

**FesKlima**  
Industrial Evaporative Cooling Units

**FesChill**  
Pre-Cooling Systems

“Design By Nature, Technology From FesKlima”



**FORM** **55**  
YIL YEARS



Form Endüstri Tesisleri, has been carrying on its environmental and innovative activities for 55 years as the production company of Form Group of Companies.

Established in 1965, Form Group has 55 years of experience in the Turkish Air Conditioning market. The main activity is on air conditioning and renewable energy sector. The head office is located in Maslak-Istanbul, with sales and service offices in Ankara, İzmir, Antalya, Adana and Bursa. The production facility of Form Group is in Pancar Industrial Zone, İzmir.

The value given to energy efficiency is the main philosophy of all production of Form Endüstri Tesisleri.

Areas of activities are Industrial Evaporative Cooling Units, Evaporative Condenser Pre-Cooling Units, Natural Daylighting Systems, Natural Ventilation, Semi-Rigid Mini Flexible Air Ducting, Smoke and Heat Extraction Ventilation Systems.

FesKlima Industrial Evaporative Cooling Units have made very important references for 11 years.

Both in Turkey and abroad maximum cooling with minimum energy unit is provided for more than 5,000 employees.

With the help of air-cooled groups working on design temperatures as a result of global warming, high energy consumption, transition failure transition and decrease in efficiency problems are prevented with FesChill Evaporative Condenser Pre-Cooling Units.

As Form Endüstri Tesisleri, the importance that we attach to green energy has directed our production activities intensively on this issue. We are the first and only domestic manufacturer in Turkey. Sunvia tube, Our daylight lighting systems provide natural lighting by moving daylight into dark places with zero energy.

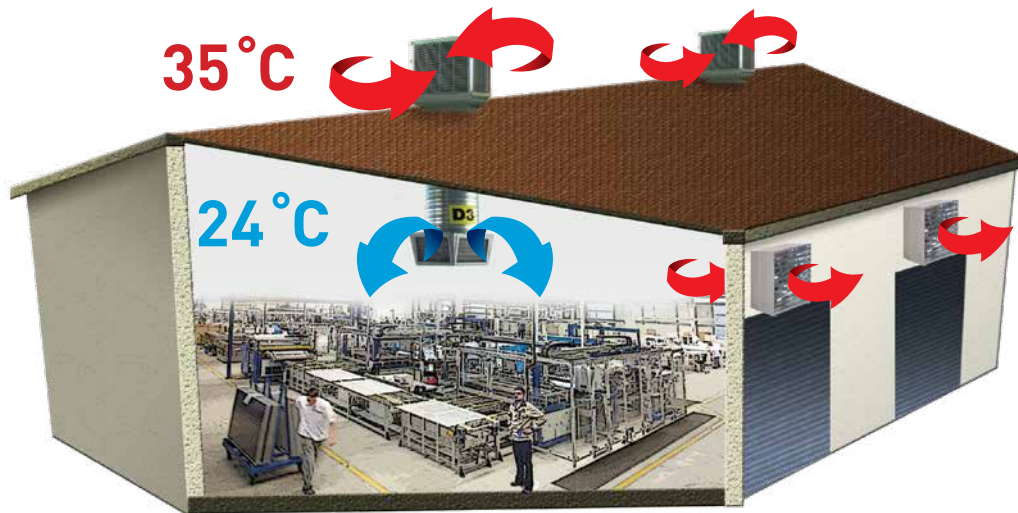
About CE certified, smoke and heat extraction systems developed for fire safety in the plant by offering the most comprehensive range of products and systems diversity. In Turkey, we provide for all kinds of industrial facilities and structures in the maximum level of safety of life and property.

In addition, within our production facility, we also have Lennox brand air conditioner production activities within the scope of domestic production Form brand fancoil, heat pump and license agreement signed. Production with these investments we have made to our facility and increasing our contribution to both domestic production and employment we provide.

For more information about Form Group please visit [www.formgroup.com](http://www.formgroup.com).

**Fes**Klima

## 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.



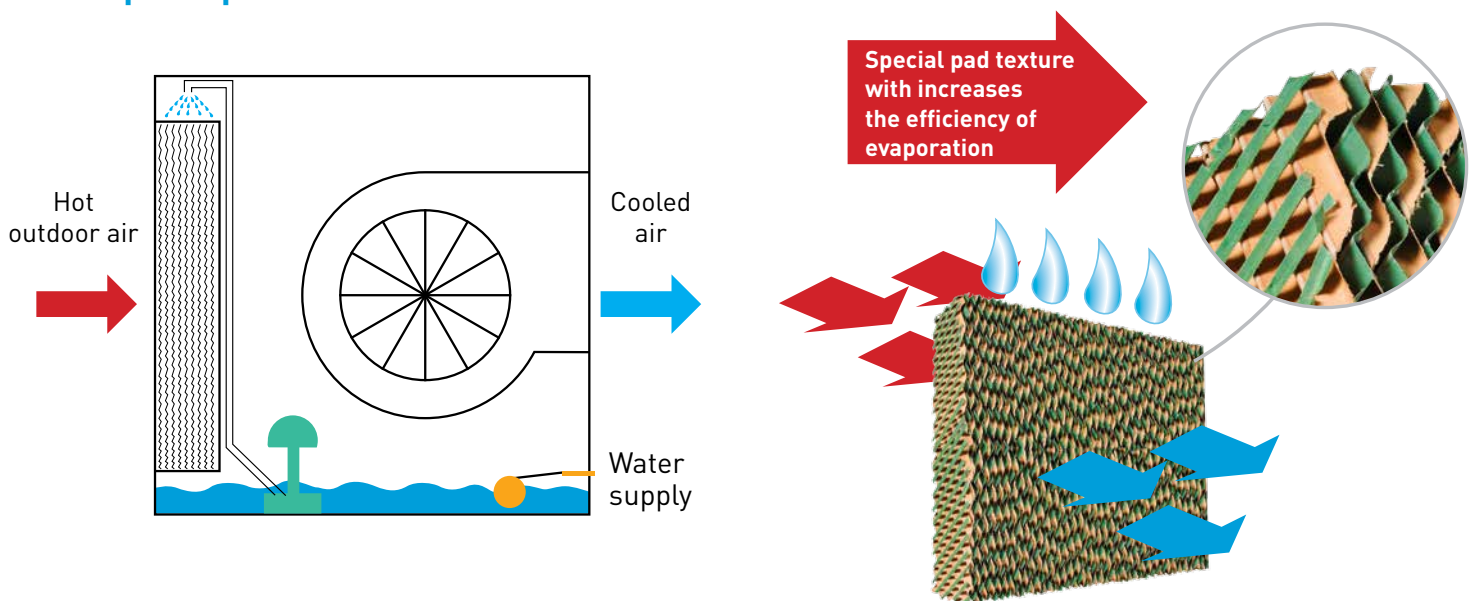
## What is Evaporative Cooling?

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

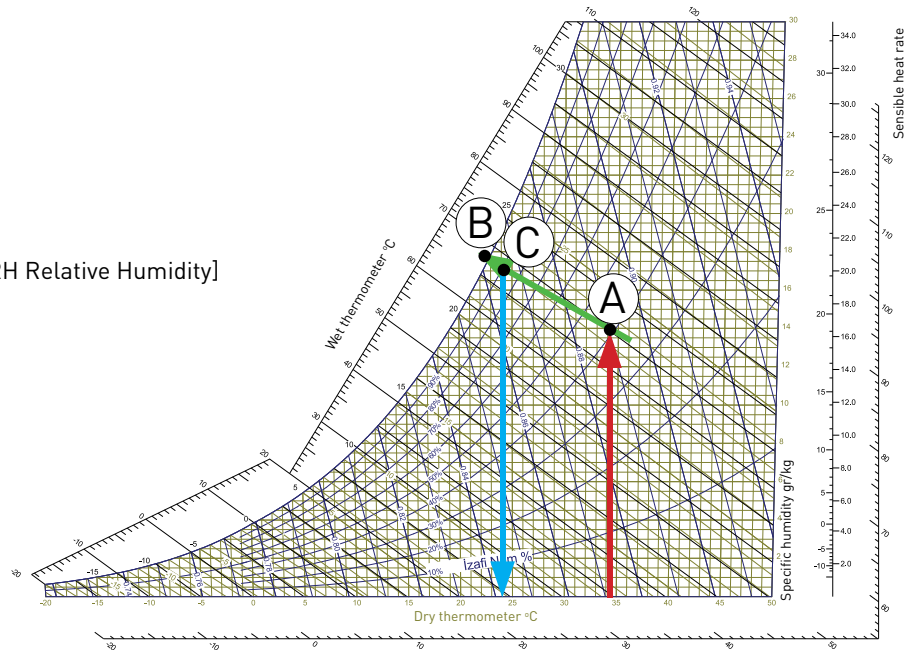


FES evaporative cooling units draw hot air through wet pads by using blower. As water evaporates from the pads it takes heat from the air with it, resulting in cooled air

## 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)

$\Delta t = 10,8^\circ\text{C}$



## Supply air outlet temperature calculation Formula

$$T_c = T_{kt} - [(T_{kt} - T_{yt}) \times \text{pad efficiency}]$$

## Supply air outlet temperature example:

- T<sub>kt</sub> : Fresh intake air dry-bulb temperature = 35,00 °C
- T<sub>yt</sub> : Fresh intake air wet-bulb temperature = 23,92°C (%20 RH)
- Pad efficiency %80 (by Munters)
- T<sub>c</sub> : Supply air outlet dry-bulb temperature

- T<sub>c</sub> : Supply air outlet dry-bulb temperature
- T<sub>kt</sub> : Fresh intake air dry-bulb temperature
- T<sub>yt</sub> : Fresh intake air wet-bulb temperature
- \* RH : Relative Humidity
- \* DB : Dry-Bulb temperature

$$T_c = T_{kt} - [(T_{kt} - T_{yt}) \times \text{Pad efficiency}]$$

$$T_c = 35,00 - [(35,00 - 23,92) \times 0,80]$$

$$T_c = 26,10^\circ\text{C} (\Delta t = 10,80^\circ\text{C})$$

## Supply air outlet dry-bulb temperature

DB \ RH	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)

DB \ RH	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.

## 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 communiqué.
- 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 (m³/h)	25000	30000
Pressure (Pa 0)	200	250
Fan Speed	On-Off /20 Steps (0ps)	On-Off /20 Steps (0ps)
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 (m²)	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

# 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 communiqué.
  - 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 (m³/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 (m²)	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



## 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 communiqué.
- 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

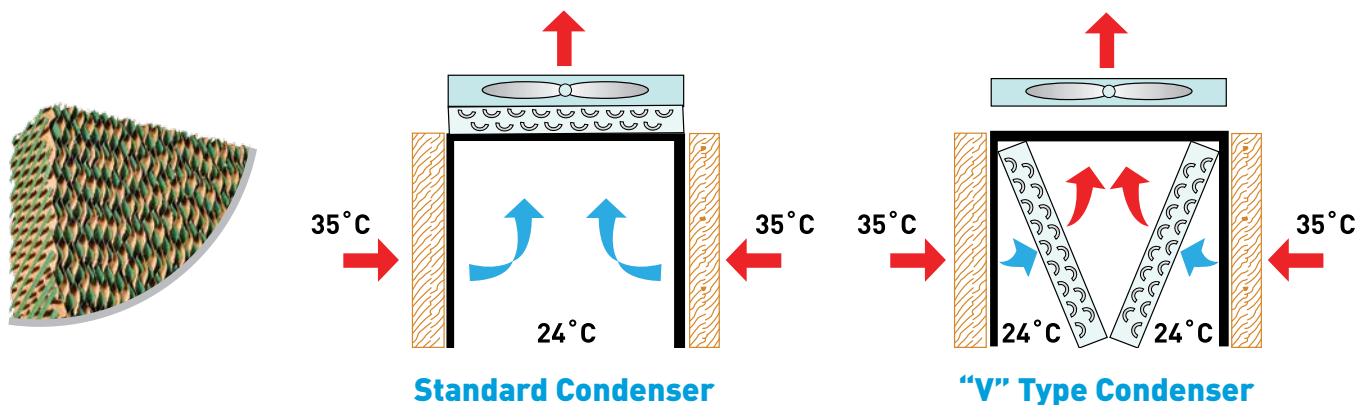
Model	FES35-RCB FES35-RCT FES35-RCS
Air Flow (m³/h)	35000
Pressure (Pa 0)	350
Fan Speed	On / Off
Power (kW)	5.5
Voltage	380V
Fan Type	Centrifugal
Water Tank (l)	150
Dimensions WxLxH (mm)	1600x1600x1800
Air Outlet Rectangle (mm)	715x715
Pad Area (m²)	7,2
Control	LCD Panel (Keyboard) Blue-tooth Android
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.



### 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

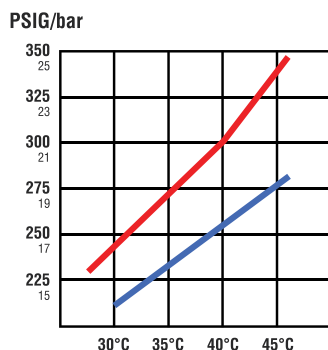


**Increased  
Cooling Capacity  
Reduced  
Energy Use**

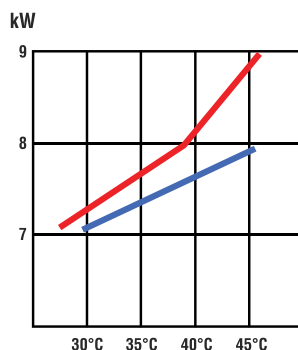


## Why FesChill?

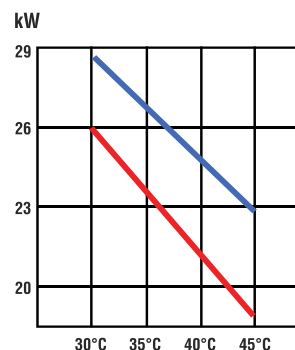
### Decreased Freon gas working pressure



### Reduced energy consumption

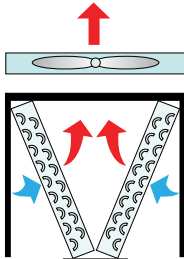
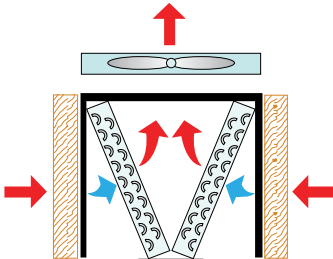



### Increased cooling capacity



— 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		
				
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



- 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)



## 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 healthy 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 healthy and more effective.**



### • FESKlima Anti-scale Tablet



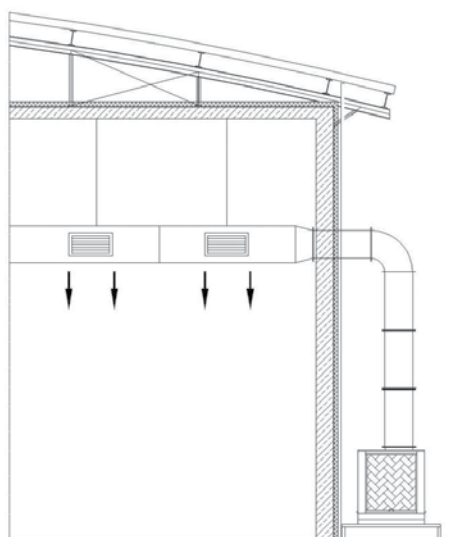
This is a special tablet which is seasonally and reduces calcification in pad and unit. Therefore, the pad and the unit life extends and cooling efficiency always remains high.

### • FESKlima 8-way Diffuser



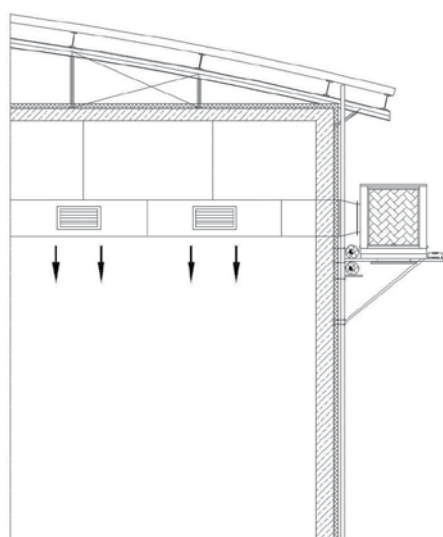
Manufactured from long life ABS. Reducing the roof load, it is a very light and effective for air distribution. The blowing direction could be regulated. With 8 pieces aluminium vents, it provides homogeneous air distributing.

## Installation Figures



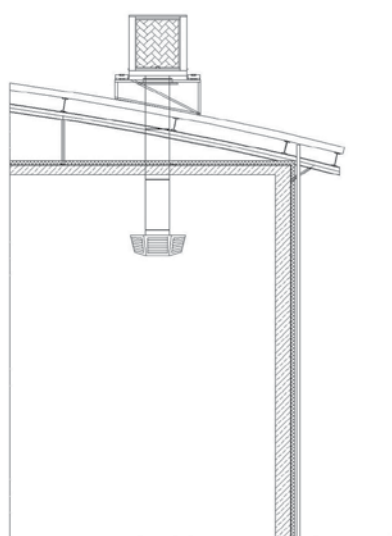
### Top-Blowing Installation

FESKLIMA 35RCT - 30APT - 25APT



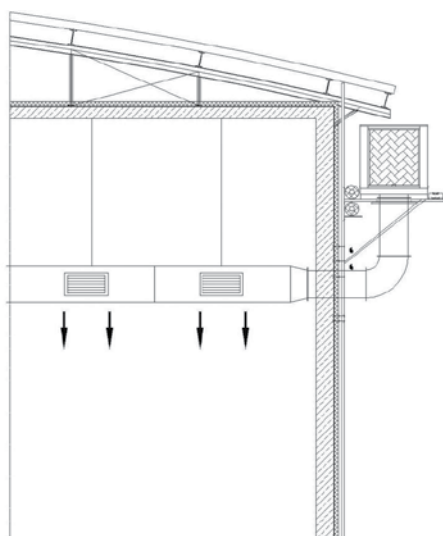
### Side-Blowing Installation

FESKLIMA 35RCS - 20RPS - 16RPS - 10RPS



### Bottom-Blowing Installation

FESKLIMA 35RCB - 20RPB - 16RPB - 10RPB - 30APB - 25APB

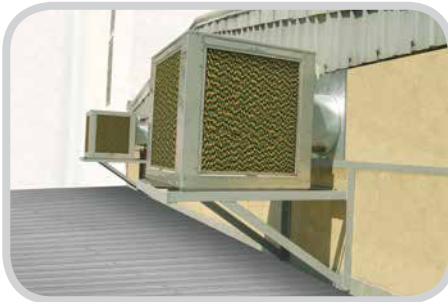


### Bottom-Blowing Installation

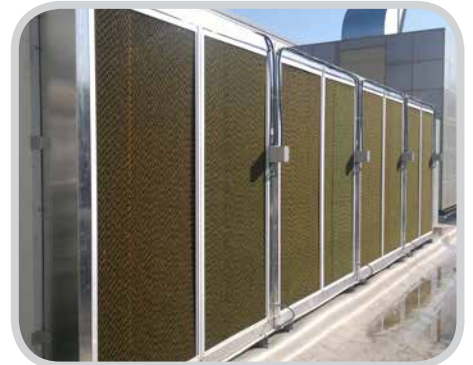
FESKLIMA 35RCB - 20RPB - 16RPB - 10RPB - 30APB - 25APB

## 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







# FORM ENDÜSTRİ TESİSLERİ

Form Endüstri Tesisleri is the manufacturing company of the Form Group and has been carrying on its environmental and innovative activities for 55 years as the production company of Form Group of Companies. It continues its manufacturing activities into the 11.000 m<sup>2</sup> factory area in Pancar Industrial Zone, Izmir. Troke Smoke and Heat Extraction Ventilation Systems, Sunvia daylighting systems, and FesKlima evaporative coolers are patented designs of Form Manufacturing. The Form has of experience in manufacturing many different productions for the HVAC sector.

The main philosophy of Form Endüstri Tesisleri is that value be given to energy efficiency in all its' manufacturing. Principal activities of the company are the production of industrial evaporative cooling units, evaporative condenser pre-cooling units, natural daylighting systems, heat and smoke extraction, natural ventilation units.

## FORM ENDÜSTRİ TESİSLERİ SANAYİ A.Ş.

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## FORM GROUP

Established in 1965, Form Group has years of experience in the Turkish Air Conditioning market. The main activity is on air conditioning and industrial systems. The head office is located in Maslak-İstanbul, with sales and service offices in Ankara, İzmir, Antalya, Adana and Bursa. The production facility of Form Group is in Pancar İzmir Industrial Zone. Form Group aims to provide high quality equipment and systems with low energy use, for various types of buildings and applications.



### Central Air Conditioning Sales and Service

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### Regional Directorates

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Bursa

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