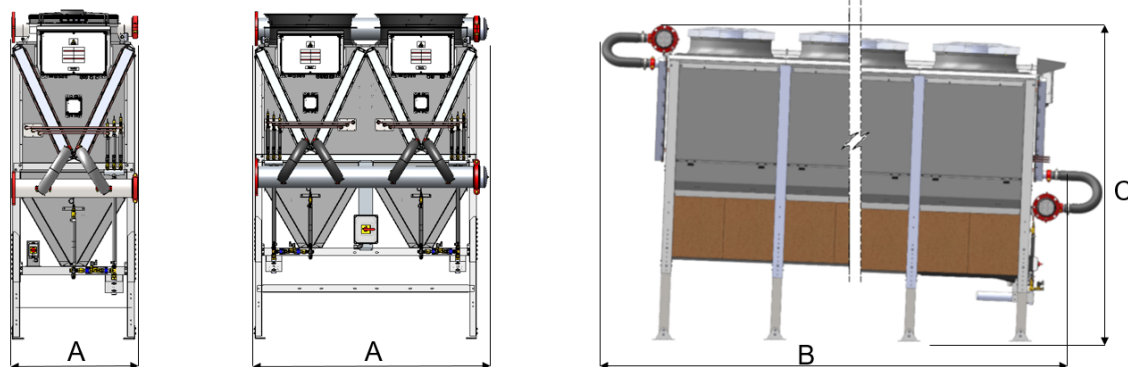
(\*) Extended support leg requirements (+40 cm or +84 cm) are determined by Frigel.

(\*\*) Add 28 mm for models with EZ fans (21, 22, 31, 32, 41, 42, 51 & 52).

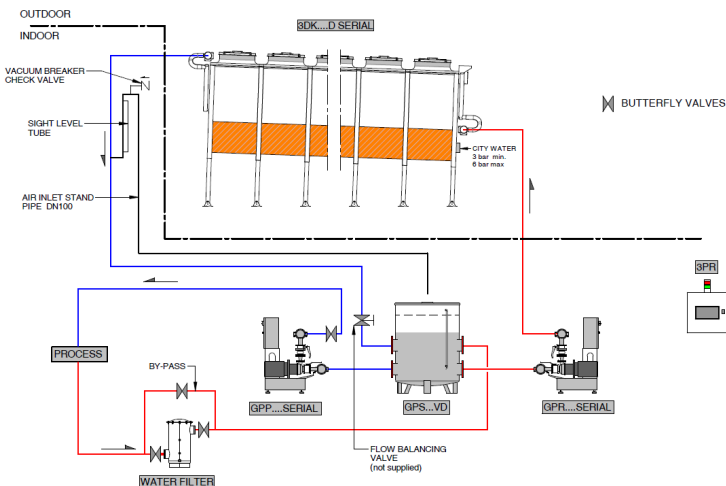
(\*\*\*) Adiabatic chamber spray connections: 1" GAS-F per row. Unused connections must be plugged. Adiabatic chamber drain connections: 1" hose barb

(\*\*\*\*) This is also the approximate rigging weight, excluding the additional weight of the optional extended support legs.

(\*\*\*\*\*) Operating weights do not include external flooded piping or support steel structures.



Application diagram  
Ecodyry D version  
with pumping station in  
serial communication



## Self-Draining with Parallel Coil Configuration (DP)

Water system (no glycol) with recirculation pump stations for moderate climates with minimal freezing conditions

Model	Rows	Fans per row	Total fans	Power input		Victaulic™ Connections mm (in) (**)	Internal volume liter	Approximate weights		Sound level dB(A) @10 m		Dimensions (mm) (*)				
				EC fans per unit (kW)	EZ fans per unit (kW)			Shipping kg (***)	Operating kg (****)	EC fan	Ez fan	A	B	C	C (+40)	C (+84)
3DK41DP	1	4	4	8,30	7,00	DN150 (6)	160	975	1.200	57	55	1.127	5.809	3.299	-	-
3DK51DP	1	5	5	10,50	8,75	DN150 (6)	180	1.180	1.400	58	56	1.127	6.910	3.343	4.183	-
3DK71DP	1	7	7	14,70	12,25	DN200 (8)	255	1.640	1.900	60	58	1.127	9.157	3.481	4.321	-
3DK101DP	1	10	10	21,00	17,50	DN200 (8)	350	2.275	2.700	61	59	1.127	12.460	3.612	4.452	-
3DK42DP	2	4	8	16,80	14,00	DN150 (6)	315	1.750	2.100	60	58	2.235	5.809	3.299	-	-
3DK52DP	2	5	10	21,00	17,50	DN150 (6)	360	2.105	2.500	61	59	2.235	6.910	3.343	4.183	5.223
3DK72DP	2	7	14	29,40	24,50	DN200 (8)	510	2.905	3.400	62	60	2.235	9.157	3.481	4.321	5.361
3DK102DP	2	10	20	42,00	35,00	DN200 (8)	700	3.920	4.700	64	62	2.235	12.460	3.612	4.452	5.492

Power supply voltage and frequency: 380-480±10%/3/50-60Hz

Do **NOT** use the data in this document for construction purposes. Specifications are subject to change without notice.

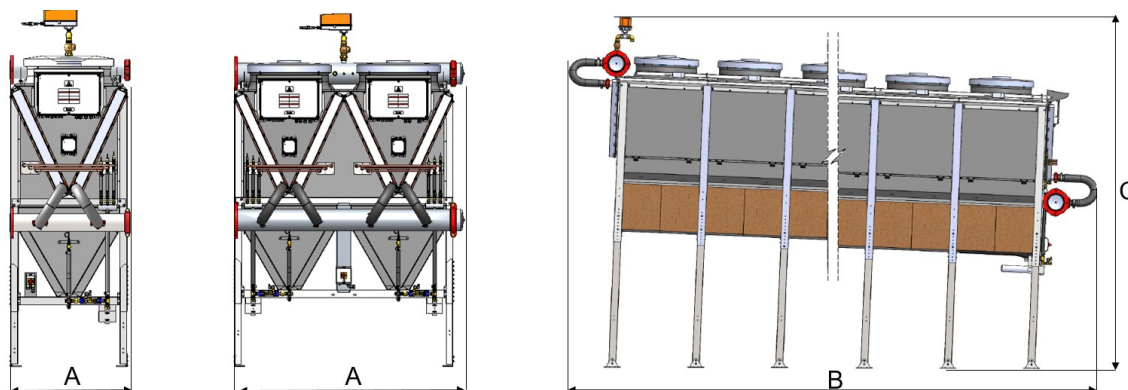
Max working temperature: 1,5 bar

(\*) Extended support leg requirements (+40 cm or +84 cm) are determined by Frigel.

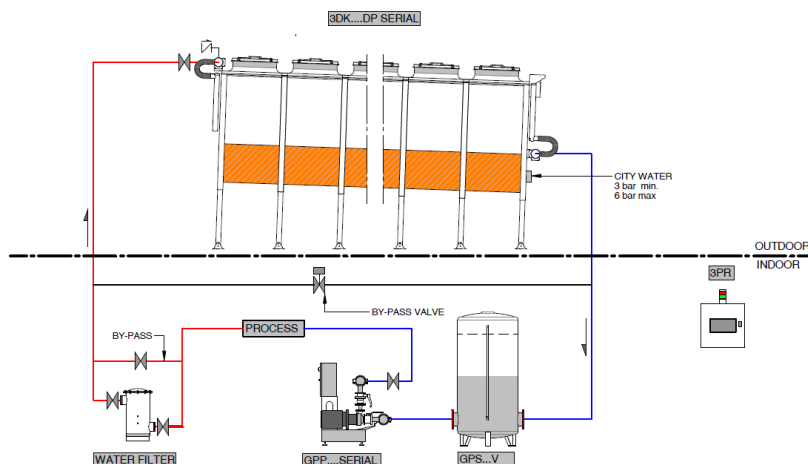
(\*\*) Adiabatic chamber spray connections: 1" GAS-F per row. Unused connections must be plugged. Adiabatic chamber drain connections: 1" hose barb.

(\*\*\*) This is also the approximate rigging weight, excluding the additional weight of the optional extended support legs.

(\*\*\*\*) Operating weights do not include external flooded piping or support steel structures.



Application diagram  
Ecody DP version  
with pumping station in  
serial communication



## Self-Draining with Series Coil Configuration (DS)

Water system (no glycol) with recirculation pump stations for moderate climates with minimal freezing conditions

Model	Rows	Fans per row	Total fans	Power input		Victaulic™ Connections mm (in) (**)	Internal volume liter	Approximate weights		Sound level dB(A) @10 m		Dimensions (mm) (*)				
				EC fans per unit (kW)	EZ fans per unit (kW)			Shipping kg (***)	Operating kg (****)	EC fan	Ez fan	A	B	C	C (+40)	C (+84)
3DK41DS	1	4	4	8,30	7,00	DN150 (6)	160	1.015	1.200	57	55	1.127	5.809	3.299	-	-
3DK51DS	1	5	5	10,50	8,75	DN150 (6)	180	1.220	1.400	58	56	1.127	6.910	3.343	4.183	-
3DK71DS	1	7	7	14,70	12,25	DN200 (8)	255	1.680	1.900	60	58	1.127	9.157	3.481	4.321	-
3DK101DS	1	10	10	21,00	17,50	DN200 (8)	350	2.315	2.700	61	59	1.127	12.460	3.612	4.452	-
3DK42DS	2	4	8	16,80	14,00	DN150 (6)	315	1.810	2.100	60	58	2.235	5.809	3.299	-	-
3DK52DS	2	5	10	21,00	17,50	DN150 (6)	360	2.165	2.500	61	59	2.235	6.910	3.343	4.183	2.553
3DK72DS	2	7	14	29,40	24,50	DN200 (8)	510	2.965	3.400	62	60	2.235	9.157	3.481	4.321	5.361
3DK102DS	2	10	20	42,00	35,00	DN200 (8)	700	3.985	4.700	64	62	2.235	12.460	3.612	4.452	5.492

Power supply voltage and frequency: 380-480±10%/3/50-60Hz

Do **NOT** use the data in this document for construction purposes. Specifications are subject to change without notice.

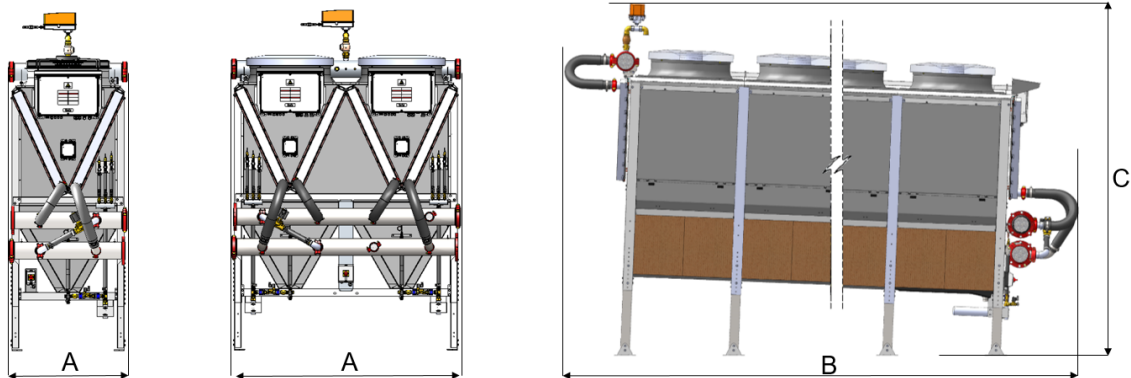
Max working temperature: 1,5 bar

(\*) Extended support leg requirements (+40 cm or +84 cm) are determined by Frigel.

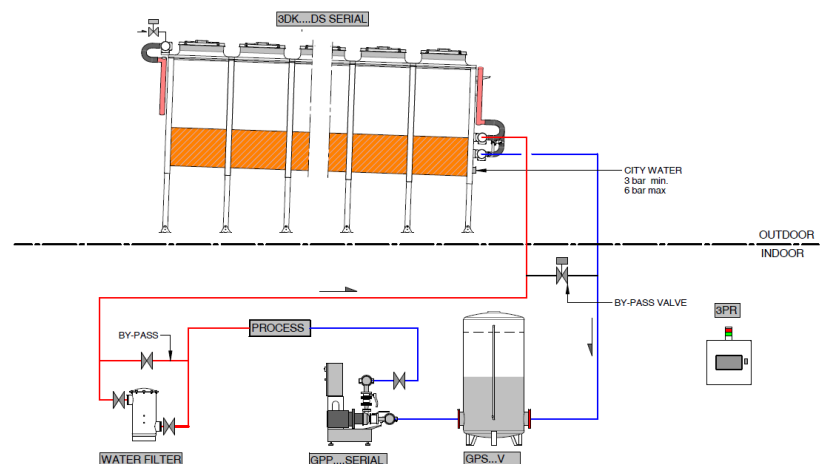
(\*\*) Adiabatic chamber spray connections: 1" GAS-F per row. Unused connections must be plugged. Adiabatic chamber drain connections: 1" hose barb

(\*\*\*) This is also the approximate rigging weight, excluding the additional weight of the optional extended support legs.

(\*\*\*\*) Operating weights do not include external flooded piping or support steel structures.



Application diagram  
Ecody DS version  
with pumping station in  
serial communication



## Applications

- Plastics
- Food and beverage
- Metal processing and die casting
- Power generation
- Pharmaceutical
- Ceramics
- Data center cooling
- HVAC
- Machine tooling
- Paper printing
- Textiles
- Wineries and distilleries

## Order Code

