

## Basic knowledge Solar cooling

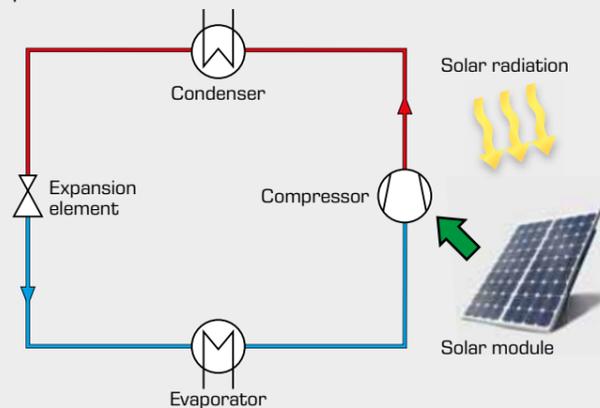
Interest in alternative processes for cold production that can be supplied from renewable energy sources is steadily growing. The basic idea of solar cooling is to use solar energy to cool buildings or equipment, especially during the hot hours

of the day. The future market of "solar cooling" is extremely important when it comes to the sustainability of buildings with air-conditioning systems, both in temperate climates and in warm countries.

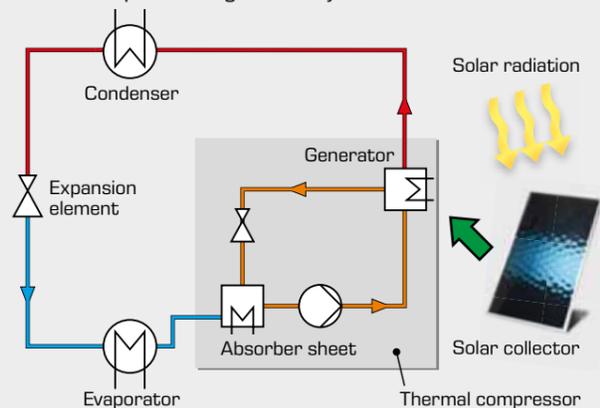
### Principle of operation of solar cooling

Solar cooling means a process in which the cooling process is powered directly by solar energy. Solar energy thus serves as a regenerative source of drive heat. Essentially, a distinction is made between two processes for the conversion of solar energy into useful energy:

Conversion into electric current, electric process with photovoltaic module



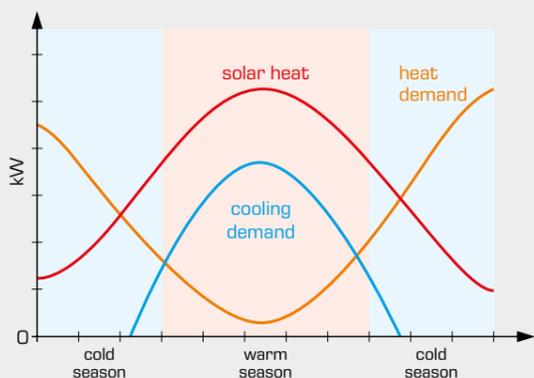
Conversion into heat, thermal process using the example of an absorption refrigeration system with solar collector



In solar refrigeration machines, the electric compressor is replaced by a thermal compressor.

### Available solar energy

Solar radiation and cooling demand correlate with each other in terms of time. This state should be exploited. The advantages of supplying cooling systems with solar energy are therefore obvious.

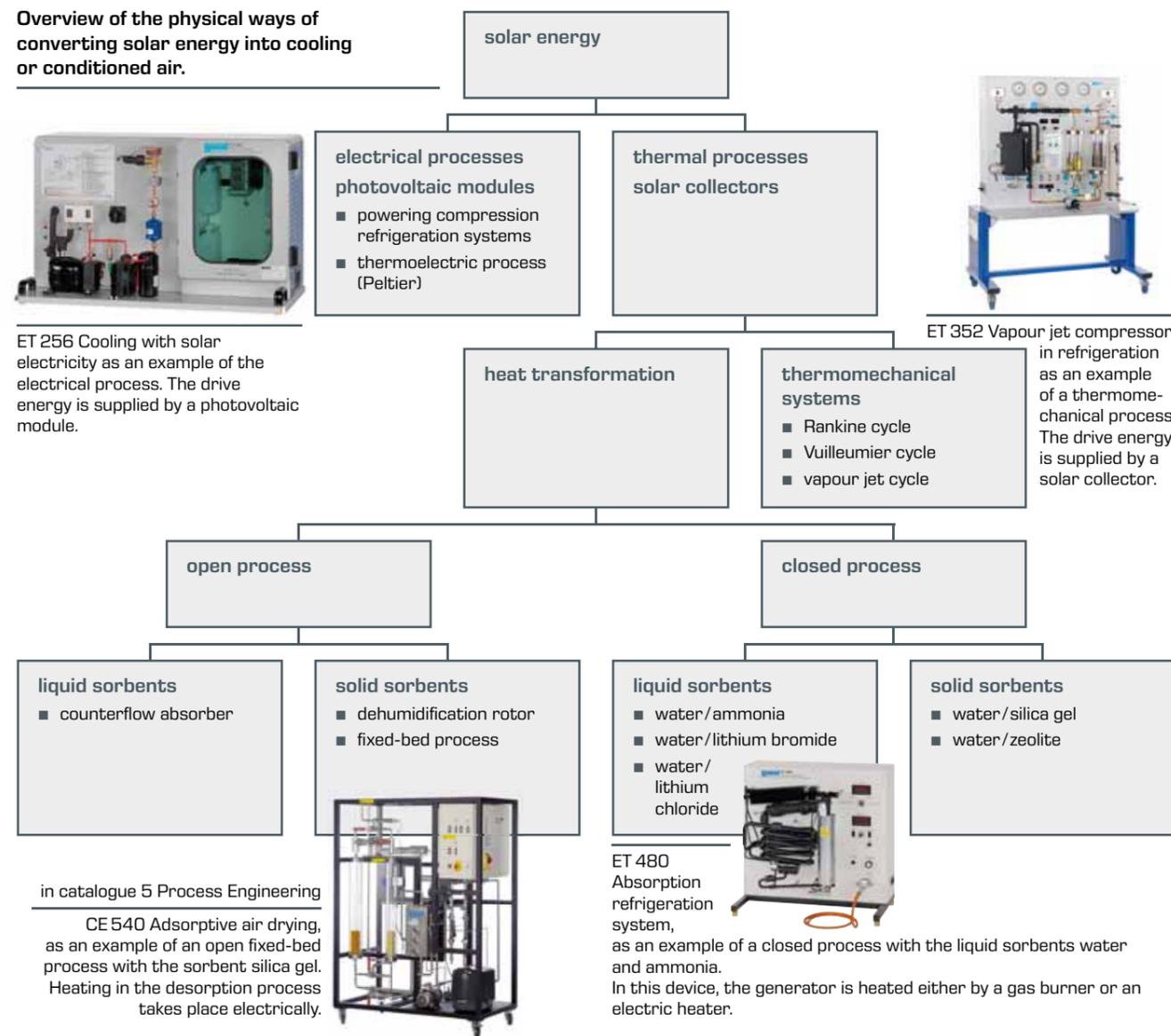


Typical annual trends for available solar energy and the heating and cooling demand of a building

### Advantages of solar cooling

- Instead of high electrical power output for a conventional cooling system, the consumption of electrical energy can be limited to the drives of pumps and fans.
- On warm summer days in particular, when the need for cooling is particularly high, electricity consumption is reduced.

### Overview of the physical ways of converting solar energy into cooling or conditioned air.



ET 256 Cooling with solar electricity as an example of the electrical process. The drive energy is supplied by a photovoltaic module.

ET 352 Vapour jet compressor in refrigeration as an example of a thermomechanical process. The drive energy is supplied by a solar collector.

in catalogue 5 Process Engineering

CE 540 Adsorptive air drying, as an example of an open fixed-bed process with the sorbent silica gel. Heating in the desorption process takes place electrically.

ET 480 Absorption refrigeration system, as an example of a closed process with the liquid sorbents water and ammonia. In this device, the generator is heated either by a gas burner or an electric heater.

### Supply of buildings as one area of application

A large proportion of possible solar cooling applications concern the building supply sector. With regard to energy optimisation, it therefore makes sense to also consider other energy consum-

ers in a building. The diagram shows two system concepts for incorporating solar thermal energy and photovoltaics.

