

Factsheet

Decentralized heating systems and hot water preparation

What is an air conditioning unit?

An air conditioning (A/C) unit is a device serves for cooling and heating purposes. In this system, the outside air is used as a heat source to evaporate a refrigerant. The resulting gas is then compressed. Through this process, usable heat is generated. A/C systems consist of an outdoor and an indoor unit. If more than one indoor space needs to be served, multiple indoor units can be installed, which is called a multi-split system. Typically, up to five indoor units can be installed per outdoor unit in such cases.

Is there a difference between heat pumps and air conditioning units?

No, air-conditioning units are heat pumps, so-called "air-to-air heat pumps": the first "air" stands for the environmental medium from which the heat is extracted. The second "air" for the heat distribution system in the house. An air-to-water heat pump, for example, also uses the outside air as a heat source, but uses it to heat the heating circuit in the house (water). Since air-to-water heat pumps are used to supply the heating system of the house with heat, they are centralized systems. Air-to-air heat pumps directly heat the air in a room and therefore are decentralized.

Where should the outdoor unit of a split air conditioning system be placed in historically buildings?

In general, the outdoor unit should be placed close to the indoor unit to minimize conduction losses. If necessary, the outdoor unit can be covered with breathable wood paneling to reduce its visibility. However, it is important to ensure adequate airflow to avoid efficiency losses. The outdoor unit can also be placed in the (unused) attic, but again, adequate air exchange must be ensured (note the "cold air pool" effect: the system cools the attic and consequently operates less efficiently). Traditionally, attics were often used to store hay, so they were well ventilated through two openings in the roof walls. A small window opening to the rear or air ducts can provide sufficient air exchange. Before installation, the top floor ceiling should be insulated, as the outdoor unit cools the air in the attic in winter (see Factsheet Building Renovation).



What are the advantages of an air-conditioning unit?

- **High efficiency:** With the use of 1 kWh of electricity, approx. 4 kWh of heat can be used in the given interior room. Even at extreme sub-zero temperatures, an air conditioner is still twice as efficient as an electric fan heater.
- **Reduction of wood demand:** Usually, in Romania, wood is used for decentralized heating. With an air-conditioning unit, the need to use stoves is reduced. This diversifies the heat supply and makes it more resilient.
- **PV electricity can be used:** Especially in the transitional period, wood consumption can be significantly reduced, and the required electricity can partly come from a PV system.
- **Comfort:** With the air-conditioning unit, no manual fuel preparation is necessary.

Factors influencing the efficiency of an air conditioning system:

- **Type:** Multi-split systems are slightly less efficient than single-split systems
- **Size/capacity:** Choose the smallest unit that can supply the required energy
- **Quality of components** (compressor, condenser)
- **Mode of operation:** Excessive on/off cycles reduce efficiency
- **Maintenance:** Irregular maintenance intervals can reduce efficiency
- **Installation location:** Proper placement of outdoor unit (shortest possible piping lengths) and suitable enclosure
- **Installation materials used:** Insulation of the piping

Cost

1.750 – 4.500 RON

Payback period

5 – 10 years
(without PV system and without cooling function in summer)

Solar Energy Based Hot Water Supply - Three Options:

- 1.) **Solar thermal** involves installing a collector on the roof that heats water in a storage tank. This system acts as a complementary system that can largely cover the need for hot water in the summer and transitional months.
- 2.) Domestic **hot water heat pumps** use the room air as a heat source for heating water. This process results in cooling of the indoor air, which is why the heat pump unit should be placed in an unheated area. A photovoltaic (PV) system can be used to generate some of the required electricity on site. Charging of the water storage tank should ideally take place during the midday hours, when solar power production is at its highest.
- 3.) A **thermosiphon** works without a heat exchanger or pump. In a direct circuit, the domestic water circulates through the system. The cold water is heated in the collector and rises to the storage tank, which must be located above the collector. Before the onset of freezing, the storage tank must be drained to avoid damage.

