



**EPHESUS SERIES
SOLAR WATER HEATING PACKAGE SYSTEMS**

INSTALLATION, OPERATION & MAINTENANCE MANUAL



www.sistemtubular.com

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1. PRODUCT TYPE AND WARRANTY

Sistem Tubular produces pressurized solar water heating package systems in the following models.

- Ephesus 16, Ephesus 24
- Ephesus 16-h & Ephesus 24-h

The number next to the Ephesus series represents the number of vacuum glass tubes in that system. The letter h is used to describe the horizontal model produced for summer based consumption profile or for low latitudes. The guaranty period of the package systems is 5 years. The guarantee certificate is delivered with the product. The life expectancy of the system is more than 20 years. On the other hand, system maintenance must be done regularly and system components that complete the service life have to be changed on time. This solar water heater is one of the most efficient water heater types available in worldwide.

The estimated mean family consumption is around 40 litres daily per person. For example, the Ephesus 24 has the capacity comfortably to meet the daily hot water consumption of a family of four.

2. GENERAL INFORMATION

This user manual contains all the necessary instructions about the introduction, installation, operation and maintenance of the product.

Sistem Tubular is a company that manufactures solar water heating systems. Using the high-tech equipment, developing new products with R & D activities towards needs, and increasing the productivity are among the priorities of the company. This new product, which provides both the comfortable usage of hot water at the same pressure without being affected by the level difference provided by the vacuum tubed pressurized type solar water heating systems and the hot water capacity of the non-pressurized systems in the tank, was developed considering the demands of the market as Ephesus series package systems.

Nowadays, using alternative energy sources without polluting the environment to produce energy and increasing productivity have become a social responsibility. Renewable energy sources promise a solution to pollution as well as to the energy problem. The use of alternative energy products aimed to satisfy energy requirements without endangering the environment is increasingly encouraged by international legislation.

3. OPERATION OF THE SYSTEM

3.1 INTRODUCTION AND WORKING PRINCIPLE OF VACUUM TUBE SYSTEM

This product combines the comfortable usage of closed-loop pressurized systems with water capacity of open-loop unpressurized systems. The most important feature that separates this product from the others is that it works without having any equipment in the reservoir tank such as double-wall, serpentine and, heat-exchanger. In order to achieve this, a special designed sealing ring has been developed to resist against pressure. The cold tap water, entering reservoir, is heated by natural convection thanks to vacuum tube and glass heat pipe, which are specially designed, and becomes ready to use as hot water.

A pressure reducer is placed in the inlet of the system, designed to work pressure of max 4 bars to ensure comfortable hot water usage, to protect it from instantaneous pressure fluctuations in the city water supply. In addition, a temperature and pressure control valve is placed to prevent overheating of the system in summer. When the water temperature in the tank reaches 90°C, the control valve turns on and keeps the water temperature at the desired level. Then, the system works safely and properly and extends its life.

The inner surface of the hot water reservoir is coated with vitreous enamel so that the system is hygienic and resistant to corrosion. Our new chassis, having a modern and ergonomic design, is safe against environmental effects such as snow load, wind, etc. The chassis provides ease of assembly. So it can be installed easily on any kind of ground or platform.

In this system, there is no obligation to set it up in order to create a level difference as in non-pressurized systems. It can also be installed in the garden instead of the roof of the house to prevent visual pollution. It is also ideal for the top floors of the apartments.

3.2 WHAT IS ALL GLASS HEAT PIPE EVACUATED TUBE? HOW IT WORKS?

All glass heat pipe evacuated tube also consists of a two layers of glass with a vacuum in between the layers like conventional solar vacuum tubes. On the other hand, its difference from conventional vacuum tubes is that the open end of the tube is closed using a special geometry like a dome shape to increase resistant to axial loads in pressurized reservoir systems. This enclosed area, which is inside the inner tube, is

vacuumed and a heat transfer fluid is injected into it. All glass heat pipe evacuated tube is generally called in this manual as vacuum tube.

The special selective coating on the outer surface of the inner tube changes solar radiation into the heat and then it is transferred to a heat transfer fluid within the tube. This liquid quickly heats up, changes its form to gas and rises to the top. It reaches the dome shaped condenser in the usage water reservoir. Since the outer surface of the condenser is in contact with the relatively cold usage water in the reservoir, the heat transfer fluid in the form of gas condenses on the inner surface of the condenser. The condensing chemical returns back in droplets to the sun-exposed base of the tube. As long as the system is heated by the sun, the circulation continues.

Advantages: Contrary to conventional vacuum tubes, there is no water circulation inside the tube, so calcification problem due to water is prevented. Due to no water circulation, there is no risk of freezing or breaking the tube in winter.

4. SAFETY NOTICE

- If there is any leakage in the reservoir, in case of electrical connection, the mains electricity must be cut off. Then contact to the authorized service immediately.
- This manual is a part of the package system and please keep it. In case of lost, contact with the authorized dealer to get the new one. It can also be downloaded from the company's internet page.
- The package system you have received must be complete and in good condition.
- In case of any damage in the system, contact with the authorized dealer.
- Assembly of the packaging systems should be done by trained personnel.
- Installation of the system should not be started until general work safety precautions have been taken.
- The system must not be started until safety and pressure reducing valves are checked.
- The system or it's parts must not be modified or replaced without the approval of the manufacturer, Sistem Tubular.
- Care should be taken to ensure that children do not reach the hot water in the tank.

5. LABELING AND TRACEABILITY

Sistem Tubular package systems have a life expectancy of more than 20 years. The systems are identified by one product label on the hot water tank. On this label, all

the details of the collector are written. The information provided on the label is important for the future identification of the product. If the label is removed from the product, it will be difficult to identify the product and to fulfill the service and warranty procedure. The sample label is given in Figure-1.

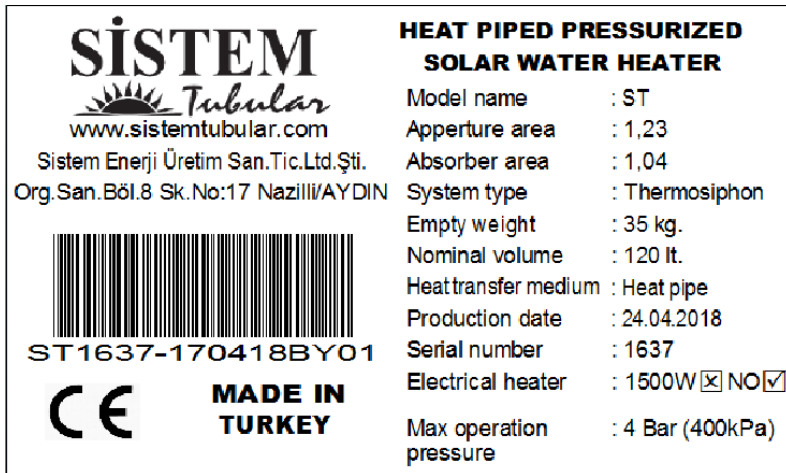


Figure-1. Sample product label.

6. TRANSPORTATION AND HANDLING INSTRUCTIONS

Vacuum tube solar water heater and its components are packed in a cardboard box in which they are delivered to customers without any damage. During its transportation and handling, all safety indications on the packaging should be respected. Using Table-1 and Figure-3, Please check whether the product is delivered to you without any missing parts. The packing materials must be removed from the collectors at the point of installation. Do not stand up on the product, it may cause serious damage and/or injuries.

7. GENERAL VIEW OF THE SYSTEM, COMPONENTS AND SIZE

7.1. GENERAL VIEW OF THE SYSTEM

This package system in Figure-2 is designed to operate through natural circulation to supply the hot water needs of residential buildings. The system has all the necessary equipment for this function. Some optional equipment depends on the user's preference.



Figure-2. General view of the solar water heater.

7.2. COMPONENTS OF THE SYSTEM

The assembly frame of the solar water heater is shown in Figure-3. The hot water tank is designed as a part of the supporting frame.

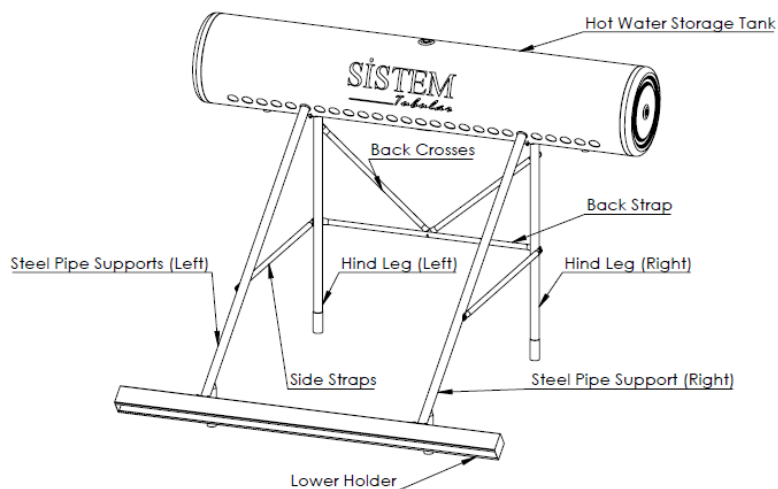
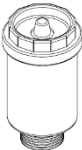
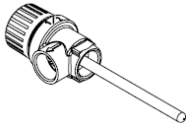
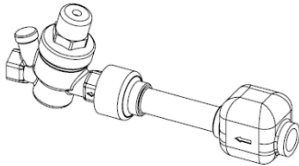
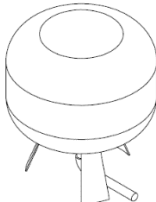



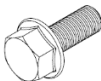


Figure-3. Assembly frame of the system.

The other components in the system are given in Table-1.

Table-1. *The components of the solar water heater.*

Model type / Name of component	Ephesus 16 Ephesus 16-h	Ephesus 24 Ephesus 24-h	view
Air purge valve	1	1	
Temperature and pressure control valve (TP)	1	1	
Safety kit: Check valve and pressure reducer (3 bars)	1	1	
Expansion tank	1	1	
Plastic support (piece)	16	24	

Dust seal (piece)	16 + 2	24 + 2	
Universal foot	2	2	
Electric heater, optional (1 piece)	1500-2000 watt	1500-2000 watt	
Mounting bolts - M8	21	21	

7.3 SIZE OF THE SYSTEM

Mounting dimensions of the system to flat roof and tile roof are given in Figure-4. Table 2 also shows the dimensions of the system according to the model.

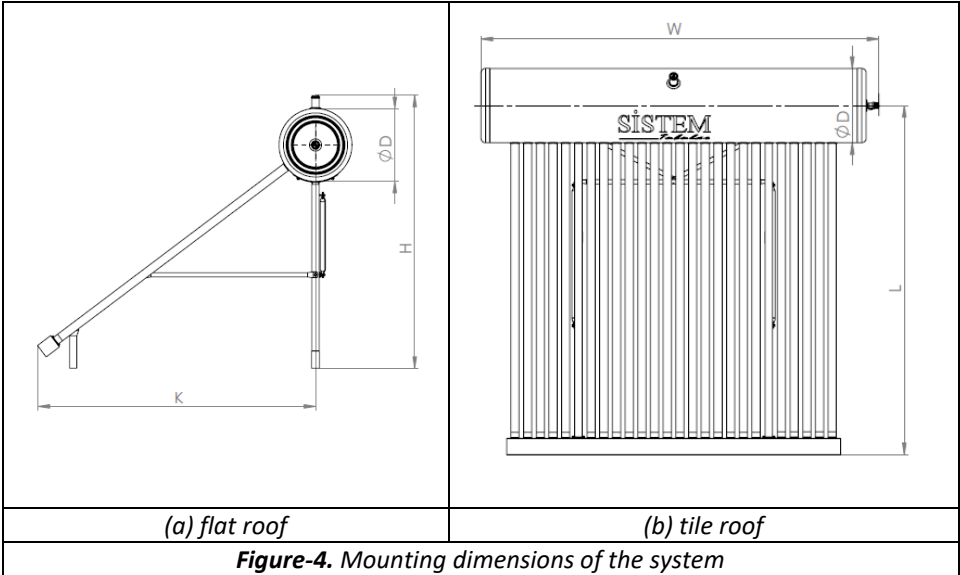


Table-2. Dimensions of the solar water heater.

System/Dimensions	Ephesus 16	Ephesus 24
K (m)	1.80	1.80
W (m)	1.65	2.20
H (m)	1.60	1.60
L (m)	2.00	2.00

8. INSTALLATION OF SYSTEM

8.1 NOTICES FOR INSTALLATION

Ephesus water heating model is usually installed on the roof but can also be installed on the ground because it is a pressurized system. Level of the installed place in terms of the usage comfort is not important.

The package system must be installed by authorized persons. The installer must comply with all safety regulations. In addition, all work associated with the installation must comply with local authority regulations, where these installation instructions and local regulations are in conflict, local regulations must prevail. All components of the system are packaged and presented to the customer. Before installing the system, check all components whether they are in good condition and the installation location (orientation and angle) of the system whether it is proper. If the mounting area is snowy and/or windy, these situations should be taken into consideration. The system must be installed by paying attention to the distances in Figure-5 so that it is not to be shadowed by an object or each other. The optimum collector angle in general is South 37° for Turkey. The distances B and C between the collector and the obstacle or other collector are also given in Table-3 according to the latitudes. For example, Turkey is between latitudes 36 to 42 so $B = 2A$ and $C = 2H = 3.20 \text{ meter}$ should be taken. Please contact the authorized dealer for further information.

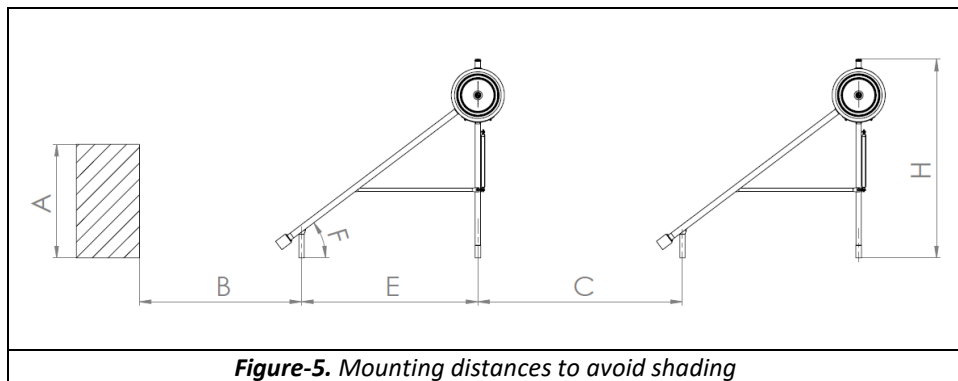


Figure-5. Mounting distances to avoid shading

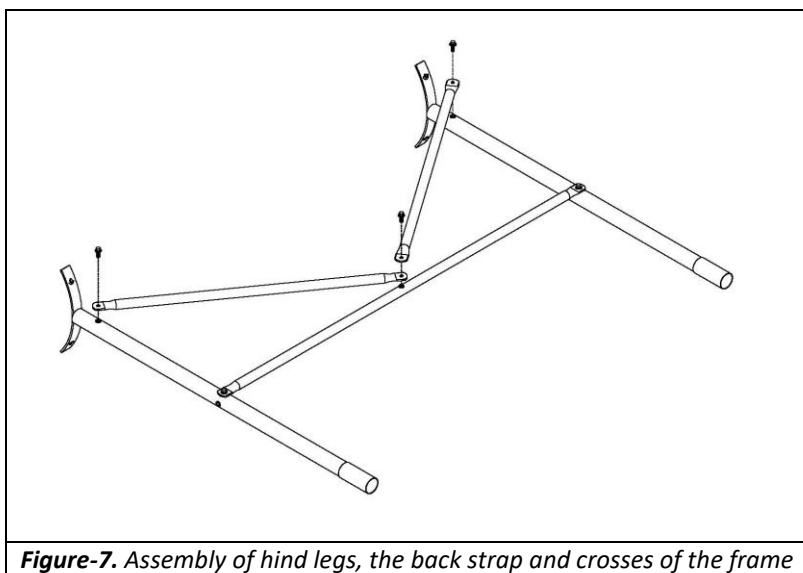
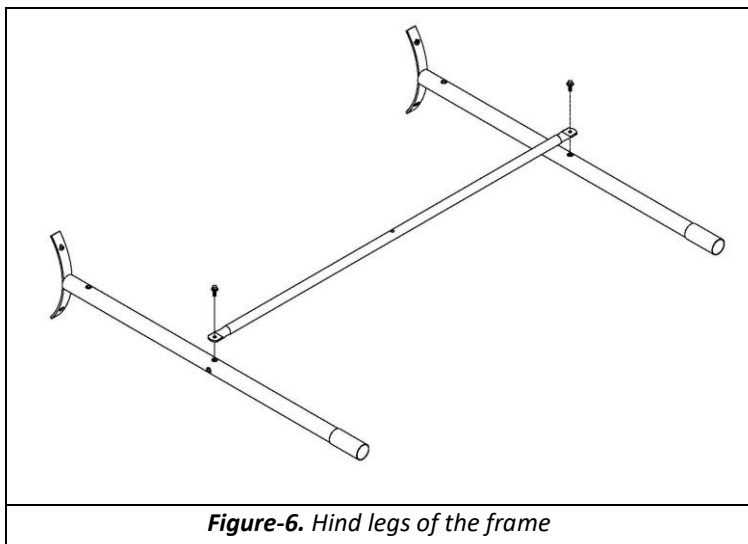
Table-3. B and C distances shown in Figure-5.

Latitude	B	C
0° - 25°	1.0xA	1.0xH
26° - 35°	1.5xA	1.5xH
36° - 45°	2.0xA	2.0xH
46° - 50°	2.5xA	2.5xH
> 50°	3.0xA	3.0xH

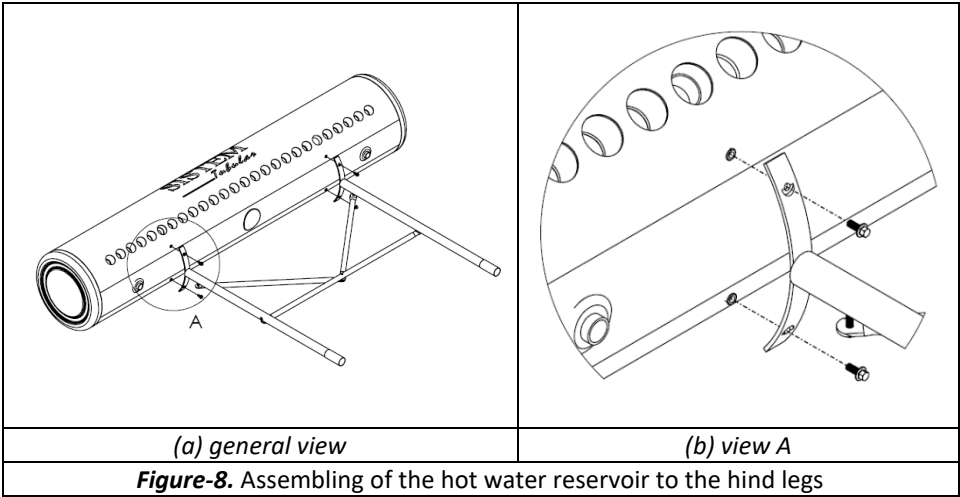
8.2 INSTALLATION

The supporting base or platform must be prepared before the installation of the system.

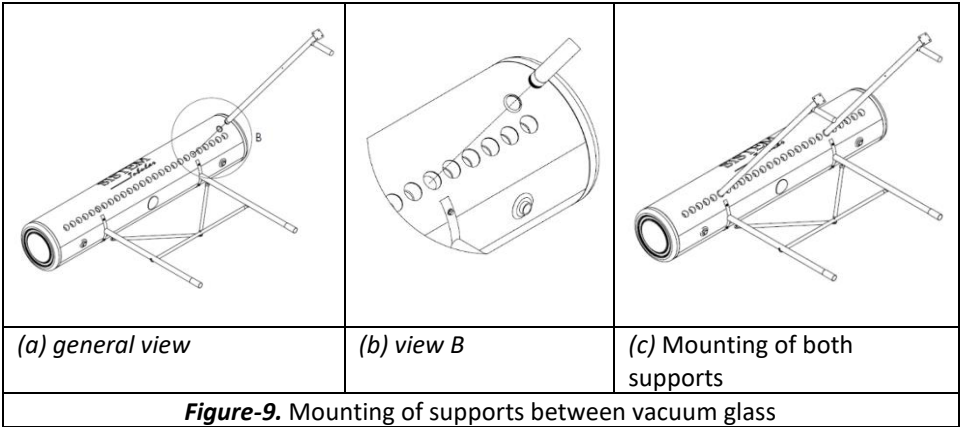
All assembly holes on the frame should be installed facing outward of solar water heater. First, mount the hind legs, the back strap and crosses of the frame which are inside the package (Figure-6 & Figure-7).



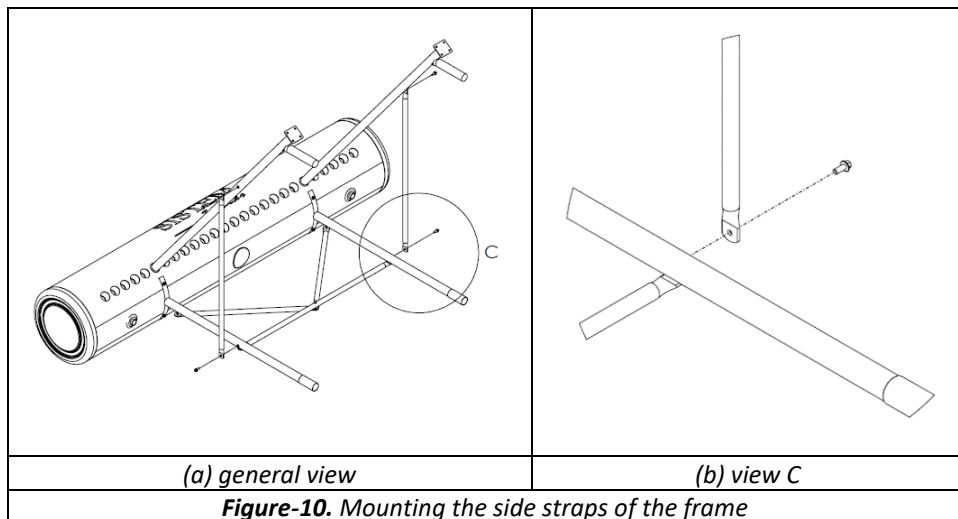
Align the assembly holes of the hot water reservoir with the curved part of the hind legs. Tighten the bolts slightly (Figure-8)



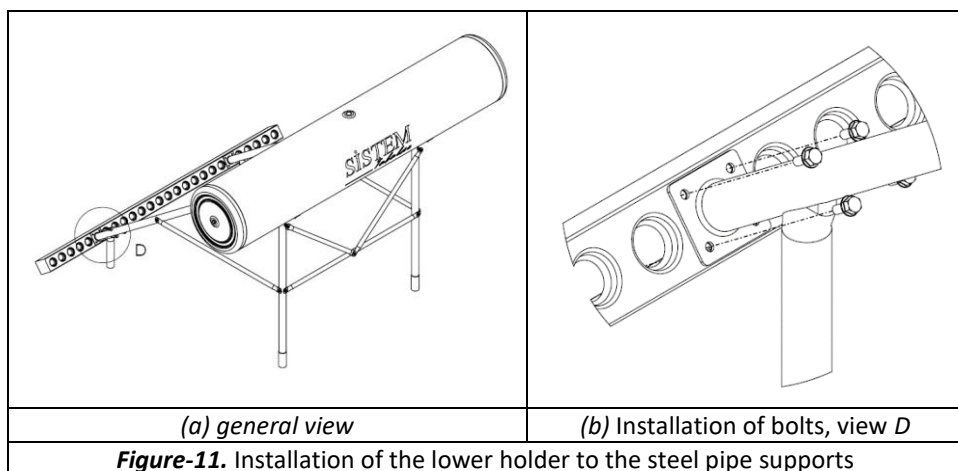
Secure the steel pipe supports among glass tubes as its assembly holes facing outward of the solar water heater by turning them into the sleeve holes in the hot water tank (Figure-9). While doing this, make sure that the fore-feet that will sit on the floor are parallel to the hind legs. You may loosen the screw a little if necessary. The last turn on the screw is for this process.



Secure the side straps of the frame using bolts (Figure-10).

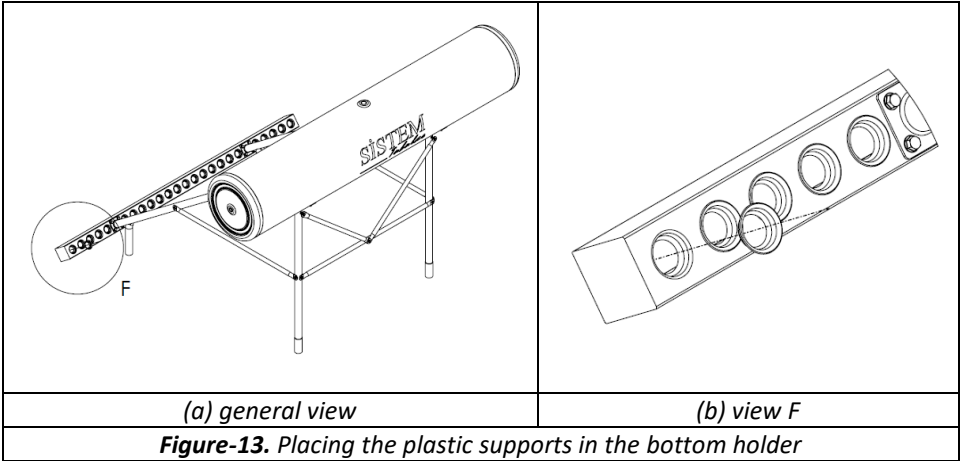
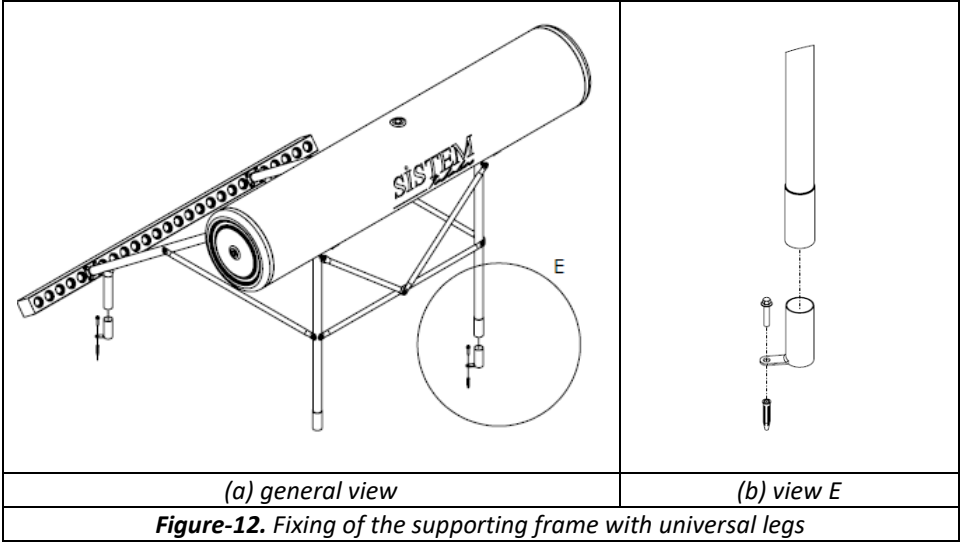


Hold the solar water heater on both sides and set it upright position. Position the lower holder relative to the steel pipe supports among (the holes of) the glass tubes. Firmly tighten the flange bolts of the supports (Figure-11).



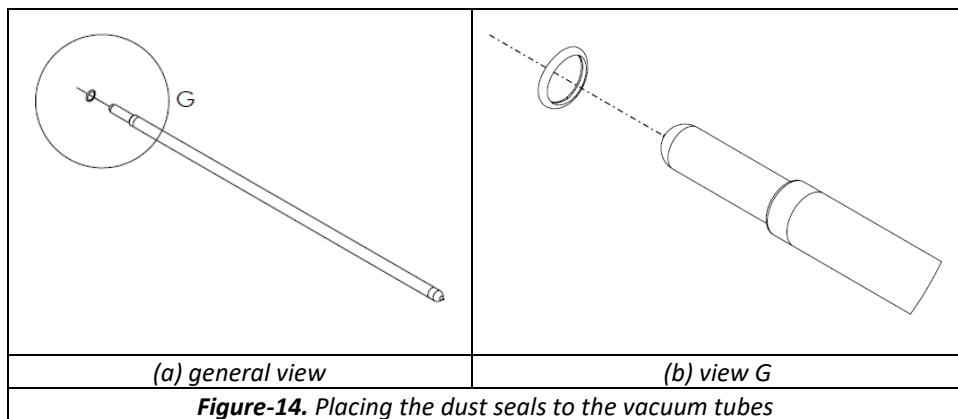
Especially, check the hind legs whether they are on the balance. Tighten all the bolts securely. During this process, the four legs of the supporting frame must be on the base or platform. If any of the legs does not have contact to the ground, (1) move the other legs of the frame to the position on the ground, and make sure that all four

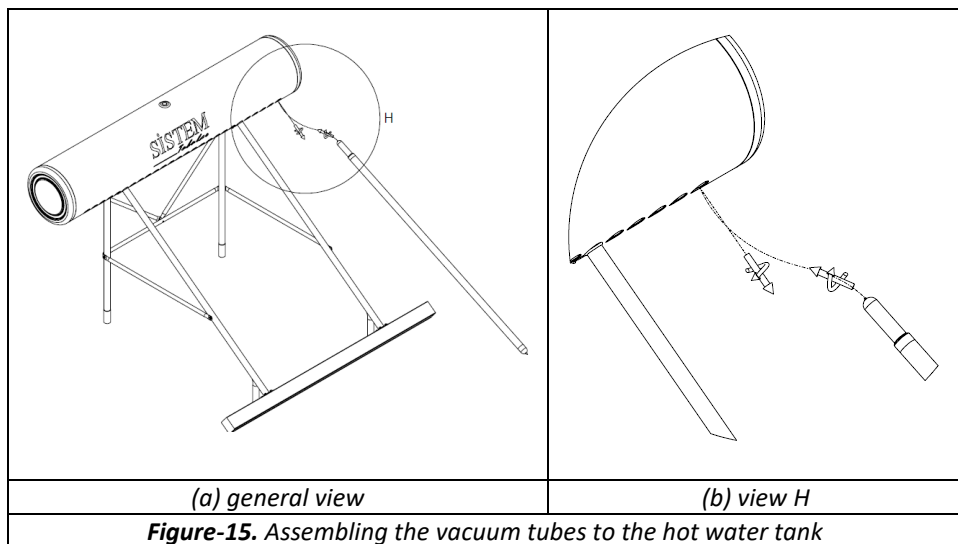
legs touch the ground. (2) However, if one of the front leg still stays in the air, apply a torque to the lower holder by pressing the leg in air towards the side and lift the other front leg to the air. Ensure that all the legs touch the base or platform. Place the universal leg's holders to the base to fix the frame at least from one front and one hind leg to take the system safety against overturning (Figure-12). Certainly do not forget to screw the universal leg's holders also to the frame. With this process, the installation of the supporting frame is completed. To assemble the vacuum tubes, first place the plastic supports in the bottom holder (Figure-13).



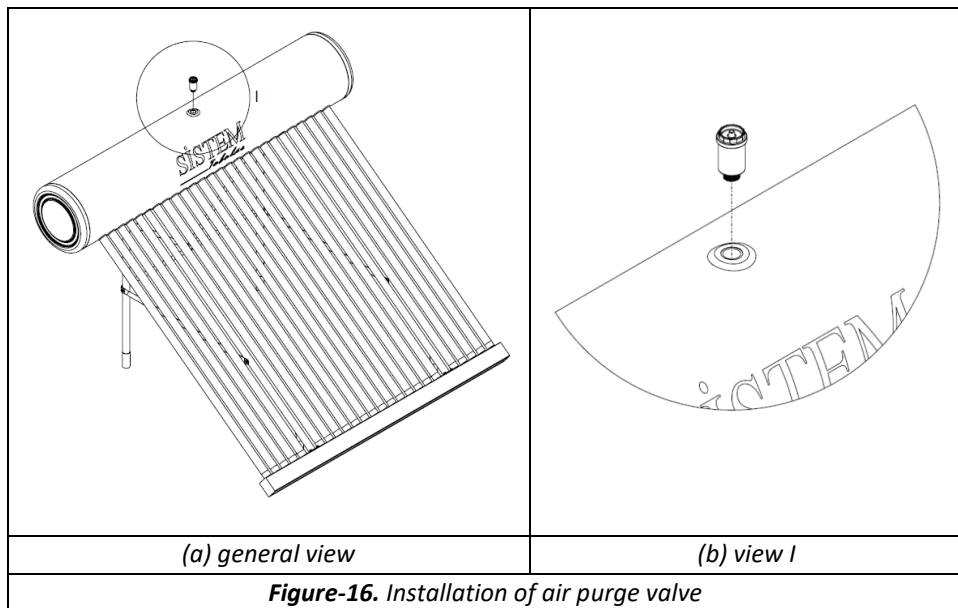
CONSIDERATIONS DURING THE INSTALLATION OF VACUUM TUBES

- Keep vacuum tubes in their box until the time of installation.
- During installation, make sure that neither end point of the vacuum tube is impacted. The tip is the most sensitive part of the tubes.
- Be careful when installing vacuum tubes. They can break as a result of shock, bending or falling.
- First place the dust seals to the vacuum tubes (Figure-14).
- Prepare a dishwashing detergent (or liquid soap) and a water mixture as a ratio of one by one in a small bowl. Apply this mixture to just 10 cm part of the larger diameter in vacuum tube after the condenser. This allows the vacuum tube to be easily installed through the sealing gaskets in the tank. Never use petroleum oil products. The silicone rubber seal wears off immediately.
- When assembling the vacuum tubes to the silicone rubber seal, make gentle circular wrist motions to place it (Figure-15). Otherwise, the thin screen of the silicone seal holding the glass surface might be bent causing water leakage.

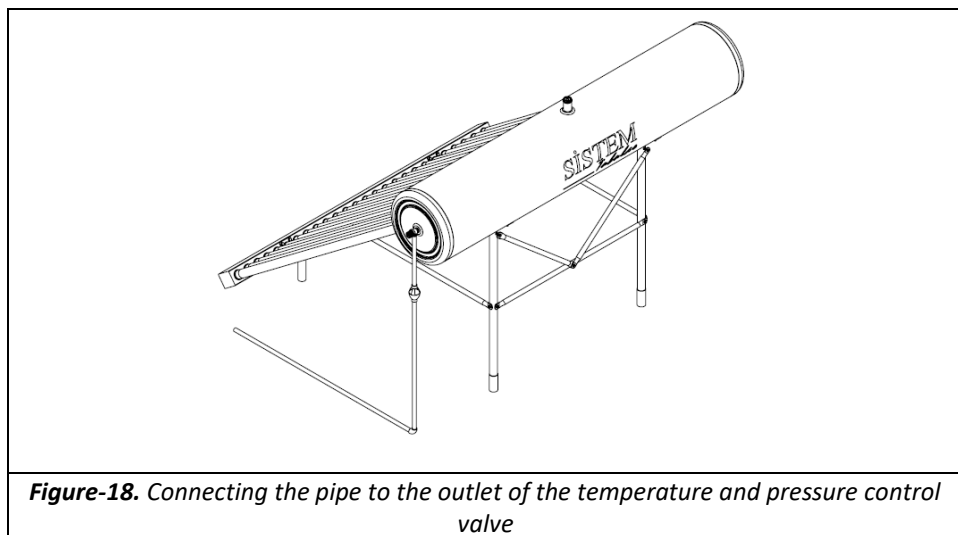
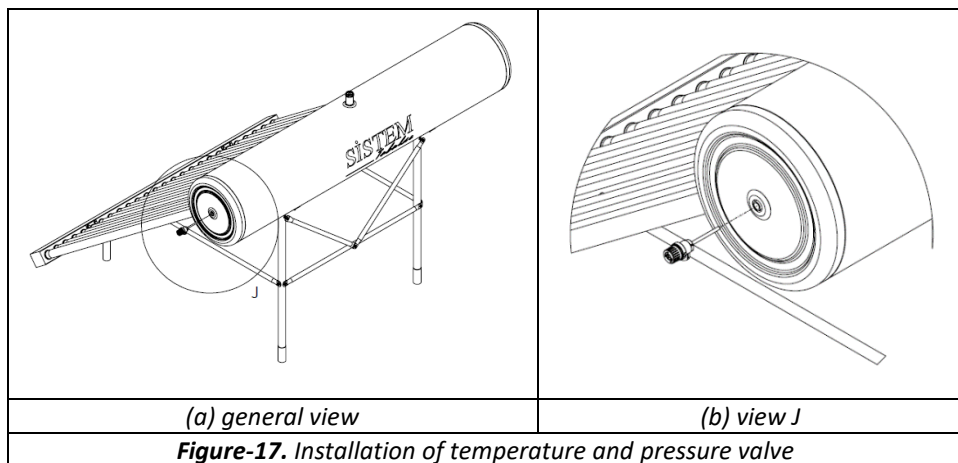




Mount the air purge valve in the screw hole on the top of the tank (Figure-16). Do not apply force on the twelve-rounded-part (dodecagon) section by a tool to tighten the air purge valve. The O-ring seal inside may be damaged. Tighten the air purge valve by holding cylindrical surface of it using a wrench. In order to reduce the heat loss in the tank, it is recommended that the lateral surfaces of the air purge valve are covered with insulating material.



Install the temperature and pressure control valve to the inlet on the cover as the vent hole downward (Figure-17). You can also refer to the flow direction indicated by the arrow on the valve for this. Valve can work without being affected by weather and external factors. It is recommended to cover it with insulating material in order to reduce the heat loss in the tank. The valve should be checked at least once a year. Install an appropriate PPRC pipe to the TP valve outlet and connect the other end of the pipe to the sewage line (Figure-18). Keep in mind that hot and boiling water will come out of the valve, and take precautions accordingly. It may be better to install an air gap as a precaution to come out water in the form of steam.



Install the cold water pipe. Observe the directional sign in the safety kit and install it to the cold water inlet without changing any settings and the order (Figure-19). Note that during this process cartridge of the pressure reducer must be in the vertical position. It is recommended to add a filter before the check-valve to the cold water line (Figure-20). It is ensured that the system operates more efficient in this way. It is also recommended that the pressure reducer must be protected against frost in cold regions. The safety kit includes check valve, pressure reducer, ball valve and

expansion tank respectively. The expansion tank in your system as shown in Figure-19, install it also in the cold water inlet. It reduces water drainage from the system due to increase of temperature or pressure. The water stored returns to the system again. The minimum operating temperature of the expansion tank is specified as -10°C by the manufacturer. It should be protected according to the climatic conditions in the region where it is established. The ball valve is not available in the product kit. The technical service should bring and install it.

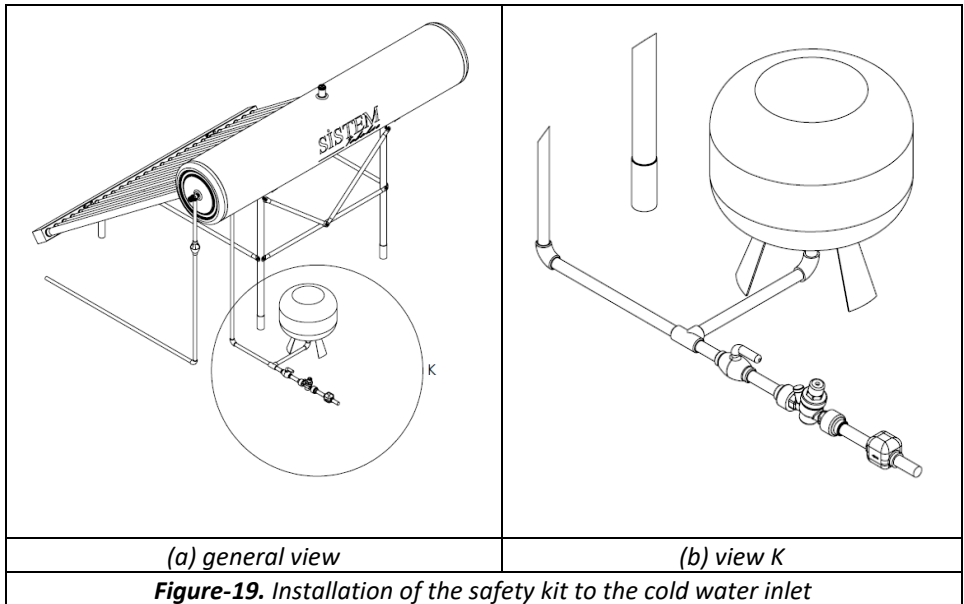


Figure-19. Installation of the safety kit to the cold water inlet

Complete the assembly by installing a pipe and a ball valve to the hot water outlet of the tank. A thermostatic mixing valve can optionally be added to prevent the risk of scald when using hot water. The thermostatic mixing valve should be connected to the intersection between hot water outlet and cold water inlet. To do this a pipe line should be connected to hot water outlet from cold water inlet. This is indicated in the hydraulic diagram of the system (Figure 20).

Once the installation is completed, the tank should be filled with water and checked for any leakages. Clean the vacuum tubes with a soft soapy cloth or glass cleaner after the installation has been fully completed smoothly.

If you do not pay attention to the instructions described in this guide, any damage and failures that may occur during the installation are excluded of the warranty.

8.3 HYDRAULIC DIAGRAM

The hydraulic diagram of the system is shown in Figure-20. According to this diagram, you can check whether all connections are properly made.

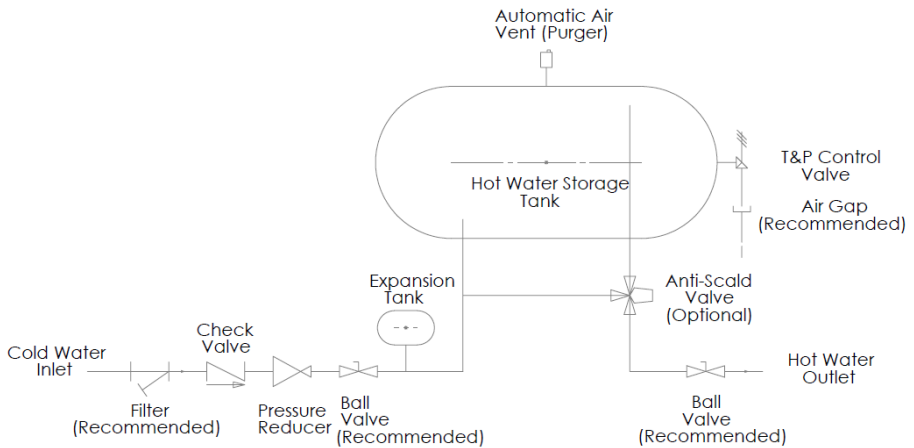


Figure-20. Hydraulic diagram of the system.

8.4 ELECTRIC HEATER (OPTIONAL)

Remove the protective cover which is the outside of the tank to install the electric heater. Remove the blind plug from the water tank and install the electrical resistance. Set the thermostat to the desired temperature. Complete the installation by making the electrical connection of the heater. Place back the protective cover on the outside of the tank.

8.5 MAGNESIUM ANODE

The magnesium anode rod was mounted in the middle lower part of the water tank in the solar water heater. This ensures cathodic protection of any metal structure in the water. Life expectancy of it is about 2 years under normal conditions and it is recommended to change it every 2 years. Where the corrosive nature of the water is excessive, its life is shorter and this case must be under consideration. The installation of the magnesium anode rod is very easy. First, shut off cold water inlet

to system to do this, then to reduce the pressure of the water tank, turn on the TP valve and check that the air purge is open which means the plastic pin is down. Remove the protective cover on the middle bottom of the outer tank. Remove the magnesium anode rod and replace it with new one. Replacing the magnesium anode rod is the user's responsibility. If necessary, contact the authorized service for it.

8.6 RUBBER SEALS IN WATER TANK

The sealing between the vacuum tubes and the tank is provided by silicone rubber gaskets in the solar water heater. It is recommended to replace the gaskets every 4 years. You can continue to use it if there is no leakage from any gaskets but in this case occasionally check for any leaks.

While replacing the gaskets, first take out the vacuum tubes. Since the gaskets are mounted on the water tank, it is not easy to reach them because of the external protection. Once you have installed the new gaskets, check whether inner thin screen of the rubber gasket is properly seated on the tank surface. Otherwise, if it is bended, water may leak. After installing the gaskets, reassemble the vacuum tubes as described in Section 8.2.

Silicone rubber gasket is specially designed for this pressurized solar water heater tank. Its material is also specific and approved for use in potable water. When replacing it, for example, do not use the gaskets which are designed for non-pressurized systems. They are not suitable for this application and have a shorter life cycle.

9. TEST, CONTROL, USAGE, MAINTENANCE AND TROUBLESHOOTING

Before starting to use the system, control the checklist indicated in Table-4 and test the system.

USAGE AND MAINTENANCE

- If you do not use solar water heater for a long term (due to holiday or similar reasons), it is advised to cover the vacuum tubes with a non-transparent cover. In this way, the system is prevented staying at high temperature. So the life of the system may be longer.
- Do not shut off the cold water inlet of the system for a long term. Especially during the summer when the water temperature in the tank rises above 90 °C, it

is necessary to enter cold water in the tank so that the temperature can be compensated by the TP valve.

- Package systems do not require any maintenance under normal conditions. However, system components need to be checked at regular intervals. For example, the magnesium anode rod has a lifetime of 2 years and is recommended to be replaced every 2 years. If necessary, contact the authorized service.
- Check the vacuum tubes regularly. If it is dusty or dirty, clean it. This will make the system to work more efficiently. Rain is usually enough to keep the tubes clean.
- Discharge the temperature and control valve manually once in a year and make sure it works.
- Before control and maintenance of the system, you must reduce the pressure of the water tank. First, shut off the cold water inlet to do this, then turn on the TP valve and check that the air purge is open which means the plastic pin is down.
- If you are using another type of water heater system such as electric water heater or combi boiler in addition to this system, turn off the hot water inlet valve which goes to the taps from the system you are not using. This problem can be solved by placing a check valve at the hot water outlet.
- Do not take any service from persons other than authorized service.
- This package system has all the necessary equipment to operate through natural circulation. No anti-freeze fluid is required against frost.

Table-4. Post-installation checklist of the solar water heater.

CONTROL LIST	Check
Installation	
Is the installation according to the instructions and local authority regulations?	
Has the installation been carried out on the roof according to the local regulations?	
Has the system been mounted in an ideal location and at appropriate angle to get sunlight?	
Are all bolts, nuts and other fasteners checked for tightness?	
Pipe Connections and Vacuum Tube Assembly	
Have all the pipes properly been installed and insulated properly?	
Have the vacuum tubes been installed as described in this manual?	
Are there any leaks in the connections or in the vacuum tubes? Recheck again about 30 minutes after the first check.	
Hydraulic Connections: Have all the hydraulic connections in Fig. 20 been carried out?	
Have the check valve, pressure reducer, expansion tank, and ball valve which are in the safety kit been installed properly?	
Has the air purge been mounted properly?	
Has the TP valve been mounted properly?	
Has the thermostatic mixing valve been connected to the intersection between hot water outlet and cold water inlet? (it is optional for scald protection)	
Has a ball valve been installed to the hot water outlet?	
Electric Connections (Optional)	
Has the electric resistance been connected properly? (if it exists)	
Has the electric connection been done according to the local regulations?	
General Info	
Was the proper selection of the model made according to the needs of the client?	
Was the guarantee properly filled in and given to the client?	
Was this user manual given to the client?	

TROUBLESHOOTING

Table-5. Detection of failures in the system and troubleshooting.

DETECTION OF FAILURE	CAUSE OF THE PROBLEM	TROUBLESHOOTING
Leakage in the pipe connections	Problem at pipe connections	contact the authorized service
System working at low efficiency	Leakage in connection pipes	Tighten connections
	Vacuum tubes dusty	Clean vacuum tube surfaces
	Excessive hot water consumption compared to the capacity of the system	System is not adequate. Larger system required ¹
	Filters in the system clogged	Clean all filters including pressure reducer ¹
Leakage from safety kit	Problem in pressure reducer	Pressure reducer will be adjusted ¹
	Failure in safety valve	Replace safety valve ¹
	Failure in pressure reducer	contact the authorized service
	The expansion tank is unable to function	The expansion tank not be exposed to direct sunlight ¹
	Another active water heater connected to the system	Check hot water inlet valve
Breakage of vacuum tubes	External factors	contact the authorized service
Low hot water pressure in the system	Filters in the system clogged	Clean all filters including pressure reducer ¹
	City water supply pressure low	Connect a hydrophore to the system ¹
	Calcification ratio in city water high	To reduce calcification use purifier or ¹
	Failure in pressure reducer	adjust or change pressure reducer ¹
Leakage in the tank except pipe connections	Run out of the magnesium anode rod	contact the authorized service
	Problem in the sealing gaskets of the tank	Check and change the sealing gaskets ¹
Electric heater not working	Problem in the resistance or its connection	contact the authorized service

¹Contact the authorized service

APPENDIX

APPENDIX-1

AUTHORIZED SERVICES & MANUFACTURER

MANUFACTURER:

Title: SİSTEM ENERJİ ÜRETİM SAN ve TİC LTD ŞTİ
Address: Organize Sanayi Bölgesi 8 Sk No 17 Nazilli, Aydın / Turkey
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