Company profile

ECOTHERM is the leading brand for turnkey hot water, steam and solar systems for hotels, hospitals and industry in the Middle East.

ECOTHERM amazes its customers with “Individual Heat Transfer Solutions” for hot water, steam and solar generation. The following advantages mark these solutions:

**Individuality**
ECOTHERM realizes extensive turnkey systems as well as the production of separate components. Each single plant is specifically aligned to the customer’s individual requirements. The basis is an own production in Austria and a wide product portfolio.

**Premium quality**
All products made of high-class duplex stainless steel guarantee a long-life cycle and perfect hygiene. ECOTHERM is certified to ISO 9001 : 2008 with all required European standards.

**Innovation**
We are always open to the new, we constantly investigate new technologies and we develop path-breaking and future-oriented products.

**Premium service**
Clients benefit from extensive service at consulting, planning, engineering, supervision and training. ECOTHERM regularly improves the know-how of its partners and clients via selective trainings.

**Efficiency**
The ECOTHERM Group managed by the owner has slim decision-making structures. ECOTHERM turnkey solutions from one single source and the economical handling of energy resources offer an optimal cost-benefit ratio.

**Experience**
With over thousand installations in the last decade in Europe, the Middle East, Asia, North Africa and Central America, ECOTHERM has become one of the technology and innovation leaders for individual hot water, steam and solar solutions on the market.

**Reliability**
ECOTHERM systems are monitored around the clock and can be serviced at low cost, quickly and efficiently via an advance control panel. Our designed plants have low maintenance requirements and are totally dependable.

**Sustainability**
ECOTHERM products help our customers to save energy and money. We save valuable resources through the use of renewable energies. ECOTHERM high-performance plants have minimal space requirements and provide maximum energy savings. When planning new products ECOTHERM engineers take all the qualitative and economic principles into account in accordance with ecological principles.

**Partnership**
We live in a partnership with all our customers, suppliers and employees. This relationship is characterized by honesty, commitment, openness, trust and reliability. The object is a joint long-term success.

**Internationality**
The international alignment of ECOTHERM with branches in Dubai, Kuwait, Mexico, Hungary, India and partners in more than 20 countries is the basis for our flexible and efficient project implementation that is always on schedule.
ECOTHERM Solar Thermal Solutions

Your optimal solution

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- ESCF-N100 Page 10
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Products:
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- Comparison Flat Plate/Vacuum Tube Collector: Page 27

Installation Guide:
- Support base assembly on a flat surface: Pages 29-31
ECOTHERM's goal is to amaze its customers with solar thermal solutions that are delivered on time, include all items needed to run the system and which can be operated properly from day one. Therefore the experienced ECOTHERM engineers include already all items needed to operate the system in the design stage. Please have a look on pages 6 & 7 to see a schematic overview of all these components.

ECOTHERM solar systems consist of high quality components. The solar collectors are manufactured according to the specifications of ECOTHERM Austria. The quality management system of ECOTHERM is certified according to ISO 9001 : 2008 for sizing, design, production and distribution of solar, hot water and steam systems as well as of pressure vessels and heat exchangers.

The buffer tanks can be manufactured in high quality stainless steel according to the highest European standards as e. g. ISO 3834-2 and therefore guarantee long service life and perfect hygiene. Our own test bench assures the highest quality and reliability.
Your optimal ECOTHERM solar thermal solution

Buffer Tank
Storage water heaters made of high quality, corrosion resistant stainless steel with patented flat heating coil. Details on page 13.

Inline Vessel
The inline vessel provides heat dispersion by reducing the working temperature and therefore significantly increasing the life span of the expansion vessel. Details on page 12.

Emergency Cooler
An Emergency Cooler is mandatory to dissipate excess solar energy in summertime. Details on page 12.

Thermostatic Mixing Valve
For regulation of cold water supply and hot water supply. Details on page 16.

Electric Anode
Non sacrificial titanium anodic protection of the buffer tank. Details on page 14.

Electric Back up
Electric heating element as auxiliary heating for days with bad weather conditions or/and high hot water demand. Details on page 14.

Automatic Back Feed System incl. Pressure Monitoring
For automatic re-filling of the solar system with cold water. Details on page 16.

3-Way Valve incl. Actuator
For controlling of the solar thermal loading of several water heaters. Details on page 16.

Pumps
The usage of a second pump prevents a standstill of the solar system in case of a malfunction of one pump. Details on page 13.
ECOTHERM manufactures large-size collectors of the ESCF-N100 series in the standard size of 10m². The special design of the absorber, the minimum time for installation and the attractive performance data make these collectors ideal for large solar thermal systems.

Details on page 10.

ESC-V18

ECOTHERM manufactures evacuated tube collectors of the ESC-V18 series. The special design makes this collector type ideal for high temperature applications such as process steam production. Also the evacuated tube collector is more efficient at lower outside air temperatures as e.g. in Central Europe.

Details on page 11.

ESC-F-N20/N26

ECOTHERM manufactures flat plate collectors of the ESCF-N20 series in the standard size of 2m² and the ESCF-N26 series in the standard size of 2.6m². This collector type is ideal for areas with high outside air temperatures as in Middle East and Northern Africa. Also because of the simple technology of the flat plate collector type this collector is more cost efficient than the evacuated tube collector.

Details on page 8 and 9.
ECOTHERM Collector: ESCF-N20

The ESCF-N20 is the custom-designed collector for regions with maritime and desert-like conditions. It is equipped with a corrosion-resistant absorber, a highly selective coating to combat sea air and an optimized ventilation concept to keep out blowing sand. The ESCF-N20 has been designed to withstand 150 km/h winds and 1.25 kN/m² snow loads. The ESCF-N20 is based on a minimum number of individual components and assembled on a robotic production line at ECOTHERM. Equipped with a modular mounting system, the ESCF-N20 can be used for both flat-roof and on-roof installations.

<table>
<thead>
<tr>
<th>Specification</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Total Area (m²)</td>
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<tr>
<td>Number of manifolds</td>
<td>8 (Ø8)</td>
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<tr>
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<td>Propylene glycol solution/water</td>
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<td>Capacity (lt)</td>
<td>1.28</td>
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<tr>
<td>Absorber surface (m²)</td>
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<td>Total dimensions (LxWxH mm)</td>
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<tr>
<td>Collector total weight (without liquid) (kg)</td>
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<tr>
<td>Absorber</td>
<td>Selective aluminium</td>
</tr>
<tr>
<td>Absorbency / radiation coefficient</td>
<td>95% ±2% / 5% ±2%</td>
</tr>
<tr>
<td>Max. stagnation temperature under test conditions</td>
<td>170.2 °C</td>
</tr>
</tbody>
</table>

Applications

ECOTHERM manufactures flat plate collectors of the ESCF-N20 series in the standard size of 2m² and the ESCF-N26 series in the standard size of 2.6m². This collector type is ideal for areas with high outside air temperatures as in Middle East and Northern Africa. Also because of the simple technology of the flat plate collector type this collector is more cost efficient than the evacuated tube collector. The optimized mounting system, which permits time-saving installation by hand, and simple connection considerable reduce the overall time and effort required to install the system.
ECOTHERM Collector: ESCF-N26

The ESCF-N26 is the custom-designed collector for regions with maritime and desert-like conditions. It is equipped with a corrosion-resistant absorber, a highly selective coating to combat sea air and an optimized ventilation concept to keep out blowing sand. The ESCF-N26 has been designed to withstand 150 km/h winds and 1.25 kN/m² snow loads. The ESCF-N26 is based on a minimum number of individual components and assembled on a robotic production line at ECOTHERM. Equipped with a modular mounting system, the ESCF-N26 can be used for both flat-roof and on-roof installations.

**Applications**

ECOTHERM manufactures flat plate collectors of the ESCF-N20 series in the standard size of 2m² and the ESCF-N26 series in the standard size of 2.6m². This collector type is ideal for areas with high outside air temperatures as in Middle East and Northern Africa. Also because of the simple technology of the flat plate collector type this collector is more cost efficient than the evacuated tube collector. The optimized mounting system, which permits time-saving installation by hand, and simple connection considerable reduce the overall time and effort required to install the system.

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<td>45</td>
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<td>Absorber</td>
<td>Selective aluminium</td>
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<tr>
<td>Absorbency / radiation coefficient</td>
<td>95% ±2% / 5% ±2%</td>
</tr>
<tr>
<td>Max. stagnation temperature under test conditions</td>
<td>170.2 °C</td>
</tr>
</tbody>
</table>
ECOTHERM manufactures large-size collectors of the ESCF-N100 series in the standard size of 10m². The special design of the absorber and the attractive performance data make these collectors ideal for large solar thermal systems. The optimized mounting system, which permits time-saving installation by crane, and simple connection considerably reduce the overall time and effort required to install the system.

**Product benefits**

- Up to 10 collectors can be connected in parallel or in series with each other with minimum pressure loss (Low Flow/Tichelmann)
- Optimal stagnation and draining behaviour thanks to the serpentine absorber-designed for large systems
- Aluminium frame collector with a high degree of long-term stability satisfies all static requirements as per DIN 1055
- Time-saving collector installation thanks to optimized support triangles with support rails as well as simple collector connections
- Excellent value for money thanks to aluminium absorber with highly selective coating as well as minimum crane use and installation time to set up the system
- Easy to service since glass covers and modules can be individually replaced

<table>
<thead>
<tr>
<th><strong>Total Area (m²)</strong></th>
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<tr>
<td><strong>Heat transfer medium</strong></td>
<td>Propylene glycol solution/water</td>
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<td><strong>Capacity (lt)</strong></td>
<td>9.5</td>
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<tr>
<td><strong>Absorber surface (m²)</strong></td>
<td>9.2</td>
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<tr>
<td><strong>Total dimensions (LxWxH) (mm)</strong></td>
<td>5085x2030x80</td>
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<td><strong>Collector total weight (without liquid) (kg)</strong></td>
<td>165</td>
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<td><strong>Absorber</strong></td>
<td>Selective aluminium</td>
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<td><strong>Max. operating pressure</strong></td>
<td>1.0 MPa (10 bar) 1.0 MPa (10 bar)</td>
</tr>
<tr>
<td><strong>Absorbency / radiation coefficient</strong></td>
<td>95% ±2%</td>
</tr>
<tr>
<td><strong>Radiation coefficient</strong></td>
<td>5% ±2%</td>
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</table>
ECOTHERM Collector: ESC-V18

ECOTHERM manufactures evacuated tube collectors of the ESC-V18 series. The special design makes this collector type ideal for high temperature application such as process steam production. Also the evacuated tube collector is more efficient at lower outside air temperatures as e. g. Central Europe. The optimized mounting system, which permits time-saving installation by hand, and simple connection considerably reduce the overall time and effort required to install the system.

Product benefits

- Up to 5 collectors can be connected in series with each other with minimum pressure loss (Low Flow/Tichelmann)
- Tubes can be replaced without draining the collector circuit - “dry connection”
- Circular absorber surface guarantees that each individual tube is always optimally aligned with the sun
- High efficiency via highly-selective coating on absorber
- The CPC reflector and the direct flow through the evacuated tubes make a significant contribution to a very high yield
- Optimal thermal insulation via a vacuum, which results in high efficiency, particularly in winter and at low irradiation

<table>
<thead>
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<td>Max. operating pressure</td>
<td>10 bar</td>
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<tr>
<td>Absorbency / radiation coefficient</td>
<td>&gt; 93.5%</td>
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<tr>
<td>Radiation coefficient</td>
<td>≤ 6%</td>
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Emergency Cooler

An emergency cooler is mandatory to dissipate excess solar energy in summer time!

The emergency cooler avoids the stagnation and overheating of the solar system. In the case of stagnation, the heat medium evaporates and steam hammering results in heavy loads on the material. Moreover the solar system supplies no thermal energy until the system is cooled down. Because of that the emergency cooler significantly increases the performance of the system and prevents damages from steam hammering.

Expansion Vessel

A membrane expansion vessel ensures a constant pressure in the system. The membrane separates the gas volume from the solar liquid. This membrane in the expansion vessel equalizes the expansion and the contraction of the solar liquid caused by heating and cooling.

Inline Vessel

These tanks are equipped with an entry and exit valve and are placed before the solar expansion tank. Because of the particularly high temperature in the solar circuit, the solar liquid can evaporate and can reach the solar station damaging essential parts such as pumps, fittings, gaskets and above all the membrane of the expansion vessel.

The inline vessel provides heat dispersion by reducing the working temperature and therefore greatly increasing the life time of the expansion vessel.
Control Panel

System and building visualisation in 3D guarantees a clear overview and establish an easy check of the operating stages.

**Touch screen panel**

With the ECOTHERM touch screen panel it is very easy to display parameters, to change set points and to manage other useful information by the plant operator.

The clear design represents not only the latest state of technology, but also saves space in the control cabinet.

Buffer Tanks

**Description**

Storage water heaters made of high quality, corrosion resistant stainless steel with patented flat heating coil, welded at the bottom of the storage tank with vertical-oval cross-section for optimal performance and layering, almost 100% storage volume available, bath pickled, low maintenance, improved hygiene, flange DN 200 at front for cleaning purpose or for mounting an additional heat exchanger or screw-in heating element, sleeve 6/4” for screw-in heating element in the upper third, sleeves ½” for thermometers and temperature sensors, cold water connection at the front, hot water outlet at the center top.

- Almost 100% volume usage
- High-efficiency heat exchanger
- Improved hygiene

*ECOTHERM “ESWF-1” stainless steel storage tank.*

Pumps

By using a second pump a standstill of the solar system is prevented in case of the damage of one pump. Additionally this design will increase the life cycle of the pumps because of its alternating mode.
Electric Heating Elements

Heating element made of stainless steel - Incoloy-825

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<th>Model</th>
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<th>Power rating kW</th>
<th>Power supply Volt</th>
<th>Surface load W/cm²</th>
<th>Head Ø Inch</th>
<th>Length mm</th>
<th>Thermostat (integrated)</th>
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Ceramic heating elements

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<th>Connection Volt,AC</th>
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<th>Full load current Amps.</th>
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</table>

Non Sacrificial Titanium Anode

- Non sacrificial electric anodes provided with 240V power socket
- No maintenance required
- No anode consumption
- Permanent potential control

<table>
<thead>
<tr>
<th>Type</th>
<th>Model for stainless steel tanks</th>
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<tbody>
<tr>
<td>FSA-402</td>
<td>Non sacrificial titanium anodic protection 402 mm Art.60000038 (for storage tanks 200 litres - 540 litres)</td>
</tr>
<tr>
<td>FSA-832</td>
<td>Non sacrificial titanium anodic protection 832 mm Art.60000043 (for storage tanks &gt; 550 litres)</td>
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</table>
Stainless Steel Flexible Hose Pipe

Stainless steel flexible metal hoses are produced from Austenitic Stainless steel of 300 series, which improves the hygiene of the product. Flexible metal hoses are produced in a helical, annular corrugating geometry that gives the product a sufficient bending feature without any diameter reduction. Therefore mainly the time for the water line piping and for the mounting is tremendously reduced. Additionally it is easy to shape the pipes for any application without any extra fitting for any corners - just for the inlet and outlet fitting connections.

Connection Fittings

The connection fittings together with the metal hoses are the latest technology for solar piping systems. There is no need for any preparation and/or pre-calculation and/or extra fittings. Just take out of the hose the box, cut the hose to the required length, put on the fittings and finally mount the system within maximum 8-10 minutes. Great savings of time and money.

Automatic Air Vent

The high temperatures in solar systems may lead to steam discharge or even boiling dry. Solar systems often have supportive heating, and the loss of efficiency is not directly noticeable. Air also accelerates the degeneration of the solar fluid. This can lump and clog to such an extent that the panel or even the entire system is damaged beyond repair. Air in the collectors causes “false stagnation”. The efficiency of the energy-saving installation will then be less than zero. Air must be removed from the solar panels at the highest point. The benefits of this automatic air vent are: Preventing false stagnation, solar fluid will not prematurely degenerate, system will not boil dry via the deaerator, no more climbing to the top to open or close valves and permanent air-free, efficient installation.
Hot Water Meter

For solar performance measurement a hot water meter can be installed in order to continuously collect information about the efficiency and performance of the installed solar thermal system. Hence with this knowledge the solar system can be optimized to meet the needs of the specific application.

Thermostatic Mixing Valve

This valve is used for the regulation of the cold water supply and the hot water supply. The benefits of this thermostatic mixing valves are:
The supply of blended water with constant temperature, high control accuracy, operates without any outside energy, protects against scalding, saves water and energy and enhances comfort and safety.

Automatic Back Feed System incl. Pressure Monitoring

Pressure transmitters monitor the pressure in the solar system and in the CWS-line. If the pressure in the solar system is lower than the set point (about 1-5 bar), the solenoid valve to the CWS-line will be opened. If the CWS-pressure is lower than the set point, the back feed process will be stopped. For safety reason the solenoid valve will also be stopped, if the required system pressure will not be achieved within 10 minutes (risk of leakage).

3-Way Valves incl. Actuators

This valve is used for the control of the solar thermal loading of several water heaters. This ensures higher efficiency of the solar thermal system.
Support in the Design & Specification Stage

- 3-D CAD design
- Design software for heat exchangers, hot water and solar systems (e.g. ECOSIZE; see box at bottom)
- Thermal and static design standards are fully compliant to international standards.
- Simulation of the solar gain:
  ECOTHERM can carry out simulations of the solar contribution for every day and every hour of the year.
- Fuel saving and avoided CO$_2$-emission:
  Calculations and simulations for fuel saving and avoided CO$_2$-emission help our customers to calculate the return of investment, future savings and profits.
- Global footprint:
  Already in design stage we make “the green step for a greener tomorrow” visible to present in public.
- 3-D animation and presentation videos

Already in the design stage, we can produce a virtual walk through the system and prepare animations of shading.

ECOSIZE App “Solar Thermal”

All ECOTHERM franchise partners all over the world are using the ECOTHERM configuration programme ECOSIZE. Get your free login and benefit of the app “Solar Thermal”.
Compact Solar Systems

ECOTHERM’s compact solar system optimizes performance and consumption and is therefore the best starting point when it comes to optimally utilizing the sun’s energy.

General description
- Covers approx. 70% of the hot water requirement
- Quick & simple at site assembly, “Connect & Operate”
- Fully coordinated components
- Simple and reliable technology
- Suitable for all homes

A few steps to start up the compact solar system
- Installation of the solar panels
- Placing the storage tank unit
- Interconnection of the panels with the tank unit by using a stainless steel flexible hose pipe
- Plug in the collector sensor
- Connection of the cold and hot water line in the tank
- Filling the system and plug in the controller

All system components are included in only two units. The collector unit and the storage tank unit.
- The pre-installed storage tank unit contains the solar pump, expansion vessel, safety valve, pre-insulated tank and the solar controller.
- Even the solar pump and storage tank sensor are already connected to the controller.

1. ECOTHERM Solar-Panels
2. Interconnecting Piping
3. ECOTHERM Compact Solar System Plug & Play
# Dimensioning

## Dimensioning of the ECSS-S series (Stainless steel solar calorifier)

<table>
<thead>
<tr>
<th>ECSS-System</th>
<th>Description</th>
<th>ECSS-300S-2</th>
<th>ECSS-540S-3</th>
<th>ECSS-800S-4</th>
<th>ECSS-1000S-5</th>
<th>ECSS-1500S-8</th>
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<tr>
<td>Persons</td>
<td>Persons</td>
<td>3 - 6</td>
<td>6 - 10</td>
<td>10 - 14</td>
<td>12 - 18</td>
<td>19 - 28</td>
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<tr>
<td>Energy saving *</td>
<td>MWh / Year</td>
<td>4.0</td>
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<td>8.8</td>
<td>11.1</td>
<td>17.7</td>
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<tr>
<td>CO₂ saving *</td>
<td>Tons / Year</td>
<td>1.05</td>
<td>1.7</td>
<td>2.3</td>
<td>2.9</td>
<td>4.6</td>
</tr>
<tr>
<td>Tank capacity</td>
<td>Liter</td>
<td>300</td>
<td>540</td>
<td>800</td>
<td>1,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Nos. of Solar Panels</td>
<td>pcs</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>

### High global radiation: 1,900 - 2,200 kW / m² per Year

For example: United Arab Emirates, Saudi Arabia, Qatar, Kuwait, Oman, Yemen, Bahrain, a large part of India, Thailand, Malaysia, Australia, South Africa, East Africa

### Middle global radiation: 1,600 - 1,800 kW / m² per Year

For example: Southern Italy, Spain, Portugal, Greece, Turkey, Indonesia, Brasil, Syria, Lebanon, South China, North India, Vietnam

<table>
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<tr>
<th>ECSS-System</th>
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<th>ECSS-300S-3</th>
<th>ECSS-540S-4</th>
<th>ECSS-800S-6</th>
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<tr>
<td>Energy saving **</td>
<td>MWh / Year</td>
<td>4.4</td>
<td>6.2</td>
<td>9.4</td>
<td>12.4</td>
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<tr>
<td>CO₂ saving **</td>
<td>Tons / Year</td>
<td>1.1</td>
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<td>6</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

## Dimensioning of the ECSS-E series (Glass lined steel solar calorifier)

### High global radiation: 1,900 - 2,200 kW / m² per Year

For example: United Arab Emirates, Saudi Arabia, Qatar, Kuwait, Oman, Yemen, Bahrain, a large part of India, Thailand, Malaysia, Australia, South Africa, East Africa

<table>
<thead>
<tr>
<th>ECSS-System</th>
<th>Description</th>
<th>ECSS-300E-2</th>
<th>ECSS-500E-3</th>
<th>ECSS-750E-4</th>
<th>ECSS-1000E-5</th>
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<td>6 - 10</td>
<td>10 - 14</td>
<td>13 - 19</td>
</tr>
<tr>
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<tr>
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<td>1.7</td>
<td>2.4</td>
<td>3.0</td>
</tr>
<tr>
<td>Tank capacity</td>
<td>Liter</td>
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<td>500</td>
<td>750</td>
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### Middle global radiation: 1,600 - 1,800 kW / m² per Year

For example: Southern Italy, Spain, Portugal, Greece, Turkey, Indonesia, Brasil, Syria, Lebanon, South China, North India, Vietnam

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<tr>
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</table>

* Location: Dubai / UAE
** Location: Beirut / Lebanon
Solar Cooling

Application
The energy consumption for air conditioning is increasing. Due to the intensified use of glass facades, the rising cooling capacities do not only touch the Middle East, but also the northern regions with moderate climate. During summertime we have the highest solar irradiances and the highest demand of cooling energy. This is the perfect match for solar cooling. We use the excess solar yields as operating power for our absorption chillers and achieve therefore a enormous high solar system efficiency.

Absorption chillers
Our absorption chiller series EACM-C.. is operating with heat at very low pressure. The operating liquid is water and a lithium bromide dilution. Water is used as cooling medium and lithium bromide (a stable salt with high chemical affinity to water vapour) as absorption medium.

Requirements for the cooling tower
All energy from solar system plus the energy for the chiller circuit have to be dissipated by a cooling tower. The temperature return to the absorption chiller should not be more than 31°C.

Requirements for the solar system
The minimum temperature to run the absorption chiller is 75°C. So it’s necessary to use collectors with low thermal losses. Further it’s an advantage to run the solar circuit by a speed controlled pump.

Requirements for the chiller circuit
The lowest temperature, that we can generate with our absorption chiller is 7°C. The return line from the chiller circuit should be 12.5°C. For more flexibility we recommend the use of a chilled water buffer tank.
Several different aspects influence the correct design of a solar thermal system. ECOTHERM uses its global experience as well as local data and know-how in order to create a proper design. Some of these information is summarized within the next few pages.
Solar Energy -
The most reliable source of power

The solar constant of 1,367 W/m² changes only 1% in 100 million years.

As the solar energy enters the Earth’s atmosphere some of it is absorbed, deflected and or reflected (scattered) by clouds, water vapour and particles in the air.

The utilizable irradiation depends on geographical position, weather influences, shading, altitude, and smog and is diagrammed in the global irradiation map in kWh per year.
Solar Principles

Global radiation, annual average in kWh/m²

Annual sum of global irradiance in the Middle East

The position of the sun is changing every minute and is linked to the seasons.
Effects on solar yield by collector azimuth and inclination

The weather plays an important role in the solar gain:

Note:

If it is possible to identify the sun as a disc behind a cloudy sky, the solar irradiation is still about 300 W/m².

Average annual raining days

East Sahara: ~ 1 day
Austria / Vienna: ~ 90 days
India / Mumbay: ~ 105 days
Sun Irradiation on a Collector Array

Variation of irradiation over a year

Annual course *)

Variation of irradiation over a day

Daily course on a sunny and clear day *)

*) Location: Middle East

Main Losses in a Solar System

Because of its nature we cannot use the whole irradiation of the sun. There occur several losses in a solar system:

- The optical losses caused by reflexion and transmission of the glass and the absorber -> 20-30%
- The thermal losses of the collector. Higher collector temperatures lead to higher thermal losses ->10-50%
- Losses of the piping and of the storage tank. Therefore pipes and storage tanks should always be well insulated.

All together it can be calculated with about 50% loss for a solar domestic hot water heating.
System Efficiency

The system efficiency is affected by the following parameters:

- Hot water temperature
- Solar fraction
- Wastage due to non-consumption
- Efficiency of the solar panels
- Load profile
- Cold water temperature
- Storage tank capacity
- Temperature in the solar circuit
- Size of the heat exchanger

Solar Fraction

The solar fraction is determined by the solar energy and the total energy consumption.

Example

Total energy required: 150 MWh
Solar Contribution: 90 MWh
Solar Fraction = 90 MWh / 150 MWh
Solar Fraction = 60%
Relation between Solar Fraction and System Efficiency

High Solar Fraction (70-90%)
- High collector temperature = high thermal losses
- Big buffer tank volume = high losses for storage
- Standstill time of solar system = wasted energy
- Periodically overheating of the solar panels!!

= Low System Efficiency (max. 30%)
= High Investment for complete system
= No economic return of investment

Medium Solar Fraction (40-60%)
- Low collector temperature = low thermal losses
- Low buffer tank volume = low losses for storage
- No excess solar energy
- Low risk of overheating of the solar panels (stagnation)

= High System Efficiency (40-55%)
= High price performance ratio
= Quick return of investment

Comparison Flat Plate vs. Vacuum Tube Collector

In the Middle East and Northern Africa Region where the outside temperature is much higher than in Europe Flat Plate Collectors are more economical than the Vacuum Tube Collectors because the working range is shifting towards left direction with increasing outside temperature.
Installation Guide

ECOTHERM's amazes its customers with individual turn-key solar thermal solutions. The services range from design, manufacturing, shipping, installation up to commissioning, documentation, training and after sales service. This chapter contains some important tips for a correct installation of solar thermal systems.
Support base assembly on a flat surface
High selective coating

Tempered solar glass

Outlet 22 mm

50 mm Insulation

Aluminium frame

Absorber sheet high selective coated

Aluminium cover strip

Solar glass

Insulation 50 mm

Aluminium back plate

Operation Guide
Find our references at www.ecotherm.com