

EN



## *WATER SPRAY SYSTEM*

# INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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This document specifies the instructions for installation, operating and maintenance of the products with **Spraying Systems** manufactured by FRITERM A.S., Turkey. The products are shown at the below table.

PRODUCTS	TYPE	MODELS
Products with Spraying Systems	Universal Condensers	FUH YK / DK / VK
	Commercial Type Condensers	MHS, HS, EHS and their L models
	Wet-Dry Coolers	FDIKS / FYIKS / FVIKS

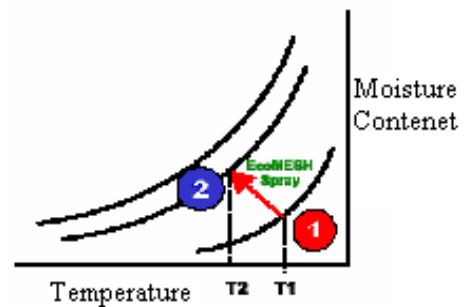
Spraying systems are as bellows:

- 1) Ecomesh Water Spray System and
- 2) Direct Adiabatic Water Spray System

**1. SYSTEM DEFINITION**

**1.1. Ecomesh Water Spray System**

Ecomesh Spray System concept is based on intermittently and efficiently evaporating water on a large mesh area in front of the heat rejection surface of Condensers and Dry Coolers. Water spray provides an adiabatic cooling effect of till 25 °C for the incoming air stream and it can be initiated via an ambient sensor or alternatively by external control override. As soon as settings exceed, a pre-set level controller initiates water spray in order to make air temperature lower during high ambient periods.



**Advantages of Ecomesh Water Spray System:**

Running Cost: Lower condensing temperature provides reliable operation and lower annual electricity running costs.

Reduced Water Consumption: Water is used whenever it is required at significantly reduced quantities.

Flexible System: Sectional panel and coil clip design suits with any brand and model of mini-splits, air cooled chillers, rooftop units, air cooled condensers and dry coolers on the market.

Lower Maintenance Cost: Reduced condenser pressure leads to reduced discharge temperature which extends the compressor reliability and life.

Quick Response: Large mesh surface area provides efficient adiabatic cooling surface with minimum air flow reduction, hence, water evaporates very rapidly to cool the incoming air.

Eliminates Health Risks: It uses water directly without any water reservoir, hence, the health risks associated with a still water reservoir are completely eliminated.

Green Solution: Reduced energy consumption, hence, less indirect CO<sub>2</sub> emission.



## 1.2. Direct Adiabatic Water Spray System

Direct adiabatic water spray system comprises a series of specialized water nozzles fitted intermittently. The nozzles are designed to pulverize the water and provide a very fine mist of atomized water droplets which are readily absorbed by the high temperature ambient air approaching the coil.

It is necessary that the water used in this system must undergo for a strict water treatment regime to reduce the risk of corrosion and prevent dirty water in the water circuit. Moreover the hardness of the water should be taken and pass from high efficiency filtration system.



**Fig. 3. Wet - Dry Cooler with Direct Adiabatic Water Spray System**

## 2. GENERAL

The instructions below should be followed strictly for the health and safety reasons while installing and maintaining the equipments.

Upon receipt, the equipment should be visually inspected, and in case of any damage or defect, the supplier should be notified within seven days.

## 3. HANDLING AND STORAGE

Be on the alert for any damage on the package or on the equipment.

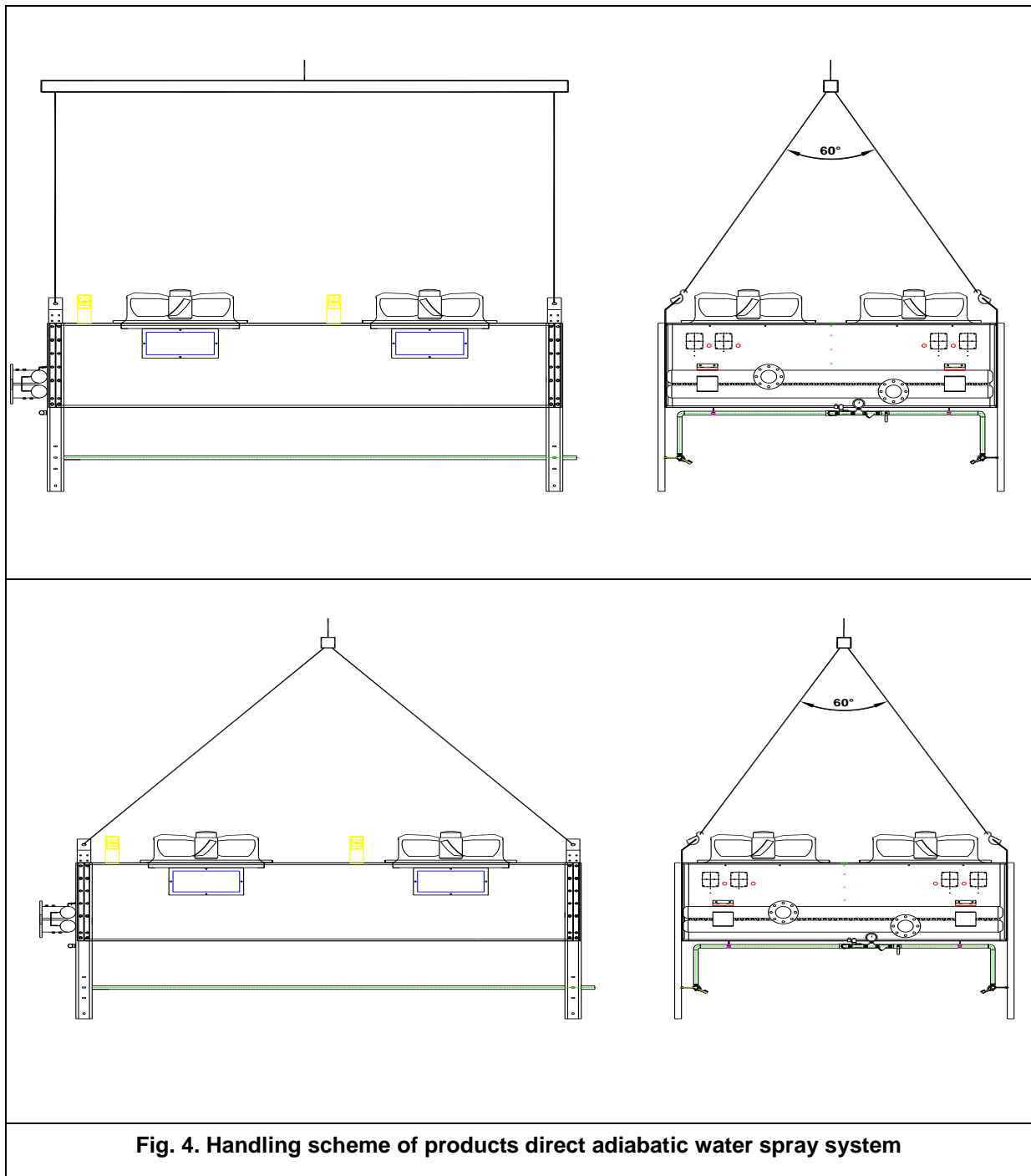
Store the equipment in the original packaging in a dry area protected from the improper weather conditions or protect it from dirt and improper weather until final installation.

Avoid exposure to extreme heat and cold.

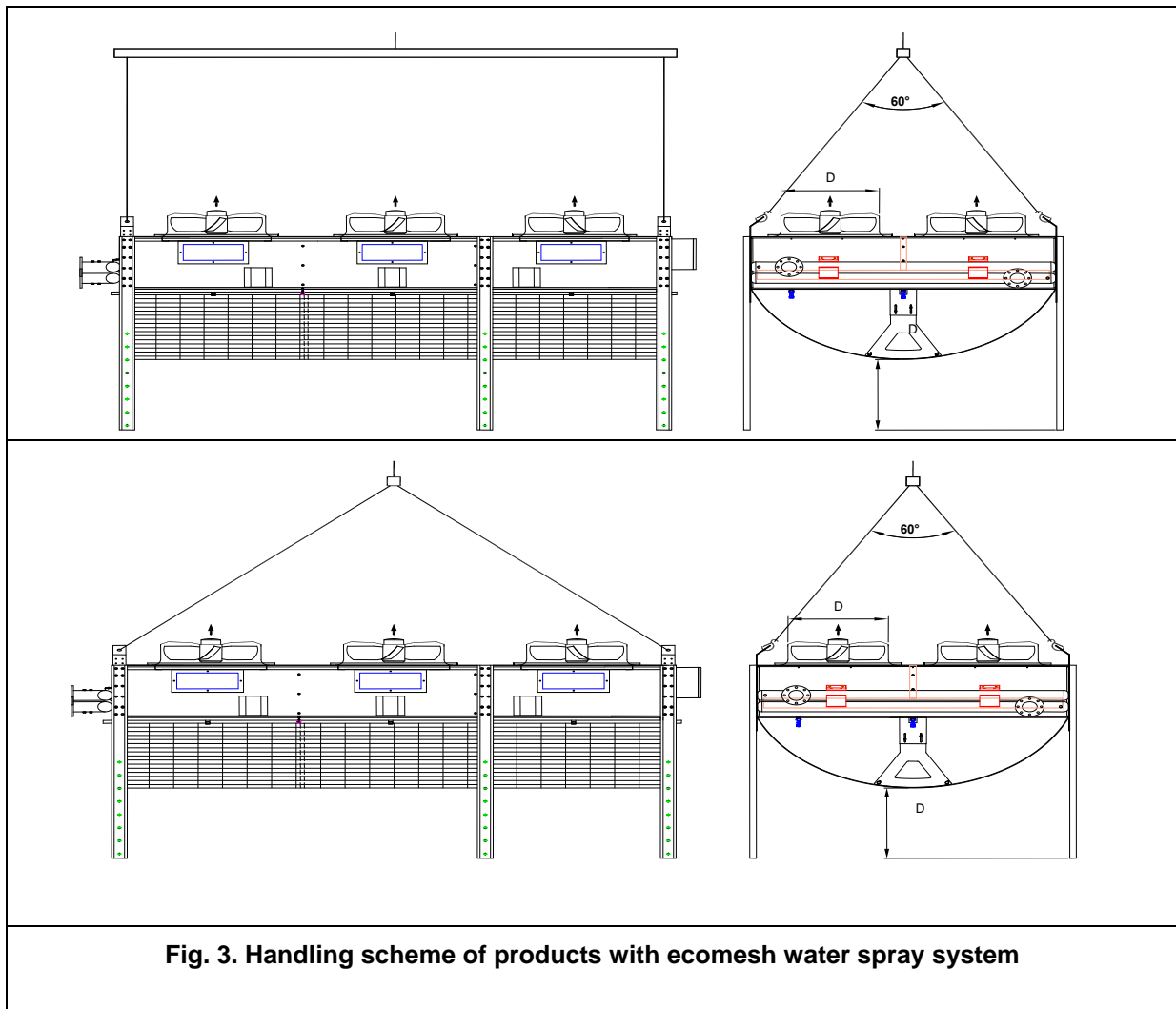
Avoid excessive storing periods (one year of storing at maximum is recommended).

If the equipment is stationary for long periods in a humid atmosphere, the fans should be switched ON for minimum of two hours every month to remove any moisture that may have condensed within the motors.

During lifting, a suitable lifting tool like a forklift or a crane is to be employed as in the drawings below. When lifting the equipment with hauling hooks, it is necessary to use a lifting beam connected to the hooks.



**Fig. 4. Handling scheme of products direct adiabatic water spray system**



## 4. INSTALLATION

The system installer is responsible that the inherent installation and security information are harmonized with the valid standards and guidelines (DIN EN 292 / 294).

The EMC guideline is to be observed in connection with the control units. The manufacturer or operator of the entire plant is responsible for keeping to the EMC guideline 89/336/ EEC.

Before installing, it should be ensured that the technical specifications of the equipment are in accordance with the desired working conditions.

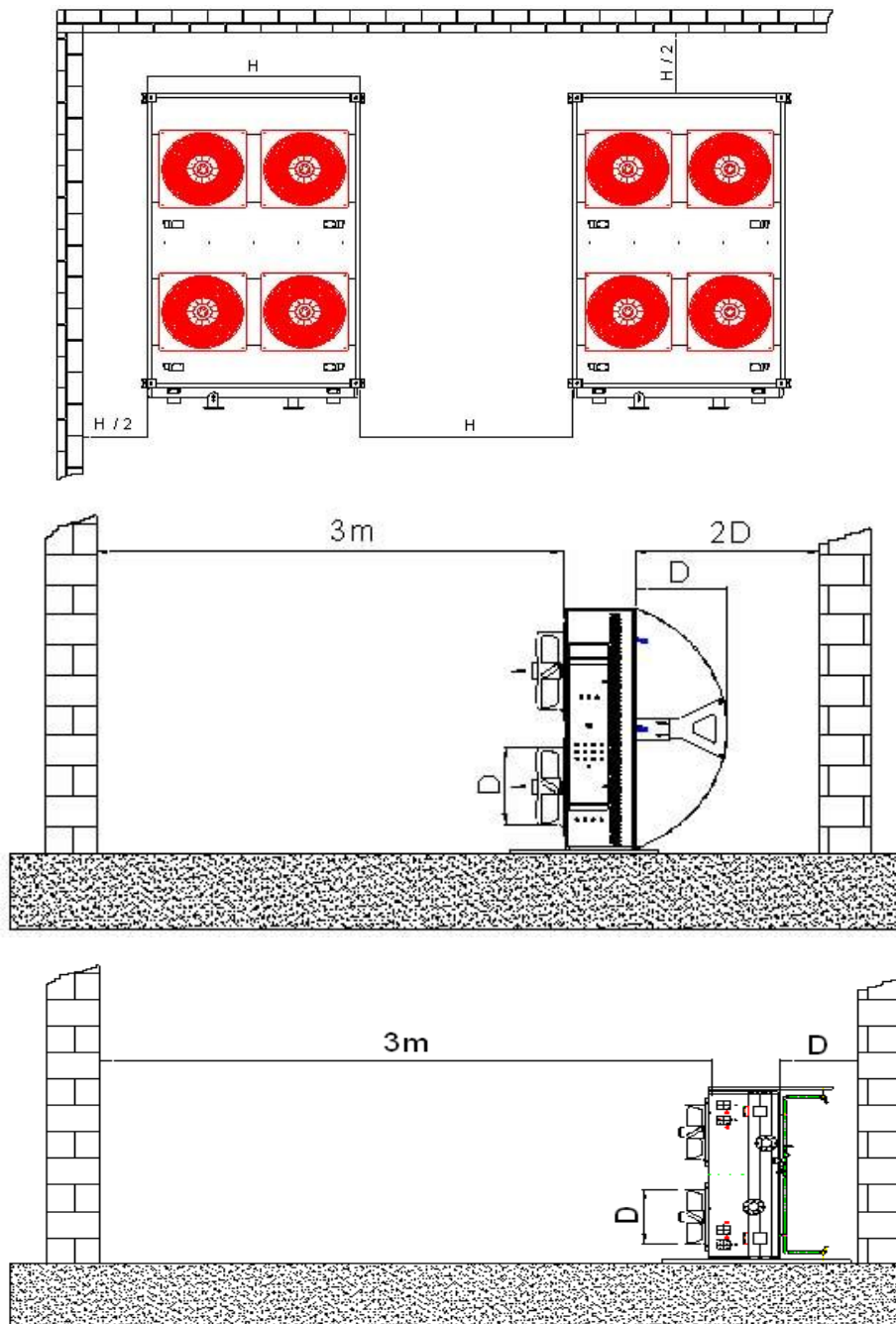
### 4.1. Location

The equipment is designed to work only for permanent installation. It should be fixed to a stable base.

The working fluid, the maximum working pressure and the voltage declared by the manufacturer should be suitable for the working environment.

The working area should be well ventilated and should not contain hazardous substances or explosives.

Air motion should not be adversely affected by obstructions and the inlet air should not be undesirably heated or cooled by the other equipments.



**Fig. 4. Minimum recommended distances for installation**

#### 4.2. Mounting

Installation and electrical connection are to be performed by qualified personnel only.

It must be ensured that no electrical supply connection exists during installation.

The mounting position of the equipment should be in accordance with its design.

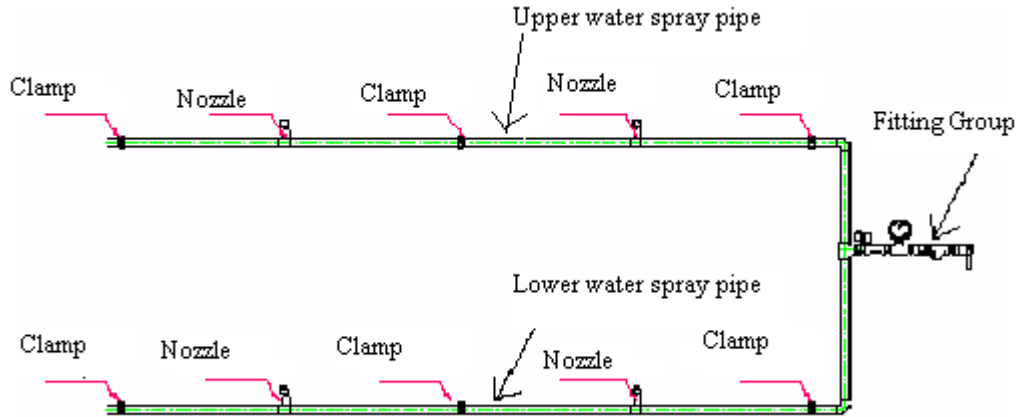
The spray system composes of the following equipments.

- 1) Water spraying system
- 2) Meshes
- 3) Fittings, tighten elements and system installation
- 4) Controller and electric connection

**4.2.1. Water spray system**

Quick change type plastic nozzles connected in series or parallel arrangement in order to provide uniform coverage area for an effective evaporation process. Nozzles are designed to operate with very low pressure and they can operate with normal city mains water pressures 1.5 - 3 bar and above.

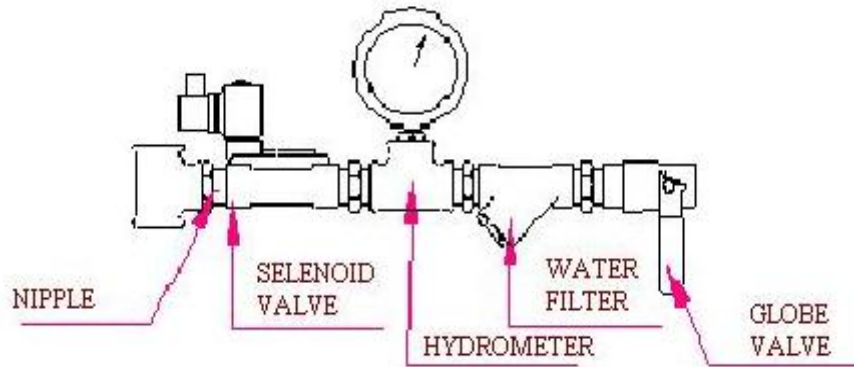
Water spray system comprises of the following equipments.



- 1) Fitting Group
- 2) Nozzles
- 3) Upper water spray pipe
- 4) Lower water spray pipe

**4.2.1.1. Fitting Group**

The fitting group is provided to the customer as a whole fitted together. It comprises nipple, solenoid valve, hydrometer, water strainer and globe valve.

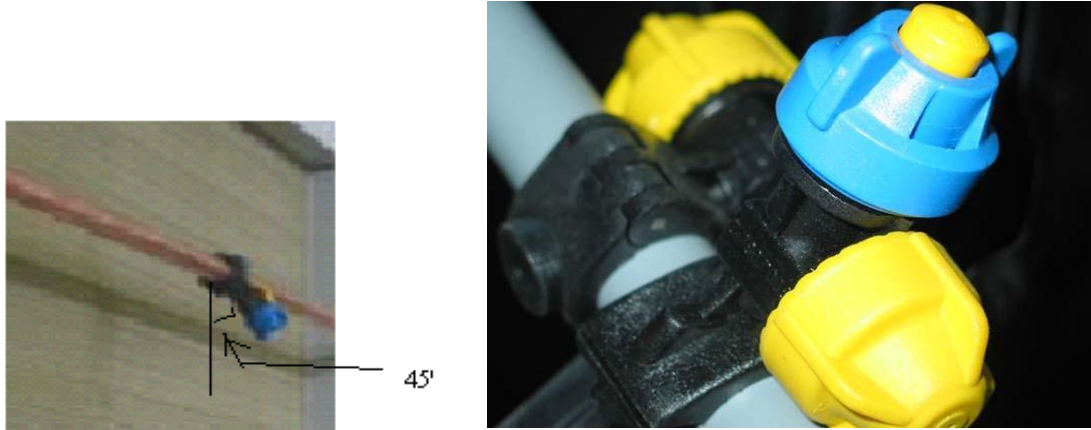


**Fig. 5. Fitting element group**

#### 4.2.1.2. Nozzles

Nozzle equipments are sent to the customer with the utilities. Nozzle connections are made to the holes on the utility.

Nozzles connection is made according to the following figures.



**Fig. 6. Nozzles mounting position**

While the pulverizers are working there should not be any leakage except from the nozzle if there is a leakage, the connections should be checked and leakage must be prevented.

Nozzles should be mounted approximately the angle of  $45^\circ$  as shown above. The nozzles should be placed in a way that the water will be sprayed widely and equally to the meshes.

#### 4.2.2. Meshes

Non metallic mesh provides an effective coverage area for an efficient evaporation surface with minimal air pressure drop. Meshes are fixed in front of the heat rejection surface via spacer bars and/or fixing brackets to suit the unit configuration. Various size sectional mesh panels are either joined together to form a full mesh area or alternatively flexible mesh roll cut to fit to a required size in front of the heat rejection surface.

The dust on the meshes should be cleaned with pressurized air or water at least once in a week.



**Fig. 7. Meshes**



### 4.2.3. Fittings, tighten elements and system installation

1. The pipe mounted with nozzles will be assembled to the clamps which are on the sheets.



2. After the pipes are installed to its place, the fixings are tightened to the wall by using bolts and nuts.



3. After the two rows system pipes are fastened to the wall, the end of the pipes will be connected by using fitting elements in order to be able to connect the pipes with U connection.



4. The fitting group will be connected to the U pipe connection of the two pipes.



- The fixing pipes are placed to the fixing elements and end of the pipes will be fastened with the clamps in order not to move. (For ecomesh system)



- The meshes are fastened to the fixing elements by using screws. (For ecomesh system)



- After all meshes are mounted with screws; it will be fixed to the other fixing elements as well. (For ecomesh system)



#### 4.2.4. Controller and Electric connection

##### 4.2.4.1. Direct Adiabatic Water Spray System controller

The system is controlled by using thermostat. It works as on-off cycle by the control system.

##### 4.2.4.2. Ecomesh Water Spray System

A custom-made intelligent PLC based controller records the ambient conditions and at a pre-set value, which is adjustable by the operator, initiates inline solenoid valve(s).

Water is sprayed intermittently to wet the meshes. The spray rate and duration are adjusted by the controller to suit the ambient conditions, hence, minimal water consumption. Water usage is based on total waste principle, hence, no health risk.

Ecomesh controller is provided with internal override terminals for a volt-free input which overrides the temperature set limit and initiates intermittent spray as soon as this terminal is linked. This facility can be used to provide head pressure or manual remote override flexibility.



Fig.7. Ecomesh Controller

4.2.4.2. Controller Working Principle and Definition

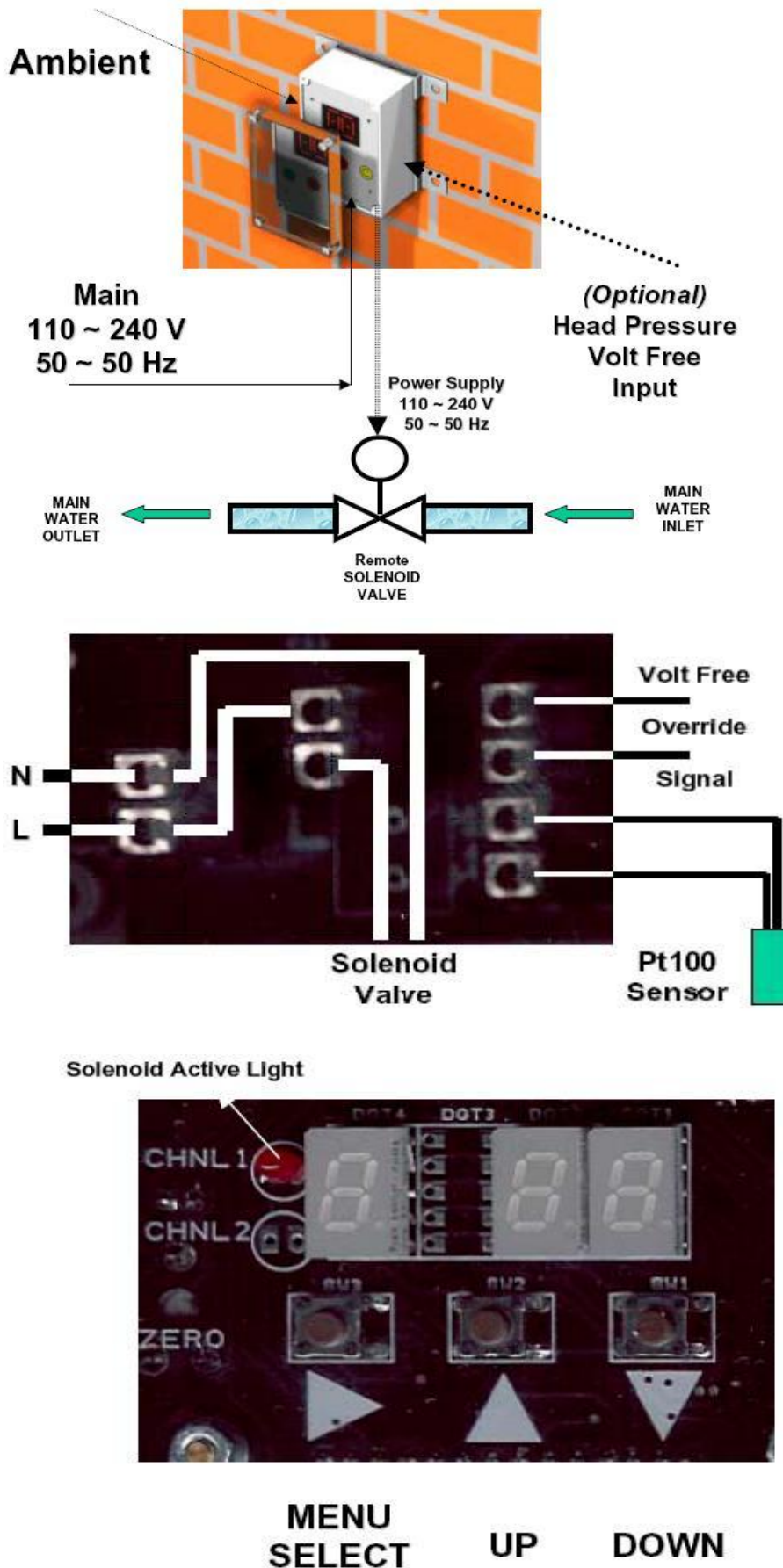
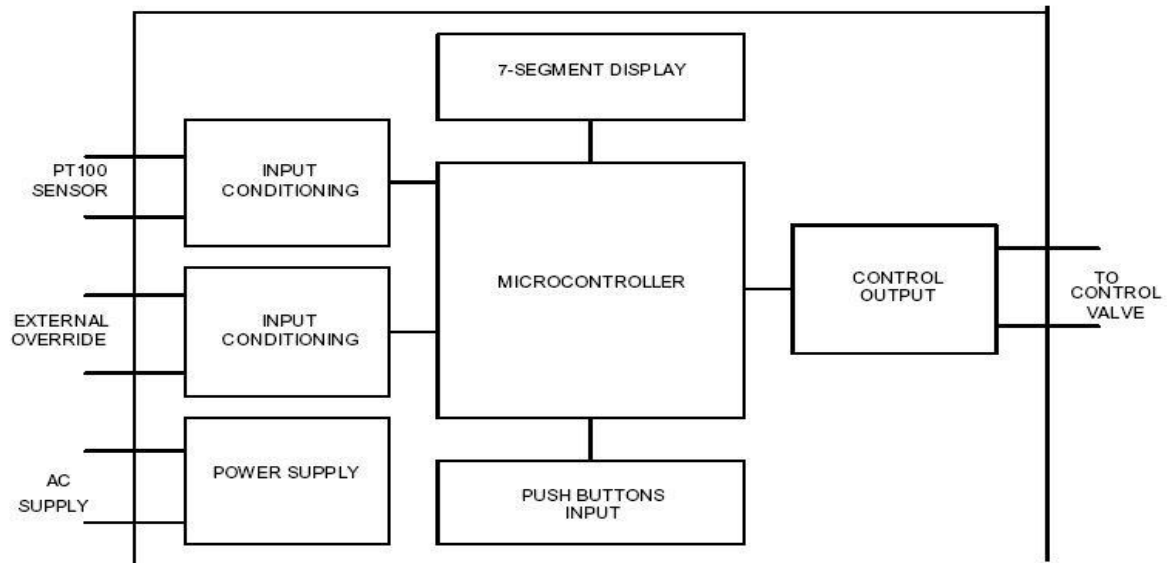


Fig. 8. Ecomesh Controller Working Principle and Definition

#### 4.2.4.3. Electric connection system

##### Ecomesh Temperature AND Time Controller Block Diagram



The operator panel consists of two Printed Circuit Boards (PCB) which house the power supply, sensor input conditioning circuitry, microcontroller, 7-segment Light Emitting diode (LED) display for temperature and timer indication, status indicating LED, control and setting push buttons, and output circuitry. The PCB is mounted inside a plastic enclosure. Both the display and the push buttons are protected by the transparent cover. All the connections to the controller are via plug-in screw terminals.

#### Power supply

The control panel requires 110 or 240Vac 5VA max. 50/60Hz supply. Please specify the supply voltage when order.

#### Sensor input

A platinum resistance thermometer PT100 temperature sensor is supplied as standard.

#### External override input

An optional volt-free contact can be connected to the external override input to force the controller output to maximum when the contact is closed.

#### Control output

Opto-triac outputs are used for the control output. The ratings are 240Vac 1A max and 110Vac 2.1 A.

#### User interface

The user interface comprises of 3 digits 7-segment green LED display, 1 status indicating LED and 3 push buttons.

The 7-segment display is used to indicate measured temperature, low set point temperature, high set point temperature, and 3 sets of ON time setting and OFF time setting.

One red LED is used to show the output status of the controller.

One push button is used to scroll the parameter display. The two adjustment push buttons "UP" and "DOWN" enable the temperature and time setting to be incremented and decremented.

Please note the display will revert to showing measured temperature after 1 minute of inactivity on the push buttons.

## Installation

The Ecomesh controller can be wall mounted using the mounting kit provided. Please see dimensional drawing for fixing holes arrangement.

All the electrical connections are via plug-in screw terminals. There are 4 sets of connections: The sensor input (PRT100 sensor) is connected to a 2 way connector IN+ and IN- of the RT input on the PCB. The sensor is not polarity sensitive.

The optional external override input (volt-free contact) is connected to a 2 way connector OVR+ and OVR- on the PCB. The external override input is not polarity sensitive.

The controller output is connected to a 2 way connector LINE and LOAD of the OUTPUT 1 on the PCB. Please note from release 2.1 onwards, the LINE and LOAD should connect directly to the external solenoid valve.

The mains supply is connected to a 2 way connector L and N of the mains input on the PCB.

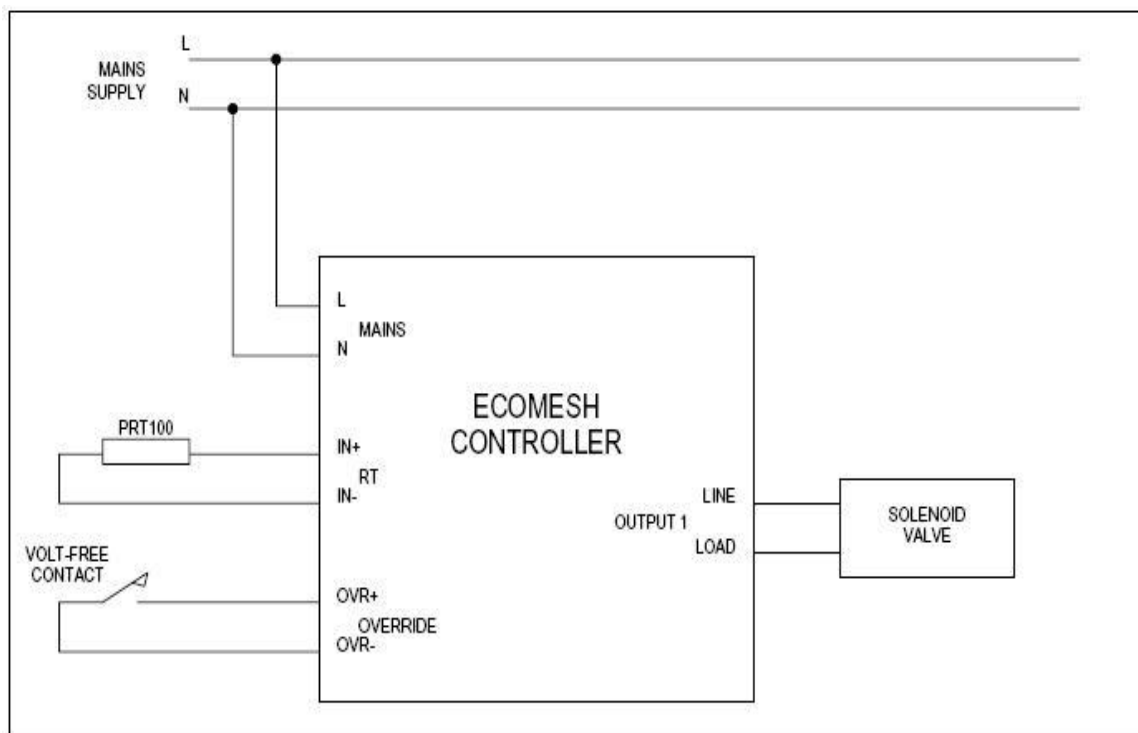


Fig.9. Electric connection diagram

## Mode of operation

All the parameters in the Ecomesh controller can be accessed by pressing the scroll button. Apart from the measured temperature, all the parameters can be set within their limits using the UP and DOWN button.

The following are the list of parameters:

ECOMESH CONTROLLER SETTING DESCRIPTION							
Menu	Description	Controller Minimum Limit	Controller Maximum Limit	Initial factory setup			Units
				Moderate Climate *	Hot Climate *	Pressure Control *	
t	Ambient Dry Bulb Reading	Sensor	Sensor	Sensor	Sensor	Sensor	°C
L	Minimum (Set) Temperature	10	60	20	25	20	°C
H	Maximum (Set) Temperature	10	60	35	50	40	°C
1	T1 - Spray Duration (1-99 Second) at L	1	99	5	10	15	Second
2	T2 - Spray Frequency y(1-99x10 Seconds) at L	0,5	99	1	0,5	0,5	Minute
3	T3 - Spray Duration (1-99 Second) at H	1	99	15	30	30	Second
4	T4 - Spray Frequency(1-99x10 Seconds) at H	0,5	99	45	30	18	Second
5	T5 - Flash Cycle ON Time (Sec) (Duration)	0	99	0	0	0	Second
6	T6 - Flash Cycle OFF Time (h) (Frequency)	0	99	0	0	0	Hour

\* The initial setup values can be changed to its desire values according to the device installation environment by the operator.

Ecomesh water spray system controller can be operated in 3 different conditions.

- 1) "t" Ambient temperature is between L (Minimum temperature) and H (Maximum temperature)
- 2) "t" Ambient temperature is above H (Maximum temperature) and
- 3) Independent of temperature

The detailed informations are given below table.

<b>ECOMESH KONTROLLER WORKING CONDITIONS</b>	
<b>1.Condition: "t" Ambient temperature is between L (Minimum temperature) and H (Maximum temperature)</b>	<b>2.Condition: "t" Ambient temperature is above H (Maximum temperature)</b>
$L < t < H$	$t > H$
<b>1</b>	<b>3</b>
Water spraying period in seconds when the ambient temperature (t) is between lower limit (L) and upper limit (H)	Water spraying period in seconds when the ambient temperature (t) is above the upper limit (H)
<b>2</b>	<b>4</b>
Off period (Value x 60 seconds) between two spraying when the ambient temperature (t) is between lower limit (L) and upper limit (H)	Off period (Value x 60 seconds) between two spraying when the ambient temperature (t) is above the upper limit (H)
<b>3.Condition: Independent of temperature values</b>	
<b>5</b>	Water spraying period in seconds when the system is independent of temperature values
<b>6</b>	Off period (Value x 60 seconds) between two spraying when the system is independent of temperature values



## 5. START UP

Before running the unit for the first time, the following facts should be checked.

1. Check the input/output electric connections. If the connection is not done in correct way, the value of the temperature will be appeared incorrectly.
2. Make sure that the sensor is working correctly. If there is any failure in function, the value of the temperature will be appeared incorrectly.
3. The current ampere of the solenoid valve should not be over the recommended values.
4. The screws of the control apparatus must be fastened tightly.

## 6. OPERATING

After the spray system is installed properly, the water system connection should be done to the fitting group. The water system must be operated by the qualified operator only.

## 7. MAINTENANCE

1. Maintenance operation is to be performed by qualified personnel only.
2. Ecomesh should be cleaned regularly once in week.
3. The system pipes and fitting group must be controlled regularly in order not to be blocked of the flow line.
4. The connection of the meshes and the fitting should be controlled in order to prevent from loosening any connection elements.
5. The electric and the sensor connections should be checked regularly.

## 8. INVALIDATION OF WARRANTY

The warranty declared in the sales contract is valid only if the instructions given in this manual are not violated.



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