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EVAPORATIVE SYSTEMS

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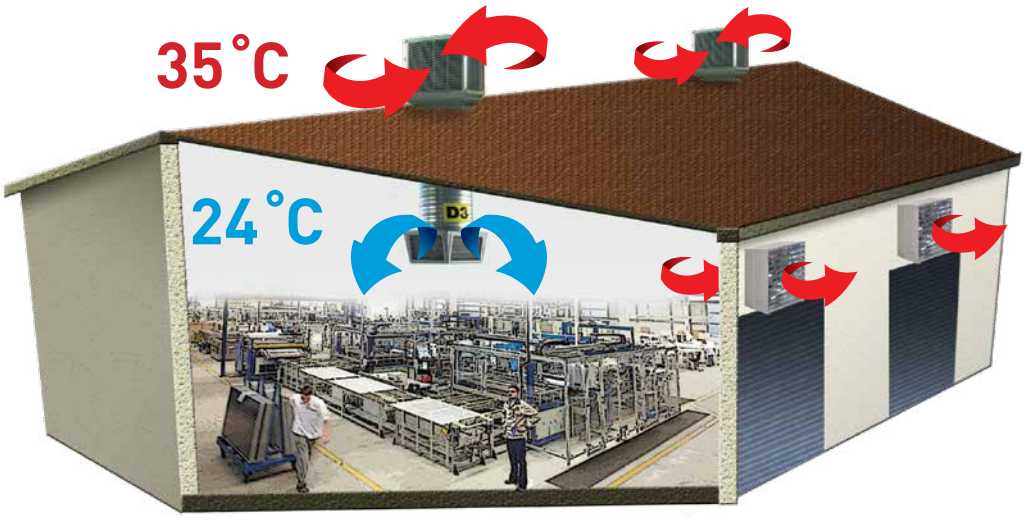
High Efficient Economic Cooling at All Location and All Geography



• Increase of business efficiency:

Human productivity falls by 4% for every degree over 22°C. FES units (Evaporative cooling units) increases human productivity with high volume of cold air.

• Practical Solution:

Quick installation, direct blow or air distribution with air duct.

• Low cost operation:

No compressor, no cooling gas, no complicated parts.

• High Efficiency:

Cooling pads are original Munters CELdec, with very high efficiency and long life.

• Economical Investment:

The capital cost is 80% less than the conventional industrial air conditioning systems.

• High Indoor Air Quality:

100% fresh air, natural filtration.

• Eco Friendly:

No refrigerant, no contaminant, low energy consumption.

• Long life:

Stainless steel or plastic casing.

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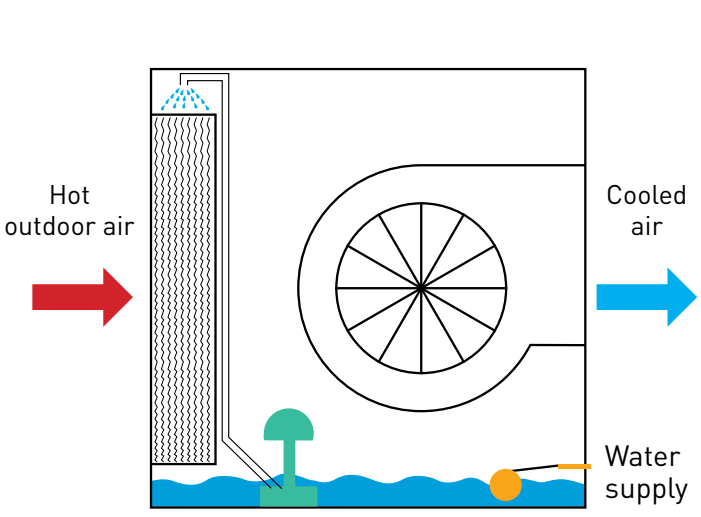
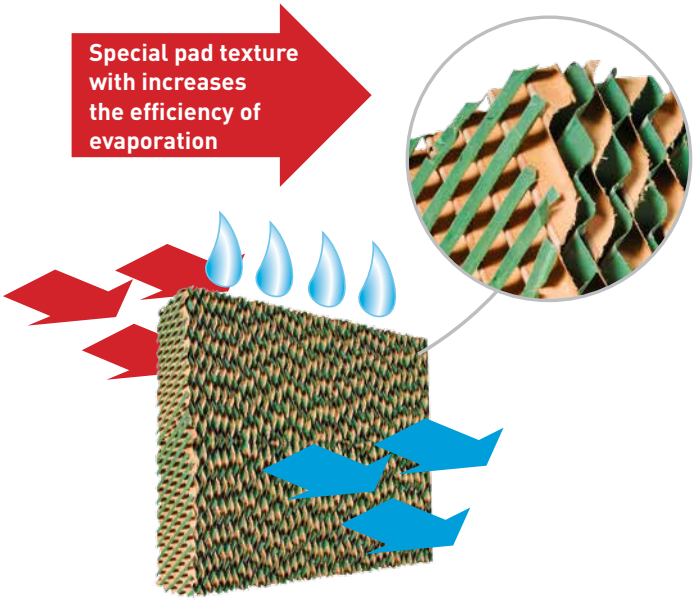
What is Evaporative Cooling?

Evaporative cooling is the addition of water vapor into air, which causes a decrease in the temperature of the air. The energy needed to evaporate the water is taken from the air in the form of sensible heat, which affects the temperature of the air, and converted into latent heat, the energy present in the water vapor component of the air, whilst the air remains at a constant enthalpy value. This conversion of sensible heat to latent heat is known as an adiabatic process because it occurs at a constant enthalpy value. Therefore, evaporative cooling causes a drop in the temperature of air proportional to the sensible heat drop and an increase in humidity proportional to the latent heat gain. Evaporative cooling can be visualized using a psychrometric chart by finding the initial air condition and moving along a line of constant enthalpy toward a state of higher humidity.
A simple example of natural evaporative cooling is perspiration, or sweat, secreted by the body, evaporation of which cools the body.

Work principle



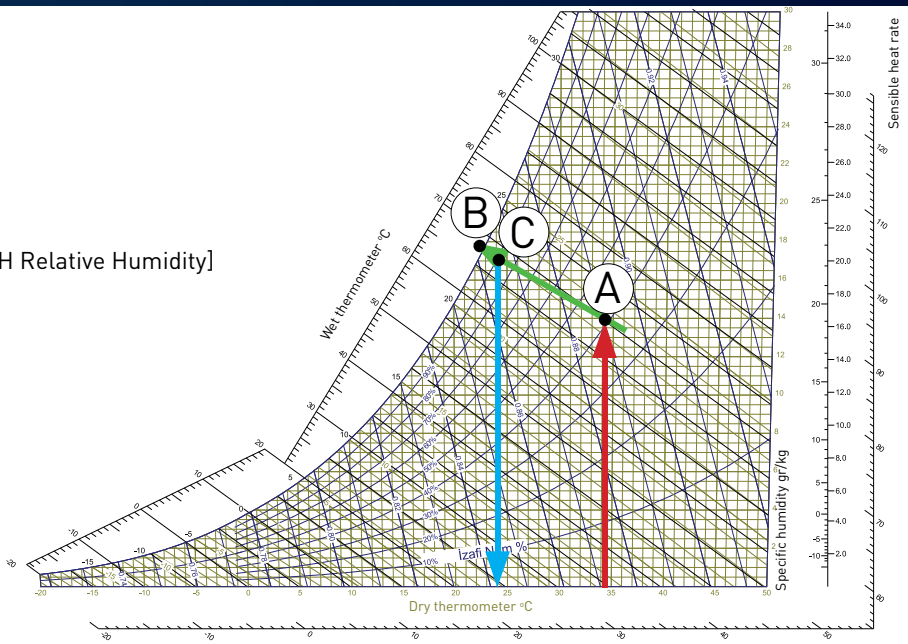


FES evaporative cooling units draw hot air through wet pads by using blower. As water evaporates from the pads it takes heat from the air with it, resulting in cooled air

Work Technic:

A : Outside Air [35,00°C, 40,00% RH]
B : 100% efficient evaporation [23,92°C, 100% RH Relative Humidity]
C : Supply Air [26,1°C, 83,62% humidity]
(80% with pad efficiency)

Δt = 10,8°C



Supply air outlet temperature calculation Formula

Tç = Tkt - [(Tkt - Tyt) x pad efficiency]

- Tç : Supply air outlet dry-bulb temperature
- Tkt : Fresh intake air dry-bulb temperature
- Tyt : Fresh intake air wet-bulb temperature

* RH : Relative Humidity
* DB : Dry-Bulb temperature

Supply air outlet temperature example:

- Tkt : Fresh intake air dry-bulb temperature = 35,00 °C
- Tyt : Fresh intake air wet-bulb temperature = 23,92°C (%20 RH)
- Pad effciency %80 (by Munters)
- Tç : Supply air outlet dry-bulb temperature

Tç = Tkt - [(Tkt - Tyt) x Pad efficiency]
Tç = 35,00 - [(35,00 - 23,92) x 0,80]
Tç = 26,10°C (Δt = 10,80°C)

Supply air outlet dry-bulb temperature

RH / DB	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%
20°C	10,7	11,4	12,0	12,7	13,3	13,9	14,4	15,0	15,6	16,1	16,6	17,1	17,6
25°C	14,2	15,0	15,8	16,5	17,2	18,0	18,6	19,3	19,9	20,6	21,2	21,8	22,3
30°C	17,6	18,5	19,5	20,4	21,2	22,0	22,8	23,6	24,3	25,0	25,7	26,4	27,0
35°C	20,9	22,1	23,2	24,2	25,2	26,1	27,0	27,9	28,7	29,5	30,3	31,0	31,8
40°C	24,3	25,6	26,9	28,1	29,2	30,3	31,3	32,2	33,2	34,0	34,9	35,7	36,5
45°C	27,6	29,1	30,6	31,9	33,2	34,4	35,5	36,6	37,6	38,6	39,5	40,4	41,2
50°C	30,9	32,7	34,3	35,9	37,3	38,6	39,8	41,0	42,1	43,1	44,1	45,1	46,0
55°C	34,3	36,3	38,1	39,8	41,3	42,8	44,1	45,4	46,6	47,7	48,8	49,8	50,7
60°C	37,7	39,9	41,9	43,8	45,5	47,0	48,5	49,8	51,1	52,3	53,4	54,5	55,5

Water consumption tendency (Liter, for 1000m³/h Air Flow)

RH / DB	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%
20°C	4,52	4,21	3,90	3,59	3,30	3,02	2,73	2,46	2,19	1,92	1,66	1,41	1,16
25°C	5,21	4,83	4,46	4,11	3,76	3,43	3,09	2,77	2,47	2,17	1,87	1,58	1,30
30°C	5,90	5,45	5,01	4,61	4,21	3,84	3,47	3,11	2,75	2,40	2,07	1,75	1,44
35°C	6,59	6,08	5,58	5,12	4,67	4,23	3,82	3,41	3,02	2,62	2,26	1,92	1,57
40°C	7,29	6,69	6,14	5,61	5,10	4,61	4,16	3,70	3,29	2,86	2,47	2,09	1,70
45°C	7,98	7,31	6,68	6,10	5,53	5,00	4,48	4,00	3,53	3,09	2,65	2,24	1,85
50°C	8,66	7,90	7,22	6,57	5,93	5,37	4,80	4,30	3,81	3,30	2,86	2,39	1,98
55°C	9,32	8,48	7,72	7,01	6,37	5,72	5,15	4,57	4,06	3,54	3,04	2,58	2,08
60°C	9,97	9,05	8,22	7,46	6,77	6,10	5,49	4,86	4,32	3,81	3,25	2,71	2,20

Supply air outlet dry-bulb temperature and water consumption tendency tables is a sample.
Data may change according to the unit model.
Data is not binding. For sensitive data, hydraulic calculations are applied.

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Plastic Body Units With Axial Fan

Specifications

- Long life plastic case. 10 years warranty.
- Voltage and surge-protected electric motors. (IP55, long life)
- Motors IE2 / IE3 HIGH - PREMIUM energy efficiency class.
  SGM 2012/2 and EN 60034-30-1: 2014, European Norms and Turkish Standards, energy efficiency according to the communique.
- Optional inverter controller for internal fan.
- The unit has the highest pad area and it is the most efficient unit in the market
- For bottom blowing, the outlet of this unit is compatible with the circular and the rectangular duct.
- The automatic timed drainage system
- LCD panel control
- Axial fan blows high-pressure air in sailor propeller type.
- Ozone generator for high hygiene requirements (optional)
- Pollution sensor (optional)
- Dosing system (optional)
- There are cartridge filters in front of the pads for filter inlet air. Easy to clean up. No need to change.
- Provides maximum cooling with highly efficient pads and highest pad area.
  APB-Bottom Blowing
  APT-Top Blowing

Model	FES25-APB FES25-APT	FES30-APB FES30-APT
Air Flow (m^3/h)	25000	30000
Pressure (Pa 0)	200	250
Fan Speed	On-Off /20 Steps (Ops)	On-Off /20 Steps (Ops)
Power (kW)	2.2	3.0
Voltage	230V / 380V	380V
Fan Type	Axial	Axial
Water Tank (l)	60	60
Dimensions WxLxH (mm)	1250x1250x1400	1250x1250x1400
Air Outlet Size - Rectangle (mm)	800x800	800x800
Air Outlet Size - Diameter (mm)	Ø710	Ø710
Pad Area (m^2)	3,83	3,83
Control	LCD Panel (Keyboard) Bluetooth Android	LCD Panel (Keyboard) Bluetooth Android
Cleaning Function	Automatic	Automatic
Dust Pre-filter	Cartridge Type	Cartridge Type
Ozone Hygiene System	Optional	Optional
Water inlet	½"	½"
Drainage	1"	1"
Net Weight (kg)	100	100
Net Weight (kg)	160	160

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Plastic Body Units With Centrifugal Fan

Specifications

- Long life plastic case. 10 years warranty.
- Voltage and surge-protected electric motors. (IP55, long life)
- Motors IE3 PREMIUM energy efficiency class.
  SGM 2012/2 and EN 60034-30-1: 2014, European Norms and Turkish Standards, energy efficiency according to the communique.
- Optional inverter controller for internal fan.
- The unit has the highest pad area and it is the most efficient unit in the market
- For bottom blowing, the outlet of this unit is compatible with the circular and the rectangular duct.
- The automatic timed drainage system
- LCD panel control
- Radial fan, stainless steel roller, custom painted.
- Ozone generator for high hygiene requirements (optional)
- Pollution sensor (optional)
- Dosing system (optional)
- There are cartridge filters in front of the pads for filter inlet air. Easy to clean up. No need to change.
- Provides maximum cooling with highly efficient pads and highest pad area.
  RPB-Bottom Blowing
  RPS-Side Blowing

Model	FES10-RPB FES10-RPS	FES16-RPB FES16-RPS	FES20-RPB FES20-RPS
Air Flow (m^3/h)	10000	16000	20000
Pressure (Pa 0)	150	200	250
Fan Speed	On-Off /20 Steps (Ops)	On-Off /20 Steps (Ops)	On-Off /20 Steps (Ops)
Power (kW)	1.5	2.2	5.5
Voltage	230V / 380V	230V / 380V	380V
Fan Type	Centrifugal	Centrifugal	Centrifugal
Water Tank (l)	60	60	60
Dimensions WxLxH (mm)	1250x1250x1400	1250x1250x1400	1250x1250x1400
Bottom Air Outlet Rectangle / Diameter (mm)	800x800 / Ø710	800x800 / Ø710	800x800 / Ø710
Side Air Outlet Dikdörtgen (mm)	470x405	560x480	560x480
Pad Area (m^2)	3,83	3,83	3,83
Control	LCD Panel (Keyboard) Bluetooth Android	LCD Panel (Keyboard) Bluetooth Android	LCD Panel (Keyboard) Bluetooth Android
Cleaning Function	Automatic	Automatic	Automatic
Dust Pre-filter	Cartridge Type	Cartridge Type	Cartridge Type
Ozone Hygiene System	Optional	Optional	Optional
Water inlet	½"	½"	½"
Drainage	1"	1"	1"
Net Weight (kg)	155	180	180
Net Weight (kg)	215	240	240

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Stainless Steel Body Units With Centrifugal Fan

Specifications

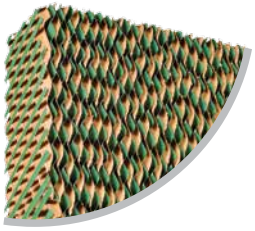
- Long life Stainless Steel Body.
- Voltage and surge-protected electric motors. (IP55, long life)
- Motors IE3 PREMIUM energy efficiency class.
  SGM 2012/2 and EN 60034-30-1: 2014, European Norms and Turkish Standards, energy efficiency according to the communique.
- Optional inverter controller for internal fan.
- The unit has the highest pad area and it is the most efficient unit in the market
- The automatic timed drainage system
- LCD panel control
- Radial fan, stainless steel roller, custom painted.
- Axial fan blows high-pressure air in sailor propeller type.
- Ozone generator for high hygiene requirements (optional)
- Pollution sensor (optional)
- Dosing system (optional)
- There are cartridge filters in front of the pads for filtering the inlet air. Easy to clean up. No need to change.
- Provides maximum cooling with highly efficient pads and highest pad area.
- G4 filters are to filter the inlet air in front of the combs (Optional).
- It is made of special extruded aluminum profiles in the frame of honeycomb,
  RCB-Bottom Blowing
  RCT-Top Blowing
  RPS-Side Blowing

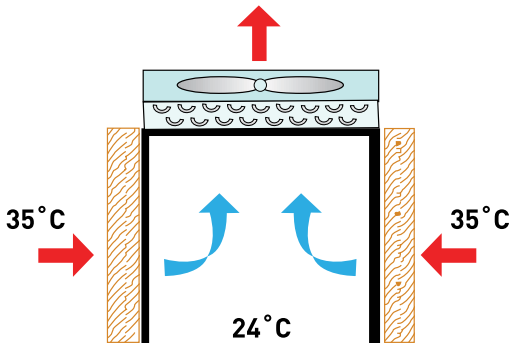
Model	FES35-RCB FES35-RCT FES35-RCS
Air Flow (m^3/h)	35000
Pressure (Pa 0)	350
Fan Speed	On / Off
Power (kW)	5.5
Voltage	380V
Fan Type	Centrifugal
Water Tank (l)	150
Dimensions WxLxH (mm)	1600x1600x1800
Air Outlet Rectangle (mm)	715x715
Pad Area (m^2)	7,2
Control	LCD Panel (Keyboard) Blue-tooth Android
Cleaning Function	Automatic
Dust Pre-filter	G4 (optional)
Ozone Hygiene System	Opsiyonel
Water inlet	½"
Drainage	1"
Net Weight (kg)	430
Net Weight (kg)	580

Please consult for other special flow rates.

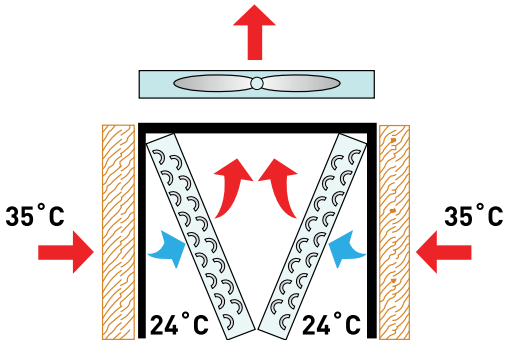
How does it works?

FESChill units cool the condenser air inlet of the air-cooled chillers with very low cost. Easily installed evaporative cooling pads can be installed to all types of condensers. The cooling pads are kept wet with simple water circulation. The existing fans of the condenser pull the air through the pads and then through the condensers. The wet pads cool the air to wet bulb temperature, which becomes cooler before entering the condenser. With the cooler air entering the condenser, it works much more effectively enabling the cooling performance to increase and the energy consumption of the chiller to decrease. The overall working performance (COP) of the system increases, while the system and condenser's life-time increases and the break-down risks decreases.





Standard Condenser



"V" Type Condenser

Advantages

- Air cooled condenser does not get wet
- Air cooled condenser surface is kept clean, there is no scale formation
- The manufacturer warranty of condenser is not effected
- Optimum water usage
- System works continuously, does not work with on-off periods
- System does not generate temperature fluctuations
- The evaporation effectiveness is high (up to 96%)
- Operates with minimum energy
- The system works with low pressure water
- Electric consumption is minimum (0.5 kw pump)
- No electrical and complicated devices other than small circulation pump
- Prevents pressure loss of condenser by keeping it clean
- Most economical efficiency increase methodology
- Easy to apply and problem free operation
- Simple and low cost automation system
- Very low maintenance cost
- Increases the life-time of the air cooled chiller

Increased Cooling Capacity Reduced Energy Use

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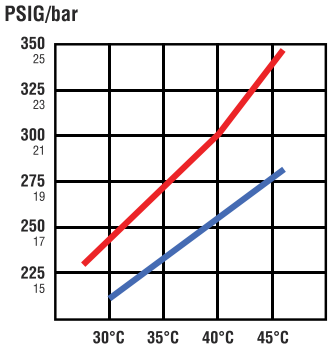
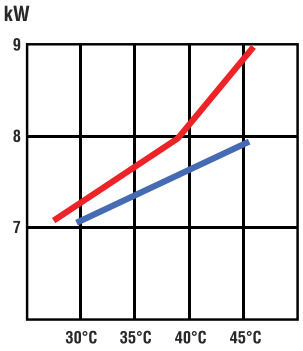
Why FesChill?

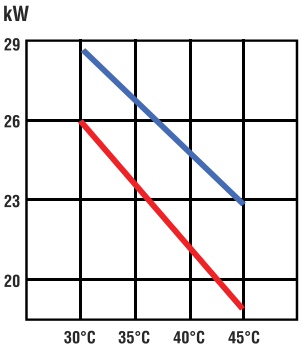
Decreased Freon gas working pressure



Reduced energy consumption

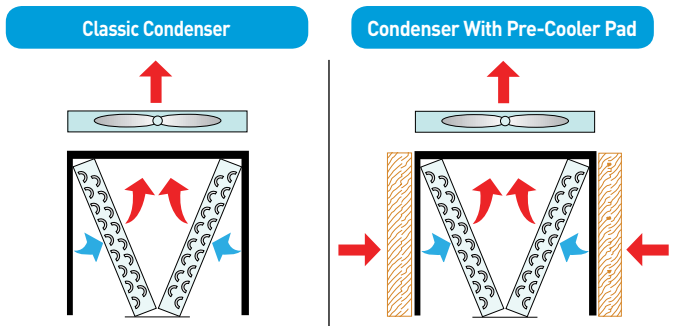


Increased cooling capacity



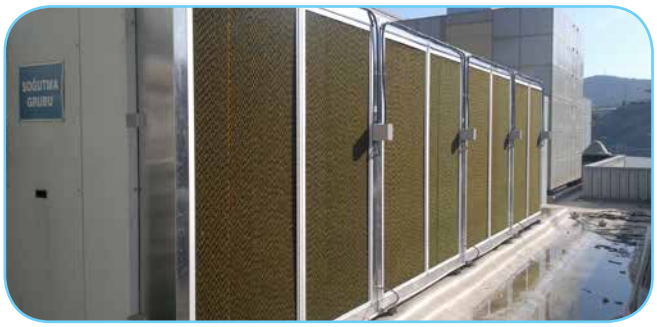
Classic condenser condenser with pre-cooler pad

The condenser's air inlet decreases the system's working pressure, which creates increased cooling capacity and decreased energy usage.



	Classic Condenser	Condenser With Pre-Cooler Pad	Savings
Condenser Air Inlet	36°C	25°C	
Energy Consumed	64 kW	52 kW	%19
Cooling Capacity	162 kW	179 kW	%11
COP	2.53	3.44	%36

The savings are illustrated on the table above for Air cooled condensers with and without FESChill unit. As a result of 11°C decrease in inlet air, the energy consumed by the Chiller is decreased by 19% and the cooling capacity is increased by 11%. This allows the EER or COP of the chiller to increase by 36%. On average every 1.8°C decrease of air inlet temperature achieved by the pre-cooling pads, increases the condenser effectiveness by 2 %.



Control Systems

FesKlima Industrial Evaporative Coolers

ANDROID APP ON Google Play

- Connectable to building automation.(RS485)
- It is possible to control up to 16 units at the same time with 1 control panel.
- English / Turkish language option is available.
- Bluetooth control with FesKlima Google Play app.
- The unit starts and stops automatically with the time settings.
- The unit can be operated according to entered setpoints for temperature and humidity.
- There is a time-controlled automatic drainage system. Also, drain with manually can be provided.
- Thanks to “hygiene” function, the unit makes its own cleaning when it is turned off.
- Only fan operation mode is also available. Only 100% of fresh air can be ventilated indoors.
- Dosage Pump; the water inside of the system can be conditioned. (optional)
- PPM sensor; the drainage starts automatically when the water is contaminated. (optional)
- The fan speed can be controlled by adding an inverter. (optional)

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Optional Accessories

• FESKlima Ozone Technology

Antimicrobial Ozone Technology

The most effective natural disinfectant against microbes. Provides hygiene in water, and eliminate bad smell.

Ozone is a very powerful oxidizer. In the water, it is used to eliminate bad smell, microbes and many organic molecules that pollute the environment. The Ozone, also, is a very powerful disinfectant. It provides a healty area. **It is completely natural** it is a very powerful disinfectant. It is not a chemical component and there will be no residue. **When we compare with the other disinfectant which have repercussions, Ozone which is a natural cycle is more healty and more effective.**

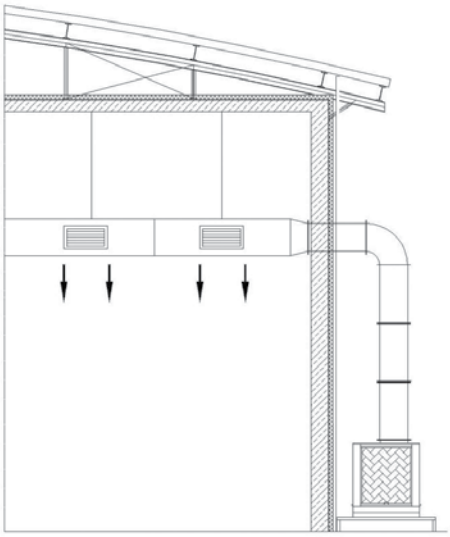
• FESKlima Anti-scale Tablet

This is a special tablet which is seasonaly and reduces calcifcation in pad and unit. Therefore, the pad and the unit life extends and cooling effciency always remains high.

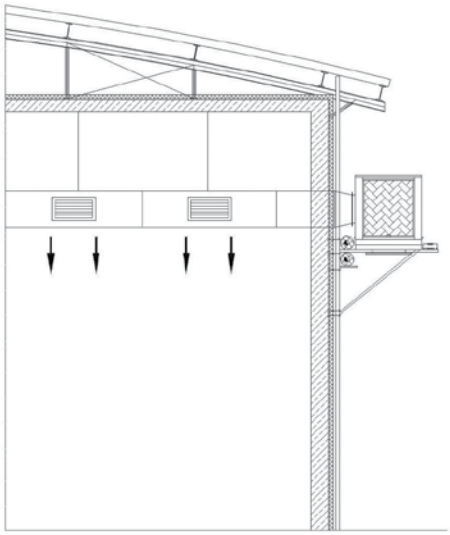
• FESKlima 8-way Diffuser

Manufactured from long life ABS.
Reducing the roof load, it is a very light and effective for air distribution.
The blowing direction could be regulated. With 8 pieces aluminium vents, it provides homogeneous air distributing.

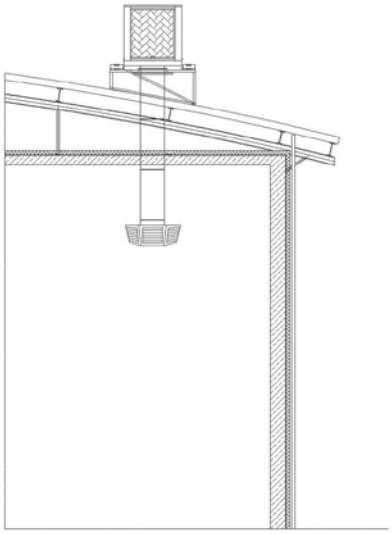
Installation Figures



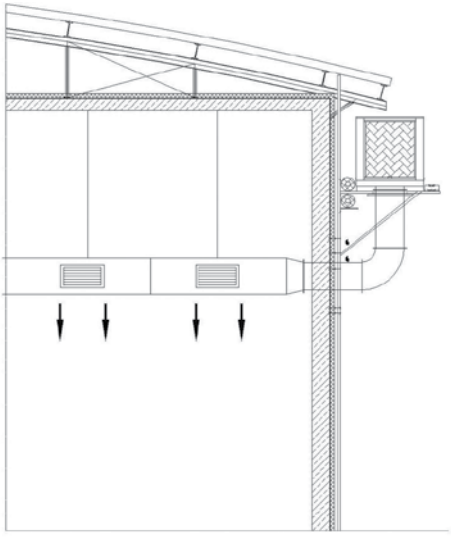
Top-Blowing Installation
FESKLİMA 35RCT - 30APT - 25APT



Side-Blowing Installation
FESKLİMA 35RCS - 20RPS - 16RPS - 10RPS



Bottom-Blowing Installation
FESKLİMA 35RCB - 20RPB - 16RPB - 10RPB - 30APB - 25APB



Bottom-Blowing Installation
FESKLİMA 35RCB - 20RPB - 16RPB - 10RPB - 30APB - 25APB

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Installation Areas

- Factories
- Textile factories
- Weaving and spinning factories
- Confection factories
- Foundries
- Industrial kitchens
- Show tents
- Mosques
- Laundries
- Industrial ovens
- Drying facilities
- Warehouses
- Shipyards
- Poultry farms
- Sports facilities
- Outdoor areas
- Restaurants
- Wedding halls