



# GENERAL CATALOGUE

Engineering Excellence  
in Greenhouse Climatization Systems



*We create the most suitable ecosystem  
for efficient greenhouse farming*



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# ABOUT US

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## Hi-end handling for your precious crops

**As Timfog, a brand under the MCM Engineering Group umbrella, we create tailor made engineering services for the greenhouse sector and focus on climatization systems and needs for greenhouses, with in-house project designing and machinery production, made in Turkey.**

We adopt as a basic principle to provide the most optimal solution service to the expectations and demands of our customers by constantly renewing ourselves with our experience and knowledge with international brands we use, correct capacity calculations, system designs that will run smoothly for years.

By reading the demands of our customers in a correct and precise way, we make sure the raw material selection and mechanical design are most optimized to the fullest, and with our broad experience and knowledge in different geographies, we provide the most accurate consultancy service to the producers in the field of greenhousing.





*With our strong foundations laid in 2002, we continue to take part in many industrial, agricultural and commercial projects in 50 different geographies of the world, with a solid-mutli brand strategy within our group, focusing on process and software engineering in many different sectors and producing innovative solutions and systems in greenhouse climatizations.*

Müslim **Sevencan**  
**General Manager**

## values.

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### **Engineering Excellence**

We are engineers, we are proud of our engineering heritage and we strive to be the best in engineering solutions. We do not engineer correctly, we do engineering correct. We always approach to every project holistically and ensure the solution we engineer fits the bill. Our value of engineering excellence keeps us focused on enhancing lives of every customer we serve.

### **Clear & Open Communication**

We believe in the power of clear and open communication.

We like to be as clear and to the point as we can and value directness above anything else.

### **Integrity**

We work with integrity and strive to maintain and build on our standards, proving our reputation for reliability.

We say what we do and we do what we say. Our word means more than any cost we need to bear. We value universal business ethics and live accordingly to fulfill them.

### **Customer Focus**

We act with a team spirit, aiming to produce solid solutions for our customers.

Customer focus mindset enables us to deliver on time, on cost and on quality. We act for project success. We always take our customer's project as our project. We listen, we care and we own. We are genuine.

### **Teamwork**

We believe in teamwork and work with passion.

Because we communicate with each department before we go on the field and prefer to lead the match together. We love what we do, and always work with passion, from a distance and up close.





# HEATING SYSTEMS

# HEATING SYSTEMS

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*We take the most difficult climatic and mechanical conditions into account when designing our heating systems.*

It is important that the temperature can be regulated day and night and that the heating system has sufficient capacity; hence, we make it our priority to provide an ideal and sustainable heating system for a homogeneous greenhouse climate without any cold spots. We take a holistic approach from choosing the correct machine and equipment selection to correct assembly and commissioning, along with an ideal control system.

**The components of our heating systems are boilers, burners, economizers, pumps, greenhouse fittings and valves and heating control system.**



The hot water boilers used in the Timfog projects are perfectly suitable for greenhouses using CO<sub>2</sub> as well as for normal greenhouses, thanks to the special system inside.

Timfog has gained international experience in greenhouse heating systems with more than 250 boilers that the company has put into operation so far.

As a result of R&D studies carried out with manufacturers, the company has developed and commissioned systems that produce very low levels of NO<sub>x</sub>, especially in boiler plants where CO<sub>2</sub> is extracted from the flue gas.

With a much lower flue gas temperature than normal boilers, these boilers offer investors significant fuel savings.

We create tailor made climatization engineering services for you and for your clients with in-house Project designs and machinery production covering all equipment, manufacturing and engineering needs of a greenhouse climatization process.

Our priority is to provide an ideal and sustainable heating system for a homogeneous greenhouse climate without any cold spots. We take a holistic approach from choosing the correct machine and equipment selection to correct assembly and commissioning, along with an ideal control system.





# HEATING SYSTEMS

Thanks to the 50 + 50 mm rock wool insulation surrounding the outer wall of the boiler, it is ensured that the hot water in the boiler can be kept for a very long time without cooling. Timfog uses high-quality and very compact hot water boilers thanks to the cooperation with international boiler brands. Thanks to the unique designs for the 2nd and 3rd flame pass in the boiler, the internal temperature of the boiler is maintained at an optimum level. Thanks to their compact structure, these boilers have advanced features that can be used for any greenhouse.



Flue gas economizers/condensers are used to cool flue gasses from natural gas-fired plants. In most installations, economizers are located at the back or top of the boiler. The energy in these installations is used to heat the water. The maximum temperature of the exhaust gasses in the economizer is 210°C.

The water circulating in the installation is heated to a maximum temperature of 95 ° C by using the additional efficiency of the flue gas economizer. The economizer is part of a closed system with a maximum permissible pressure of 3 bar.

Flue gas economizers are usually installed behind gas-fired boilers. All flue gases from the boiler are passed through the economizer, where they are cooled, and the heat from this process heats the water in the closed system. The remaining highly cooled flue gasses are either discharged to the open air or used for CO<sub>2</sub> metering or other applications.







# BURNER -CO<sub>2</sub> SYSTEMS- BUFFER TANK



# BURNER

Burners that burn and heat the water in the hot water boiler using natural gas/LNG or diesel oil are at least as important as boilers. It is vital for the greenhouse plant that the burner is particularly high quality and works smoothly. The biggest problem encountered when using international burner brands is burner service. The inability of the services to be in the greenhouse on time, the delay of commissioning, or the inability to get service in the event of a malfunction are the problems that cause investors to lose their product or lose a significant portion of their efficiency.

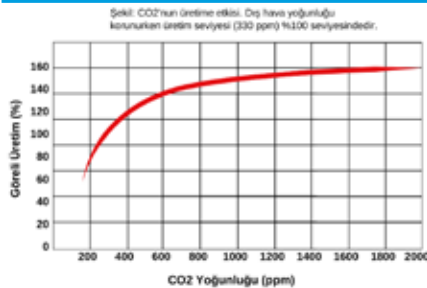


With its technicians and engineers in its infrastructure, Timfog provides commissioning, supervision, and servicing services from Istanbul to worldwide through its foreign language-speaking staff. Therefore, the supervision services it offers are much more economical than the Netherlands or similar European countries.

Timfog is a company specialized in the design, manufacture, installation, and maintenance of equipment that provides excellent combustion quality thanks to the collaboration with international brands of burners.

With its CO<sub>2</sub> and CO<sub>2</sub>-free burner control systems ranging from 1,000 kW to 15,000 kW, it provides reliable and timely service in greenhouses. In particular, the low NO<sub>x</sub> level in the burners and the high combustion efficiency distinguish the Timfog project and technical staff compared to other project companies. All burners used have international certificates and safety criteria.

## Co2 SYSTEMS



CO<sub>2</sub> units are used in greenhouses for central CO<sub>2</sub> dosing. The flue gas emitted from the natural gas-fired boilers and CHP units are transported to the greenhouse area by the CO<sub>2</sub> blower by lowering its temperature. The flue gas is then distributed into the greenhouse using U-PVC pipes through special calculations. A CO<sub>2</sub> control panel is available to control the CO<sub>2</sub> dosing system. If there are multiple fans, this can be controlled centrally from a single control panel.

In addition, other control parts such as a CO detector, a CO<sub>2</sub> sensor, or an air damper can be connected to the control panel. The CO<sub>2</sub> control panel can also communicate with the burner control panel. The switch panel has all the control and safety equipment. Furthermore, this panel is supplied in accordance with local safety regulations. The CO<sub>2</sub> detector prevents harmful CO (carbon monoxide) from entering the greenhouse area.

The CO<sub>2</sub> pressure distribution, which must be calculated considering the total surface area, is generally optimized by distribution through the CO<sub>2</sub> blower installed in the boiler room. Therefore, the U-PVC pipes needed will vary in length and diameter. The diameter of the holes in the plastic nylon air ducts used for CO<sub>2</sub> distribution also varies according to these calculations. For a correct calculation, it is important to know the plant type and the required dosage standard (a value usually expressed in cubic meters of gas per hectare). The Timfog project team guarantees the best possible dosing result with the CO<sub>2</sub> pipeline calculation and projects.



# BUFFER TANK

Area of the surface in contact with the water on the inner surface is minimized by using NPU's at the external zone instead of tension bars used in the inner part of the tank during manufacture of the classical tank. So, tank life will be extended. The circle used outside the buffer tank increases the durability of the tank and balances its position thanks to the NPU supports. A high level of strength is provided via use of sheet metal at appropriate thickness (from 4mm to 8mm).



The quality of sheet metal used is ST37, the international standard. Special oil sand is used for the bottom of the buffer tanks manufactured, and the tanks produced in line with the layout and design information provided by the Timfog engineers serving greenhouses smoothly for many years.

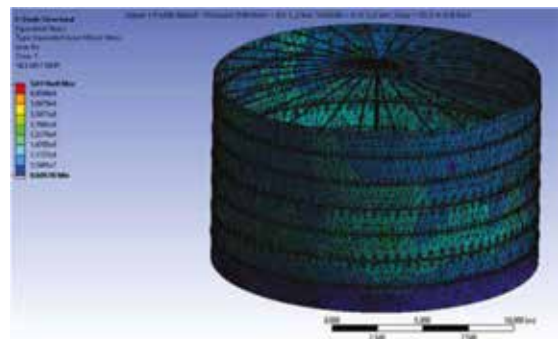
Oil sand, fills in the gaps between sand grains, and avoids occurrence of foreign particles such as humidity, corrosive acids and also prevents corrosion of the plates under the bottom surface. An average of minimum 20 cm fireproof wool insulation material is used depending on the climate conditions. The air above the water level within the tank must be deoxidized constantly for not leading to oxidation-corrosion. Therefore, a nitrification system at high quality standards is used.

It's also extremely important to check sudden pressure changes within the tank in order to prevent quick expansion and vacuum pressure while filling and discharging water. The deformation and collapse of the tank resulting from the potential pressure changes in the tank might lead to extensive damages and loss.

*As one of the limited number of simulated buffer tank manufacturers in the world, Timfog Engineering produces at international quality. All sheet metal and construction designs are made by Timfog engineers. All necessary tests at international level are performed in a computer environment before manufacturing.*

All Project details and all assembly details required during installation are shared with the customer. Timfog buffer tanks are manufactured with high hardware components. (Manhole-discharge valves-inner stair-outer stair-filling system-roof ralling.)

All the tanks produced by the Timfog engineering are simulated by 3D modelling by engineers before production is started. Thanks to this simulation modelling programs, we observe all hydrostatic and hydrodynamic reactions before the tank is manufactured and started to be used. Thus, all technical problems that may occur during tank manufacturing and all the problems that may be dangerous are predetermined. Also, it simplifies the construction process and ensures the establishment of a more efficient physical and operational system.







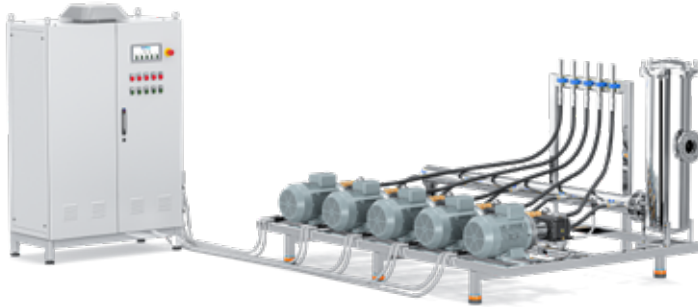
# HIGH PRESSURE FOGGING SYSTEMS





# HIGH PRESSURE FOGGING SYSTEMS

Ideal living environments of the living creatures deteriorate in conditions of extreme hot or cold, excessive or low humidity. Ideal environment for evaporation transpiration and photosynthesis that are very important for growing plants can be created by controlling the humidity in greenhouses. Better quality plants, faster harvest and less insect and less disease problems occur with right humidification systems in greenhouses.



Heat can be dropped and relative humidity increased with Timfog system as a result of evaporation of billions of water droplets sprayed from fogging nozzles by absorbing the heat of the air. The resulting cool and wet weather is used to keep the desired climate conditions in the greenhouse with Timfog circulation fans, ventilation and control systems. Thus the adverse weather conditions for the plants that may grow in the greenhouse are minimized. Wastage rates decrease and productivity increases because of the favorable conditions occurred for work environment and plant growth with decreasing temperature .

Timfog fogging systems are designed to operate at pressures between 70-120 bars. in timfog fogging networks we use "stainless steel" pipes, fittings and nozzle tips that can withstand pressures of 100 bars and more. All the materials used on the main pipeline and fittings and nozzle bodies, nozzle tips are made of stainless steel. So such a material quality enables Timfog systems to be used for liquid based pesticide spraying inside the greenhouses.



# HIGH PRESSURE FOGGING SYSTEMS

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In the greenhouse applications of Timfog systems we use press connection technique. Press fittings are made of "316 Stainless steel" material; The advantage of using press fittings is that it speeds up the installation process and enables us to complete the installation in significantly shorter period. With Timfog systems; it is possible to spray liquid based chemicals into your greenhouse without harming your fogging network.

Timfog engineers developed a special welding system which has electric resistance technique and only used by Timfog systems. In this technique, SS nozzle bodies directly welded to the SS pipes without using any secondary material. The leakage problems at the connection points related to the corrosion and gasket erosion are completely eliminated by this technique. Fast and reliable production is possible. 100% of our production is tested at 150 bar pressure before leaving our premises.







# VENTILATION SYSTEMS





# VENTILATION AND COOLING SYSTEMS



## Greenhouse Circulation Fans

Greenhouse circulation fans circulate conditioned air in the greenhouse, providing a homogeneous climate in the environment. Timfog GCF-50 circulating fans are distinguished by their superior characteristics compared to other European competitors and other competitors.

## Auto-Work Together feature:

They offer very high energy savings with their automatic cooperation function in sectors with regionally similar climatic conditions. The system activated depending on the desired setpoints for CO<sub>2</sub>, temperature, or humidity in the greenhouse can communicate with the central greenhouse controller. Thanks to its ability to communicate with other Timfog devices, such as the fog system, the heating system, and the fan-pad system, it is also easier to get all the data about the greenhouse using the same sensors.

## High Corrosion Resistance:

The fans of the GCF series, with their corrosion-resistant Magnelis plates, belong to the category of very durable fans. Thanks to the self-repairing property of Magnelis, no traces of corrosion can be seen on the surfaces of the fan blades even after many years.

## Strong airflow:

The GCF series fans have a specially designed 7-blade propeller structure with a large pitch. Thanks to this feature, it has an average airflow of 7,000 m<sup>3</sup>/h. Compared to its closest competitors, it offers 20% to 37% more airflow.

## Low energy consumption:

According to European energy standards, they are highly effective with their electric motor structure of 0.25 kW, energy class IE -3, and low energy class.

## Low noise and vibration level:

The GCF-50, one of the lowest vibration and noise level greenhouse circulating fans in Europe, is used in dozens of greenhouses in different countries with its compact design.







### Greenhouse Exhaust Fans

The exhaust fans (TEF -140) manufactured by Timfog have the following excellent characteristics;

- They are easy to install and have low maintenance thanks to their durable structures. The fan cowl and venturi are made of hard galvanized sheet steel.
- They have optimal energy and performance thanks to the perfect design and aerodynamic structures of the propeller.
- Thanks to the uniform structure of the air intake louvers, they have a more uniform air intake and almost 100% closing performance.
- The bottom bracket and the V-belt pulley are made of cast aluminum.
- All fan equipment is manufactured with aging tests and longevity analysis.
- The TEF -140 is an ideal exhaust fan when extra-high airflow capacity is required.



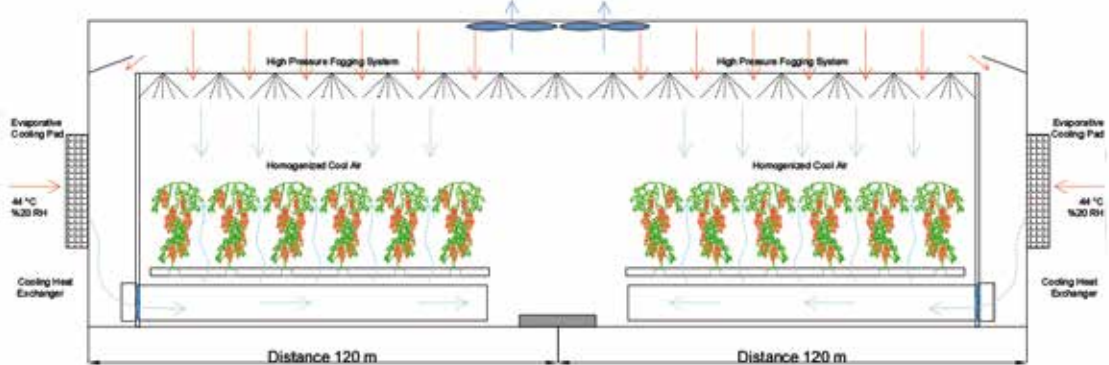
# PERFECT CLIMATE



In standard fan or pad implementations, the temperature cannot be fully reduced because of the air, which has been filled up with moisture, not being able to evacuate at the same velocity. The air temperature raises after air passes through the evaporative pad on the way to the insides of the greenhouse and increases up to 8 degrees between the absorption section of the exhaust fans and the pad.

Greenhouse tunnels have a maximum length of 50 meters and diminishing in performance can be seen as the distances get greater. The biggest drawback in standard fog executions is that the air cooled adiabatically cannot be rapidly discharged. Thus the air temperature is constantly kept over a value of the wet bulb temperature. That means to equalize the peripheral temperature and the domestic temperature in greenhouses whose internal temperatures are 8 to 15 degrees more than the outside temperature due to the daylight. However this temperature is not adequate for greenhouses that want to produce in summertime.

## ***Temperature and humidity comparison tables between normal evaporative fan pad and perfect climate system***



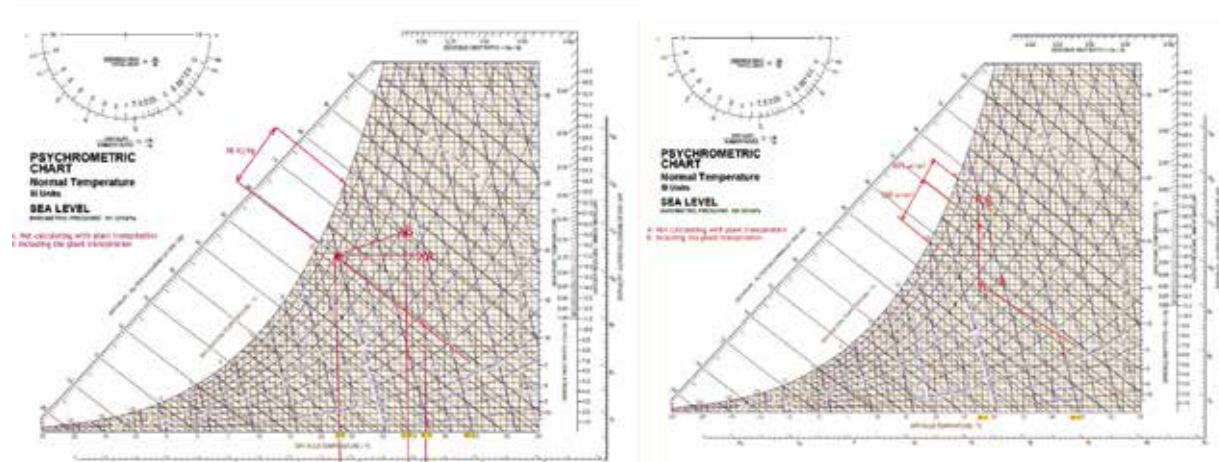
The cooled air is distributed evenly across the greenhouse. Special fabric canals which are resistant to intense warmth and frostiness are used for this duty. The air circulation from the bottom to the top is perfectly done eliminating all immense temperature differences.

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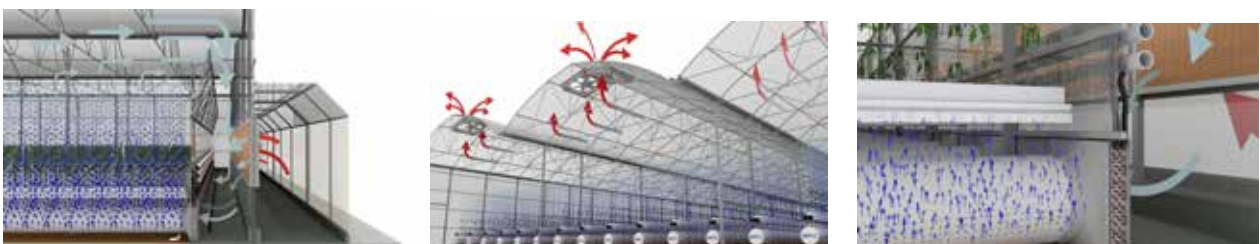
The most significant plus in winter time production in closed greenhouses is great sunlight. The butterfly roof ventilation systems in conventional greenhouses block sunlight because of their high construction element presence. This handicap isn't present in closed greenhouses. The removal of standard ventilation systems in closed greenhouses decrease the construction expenses to a large extent and contribute to the greenhouse investment expenditure.

The most crucial difference is that insect net is used in the climatization corridor entrance instead of the roof. Thus the amount of entering air is largely improved. As known, in standard greenhouses, the insect net's permeability decreases up to 50% in only one week. After a month or so, this permeability is reduced further up to 20%. Unlike the others, the insect net used in the climatization corridor entrance has more permeability because of forced air circulation. All the circulations and appreciations are made considering the whole year. The system's free- cooling effect is used.



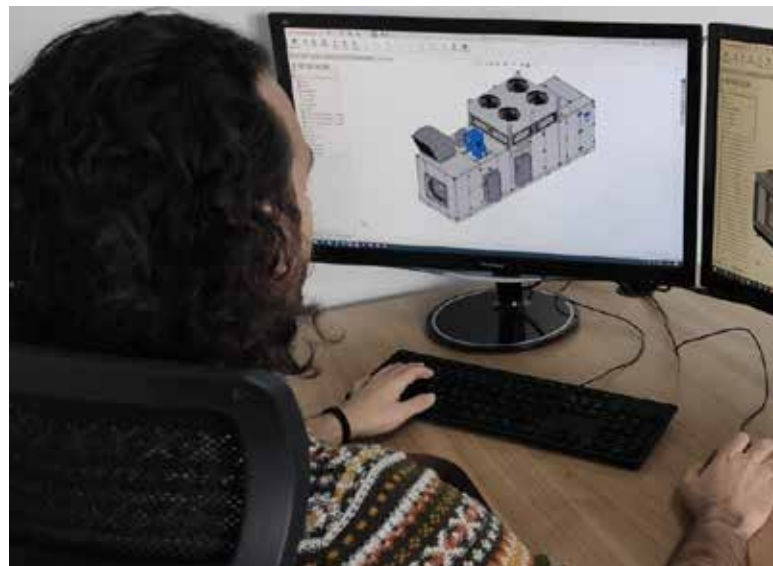
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# GREENHOUSE AIR HANDLING UNIT





# GREENHOUSE AIR HANDLING UNIT

## GAHU

### With Compressor & Desiccant

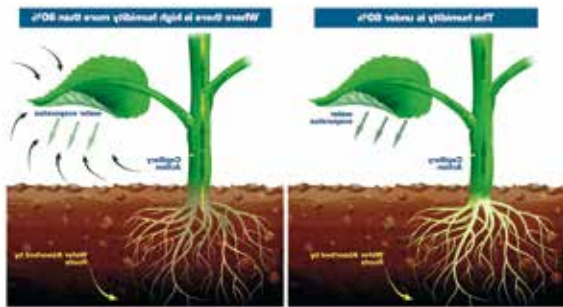


#### VPD- Based Air Handling Unit with Standalone Automation.

Understanding VPD and its impact on plant development and resource utilization is essential for grower to optimize yields and costs.

Timfog's GAHU determines necessary changes with its own automation a special VPD algorithm enabling the healthiest environment and ultimately maximizing plant growth and health.

It provides a more accurate indication of the current evaporation potential since it combines the effects of both temperature and humidity into a single value.



## Key Features

- Compact unit-easy assembly
- Optional hygiene mode, plus HEPA filters
- VPD based precise digital control and automation
- Low energy consumption
- Better yield quality and quantity
- Full integration to universal greenhouse automation systems
- Capability of being monitored and controlled remotely

Gahu with compressor and desiccant can be controlled proportionally with the fresh air and the inverter fans used on the blowing air side. It performs the humidity and temperature control in the greenhouse completely automatically. With digital control, the ambient air humidity and temperature are controlled precisely.

It provides the heating of the greenhouse with the hot air it produces during the winter season. It has a low energy consumption, it cleans and filters the air. It purifies a significant part of the bacteria in the greenhouse helps to prevent diseases that will greatly reduce plant yield in enclosed areas such as greenhouses or seedlings. It also helps 90% of disease and sports prevention. It does not contain any chemicals and its dehumidification and heating process is completely organic. With its compact exterior dimensions, it can be easily placed just outside the greenhouse.

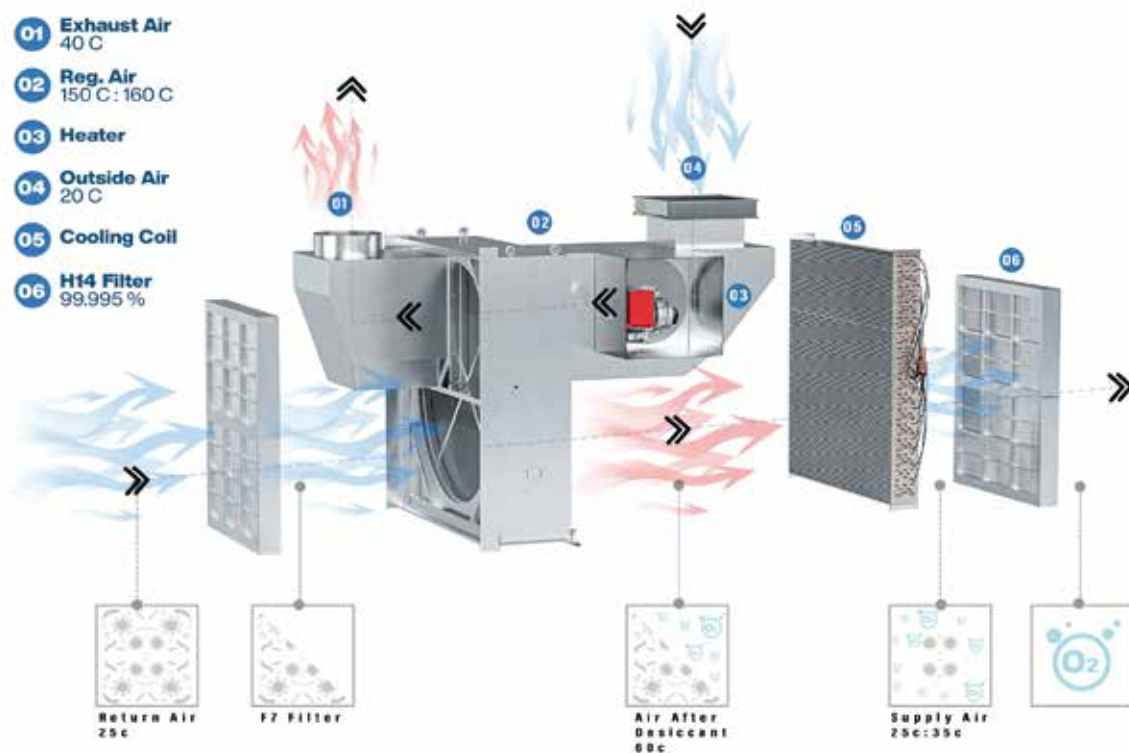
The system is based on the principle of absorbing the humid air and heating with the aid of a solid zeolite dehumidifier rotor and a blower burner. Then cooling coils in GAHU decrease the temperature and dehumidify the air for the second time.

GAHU with compressor and desiccant which can reach 400 lt /h dehumidification capacity in a single device when required, can be used comfortably in very large seedling or greenhouse area thanks to the advantages of communicating with multiple units and being centrally monitored and controlled. Together with fresh air, it will absorb humid air in the greenhouse.



# GREENHOUSE AIR HANDLING UNIT

The process consists of a state-of-the-art desiccant rotor and a burner. Water vapor is removed from the air through the rotor and air with low moisture density is released in the greenhouse. Thus, the air inside is heated at the same time.



When the high constant temperature is required, PID provides the desired constant temperature value. In addition, the specific humidity of the air passing through the drum is continuously calculated by GAHU's automation system, beginning with the first start of the burner and a periodic follow up at constantly increasing temperatures.

## Certification and Testing

Timfog's quality management system is ISO 9001 certified, ensuring ongoing compliance, meaning that the customer requirements are identified and that the design of the product meets the requirements.

Timfog GAHU devices are tested against conformity with the technical requirements of 2006/42/EC and 2014/35/EU by an independent 3rd party. The devices are always tested before leaving the factory to ensure trouble-free operation. This ensures reliable performance in the field.





The system is predicated on the principle of taking and heating the air with the help of the rotor. The desiccant Wheel rotates, changing its surfaces between the regeneration zone and the process air. In here, the rotor is heated by the regeneration air so that the humid air is dried and resent to the relevant site- eliminating fungi, bacteria and viruses in the process, distributing homogeneous air for cooling, heating, dehumidifying and ventilation. When the ait in the greenhouse is warmer than necessary, GAHU's cooling mode is activated, maintaining the temperature at desired levels. GAHU decides on these processes with the data, it receives from the greenhouse and external environment.

***The Perfect  
air purifier  
for greenhouses.***

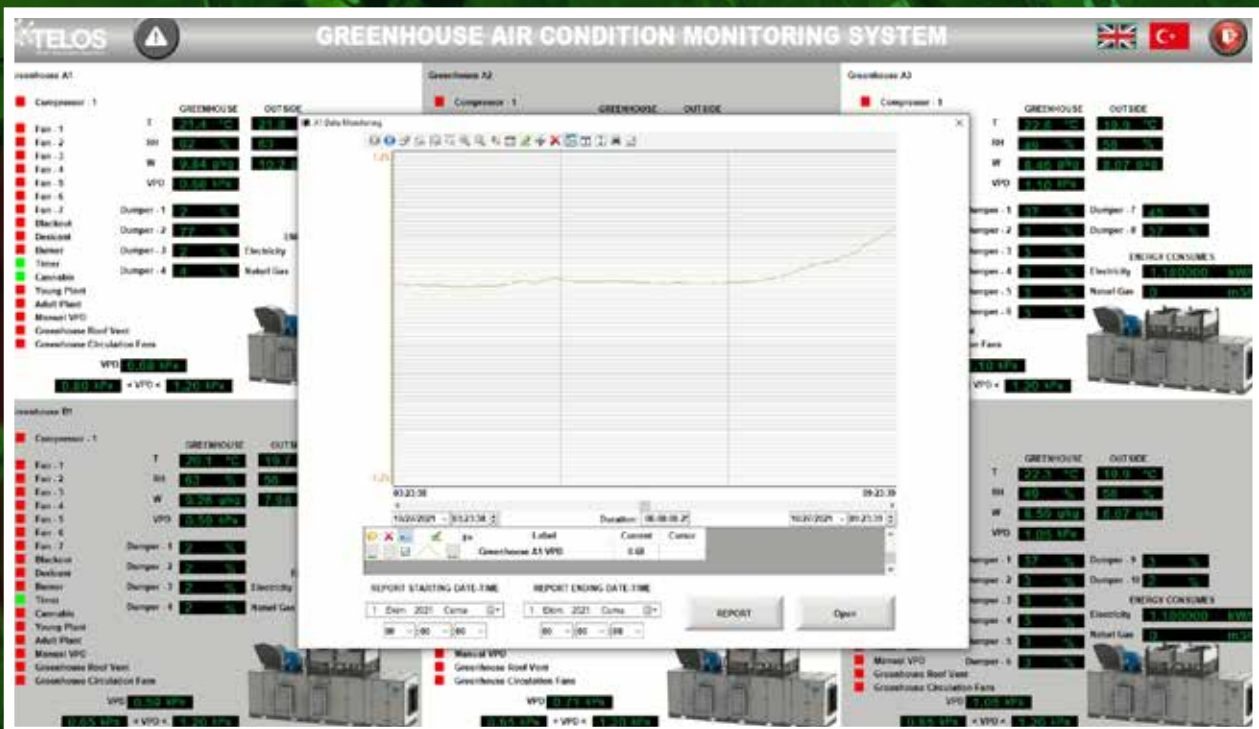




# GREENHOUSE AUTOMATION

## Intelligent Humidity Control System Humidification

- "Intelligent Humidity Control System" (determining humidity and temperature simultaneously by monitoring stoma movements of the plant, without any user action)
- Ensuring increase in photosynthesis speed of the plant due to ideal humidity and temperature
- Capability of operating as integrated with humidification (high pressure fogging)
- Integration to the central climate control system
- Capability of heating in winter, cooling in summer



## Intelligent Humidity Control System Dehumidification

- "Intelligent Humidity Control System" (control determining humidity and temperature simultaneously by monitoring stoma movements of the plant, without any user action)
- Ensuring increase in photosynthesis speed of the plant due to ideal humidity and temperature
- Capability of operating as integrated with dehumidification devices
- Maintenance free (8,000 hours oil free), unique Danfoss high pressure pumps
- Integration to the central climate control system





# GERMINATION AND COLD ROOMS



# GERMINATION AND COLD ROOMS

The cooling devices used in the germination rooms are produced by TIMFOG firm and they are specially designed. Special heating module that keeps the inside of the laundry room at 15/20 C by heating in the winter season is one of the distinguishing sides of our TIMFOG germination devices. In addition, with high pressure humidification modules in the room, desired humidity of 90-95% is achieved.

These cold rooms, which are isolated with the help of special polyurethane panels, provide high energy saving.



## Superior features of the TIMFOG germination room;

- Sensitive cooling devices
- High quality cold room polyurethane panels and cold room doors
- High pressure humidification feature
- High pressure line spreading all around the room
- Heating feature in the winter session
- Control of cooling-humidification and heating features with a single control panel
- Homogeneous air distribution with in-room special evaporator fans.







# PROJECT MANAGEMENT- AFTER SALES - R&D



# PROJECT MANAGEMENT AND AFTER SALES

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Timfog is also an engineering company based on providing a progressive supervision service. Therefore, it acts with accurate service, correct commissioning and continuous periodical maintenance analysis all over the world.

Multilingual, international service engineers, all English speaking, are on site to solve problems. All technical processes are accurately reported to customers and all concerned, both on site

and at headquarters. With the help of the records kept, it is possible to get information about the services and other services provided for each system or machine even after many years.

Timfog has been providing service with its central and national services in more than 50 countries and has been providing reliable systems for years.

Our Project Contracting team, with international experience, diligently performs installation and commissioning of Timfog projects in many different parts of the world. They establish systems that our customers can use for years without any problems, intervening remotely or on-site for all kinds of problems that occur, especially during the period when the greenhouses are put into operation.

The engineers on our contracting team ensure that greenhouse projects are implemented with full precision thanks to the constructive relationship they have established with the technical staff on site. After start-up, greenhouse investors can get fast and high-quality technical support in solving all kinds of technical problems thanks to the establishment of local technical services.





# RESEARCH AND DEVELOPMENT

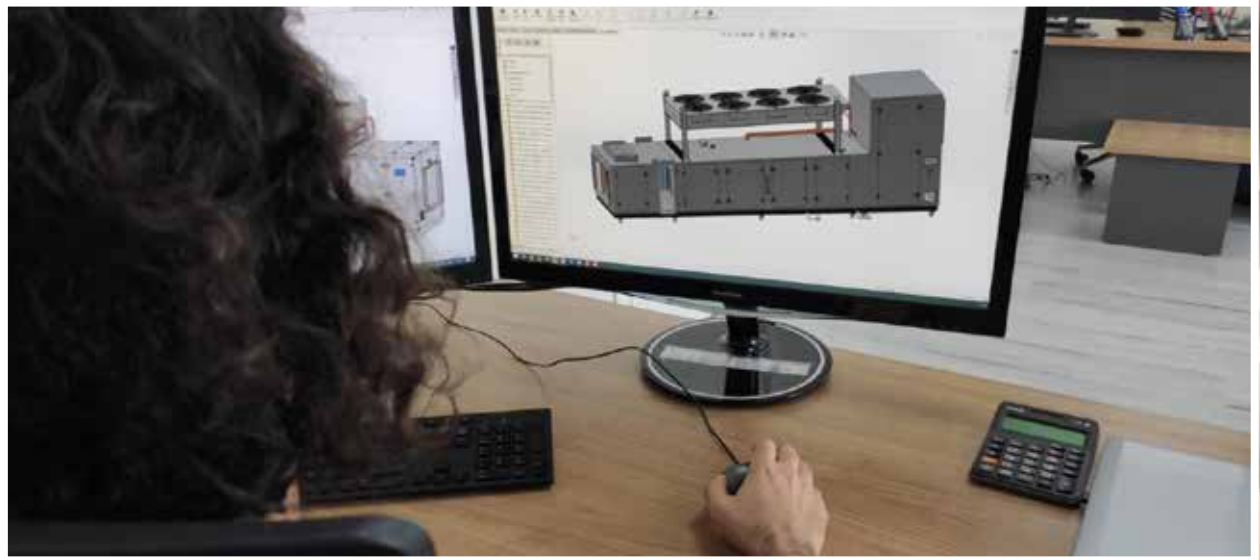
## *Backed by excellence in engineering*

That's how we solve complex climatization systems

Timfog, develops and adopts new Technologies to boost the sustainability for its clients.

Innovations are the key for a more sustainable business environment. At Timfog, we always take into account the resource scarcity, ergonomics and energy requirement in the development and innovation processes to maintain the sustainability.

Our innovation friendly company culture is embraced on all levels and in all dimensions.



## *Design with passion...*

Since the very first day, Timfog highly prioritizes setting-up a Design & Engineering Center.

As a result of successful completion of the audits carried out by academicians and supervisors appointed by the Ministry, our R&D Center is approved and nominated as a design center by the Ministry of Science, Industry and Technology.



*Modern greenhousing, superior quality and efficiency in cost control through the advantage of real-time data with a perfectionned time management are the key concepts and choosing the right solution partner is of vital importance.*

*Timfog is formed by a team of experienced engineers encouraged to grow their skills and abilities everyday to benefit our customers.*



ENDO C





ANNA





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