EC700

Energy performance of buildings

Release 6

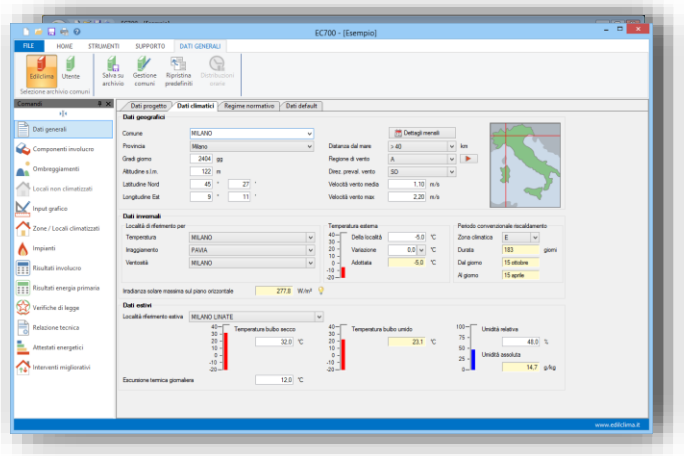
EC700 software supports the calculation of the **energy performance of buildings** according to the methods defined in the 4 parts of UNI/TS 11300 technical specification.
The modular structure of EC700 simplifies data input by the designer. Freedom from calculation burden let the designer concentrate on design issues of high performance buildings and HVAC systems.

EC700 also supports **energy auditing** of buildings. The input data on user behavior, indoor climate and external climate can be tailored to evaluate energy performance of buildings taking into account actual operating conditions.

EC700 is certified by CTI - Comitato Termotecnico Italiano.

Features

EC700 is Edilclima base software module for energy performance calculation of buildings. It can be used stand-alone. Additional modules are available to complete the calculation and reporting capabilities.
The simple and user-friendly interface of EC700 base module supports the following calculations:

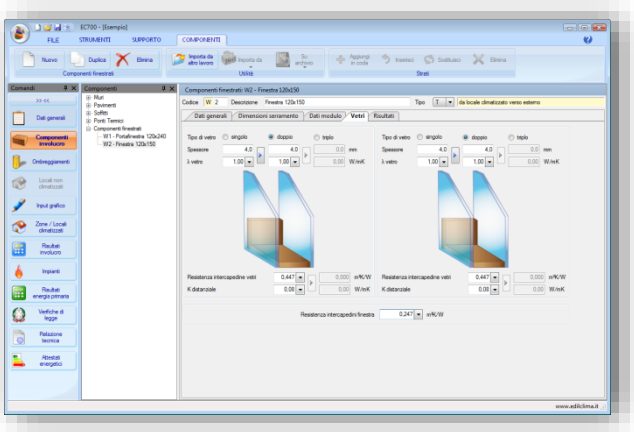


- **Heat load** according to **EN 12831**, to size heating systems.
- **Heating and cooling needs**, according to **UNI/TS 11300-1**, to evaluate the energy performance of the building envelope.
- **Primary energy for heating, domestic hot water, ventilation and lighting** according to UNI/TS 11300-2.
- Contributions from **renewable sources** (thermal solar, photovoltaic, biomass) according to UNI/TS 11300-4.
- **Primary energy for cooling** according to UNI/TS 11300-3.

EC706 additional module covers **cooling load** calculation according to Carrier-Pizzetti method (accumulation factors method).

Building envelope

Opaque building elements can be easily described by layers, taking materials from the integrated database. A database of ready to use typical building elements is available as well.
The **thermal transmittance** (U-value) of opaque elements is calculated according to **EN ISO 6946**. The equivalent transmittance of ground coupled building elements, both floors and walls, is calculated according to **EN ISO 13370.**



The layer description of any building element is used to calculate its **dynamic properties** according to **EN ISO 13786**. These are used to describe the thermal behavior of opaque elements under periodic operating conditions. The values of periodic thermal transmittance, decrement factor and time shift are calculated.

The dedicated graphic editor included in EC700 allows to easily describe **glazed elements**. Each glazed element module can be associated with a roller box, a specific under-window wall and a fanlight to facilitate and speed-up building description.
The thermal transmittance of windows is calculated according to **EN ISO 10077**. EC700 supports single window and double windows with independent glazing description.

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The user can select which method to use to take into account thermal bridges:

- **detailed calculation** using linear thermal bridges on external dimensions. A ready to use archive of thermal bridges according to **EN ISO 14683** is included in EC700 base module;
- **simplified calculation** of thermal bridges using a percentage increase of U-values as defined in UNI/TS 11300-1 technical specification. The percentage increase can be set by the user.

EC709 Thermal bridges is an additional module, that calculates the linear transmittance of thermal bridges according to a set of relevant characteristics. Linear transmittance values have been calculated according to EN ISO 10211 for a large number of combinations of connecting building elements and reference dimensions and EC709 provides a tailored interpolation.

Shading factors are calculated according to **Annex D to UNI/TS 11300-1** and support obstructions, fins and overhangs.

The software calculates b_{tr} value and internal temperature for **unheated spaces** according to **EN 12831** and technical specification **UNI/TS 11300-1**.

EC700 software includes the calculation of sunspaces. The temperature reduction factor and the direct and indirect solar gains are calculated according to EN ISO 13790.

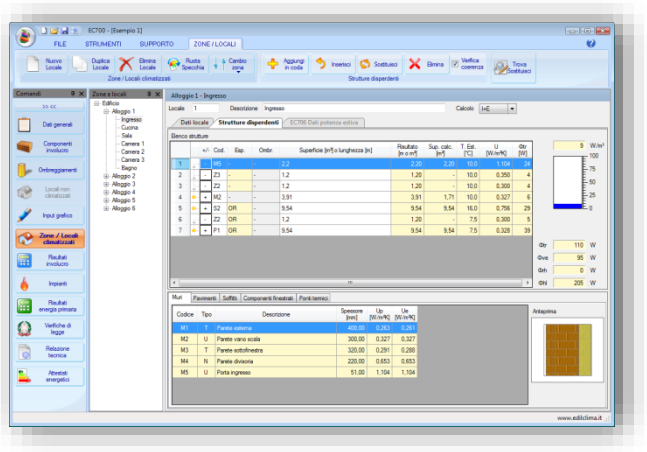
Building envelope description

The building envelope is described as a list of building elements with their associated area and orientation. The list of building elements can be generated either using the embedded dedicated graphic editor or manually in a tabular format.

The graphic editor generates the list of the building elements and their associated properties for each room of an entire building. It is a dedicated editor with features quite similar to a CAD system.

Using the graphic editor you can skip the time consuming task of the manual input of all the surface and orientation data of the building elements from a drawing. The software will automatically generate area and orientation of the building elements of each room, both for heat load and energy need calculation.

Within the graphic editor, the building plan can be displayed as a background image. The source for the background plan can be either a drawing file (DWG or DXF format) generated by any other CAD software or a raster picture (BMP format) acquired via a scanner or taking a picture of a drawing or plan. EC700 graphic editor supports DWG or DXF background files up to AutoCad release 2011. The use of the graphic editor does not require that a copy of AutoCad is installed since it is fully incorporated into EC700 base module.



Tabular (manual) input can always be used as an alternative to the graphic editor. The graphic editor generates a tabular input that can be adjusted and/or completed manually by the user.

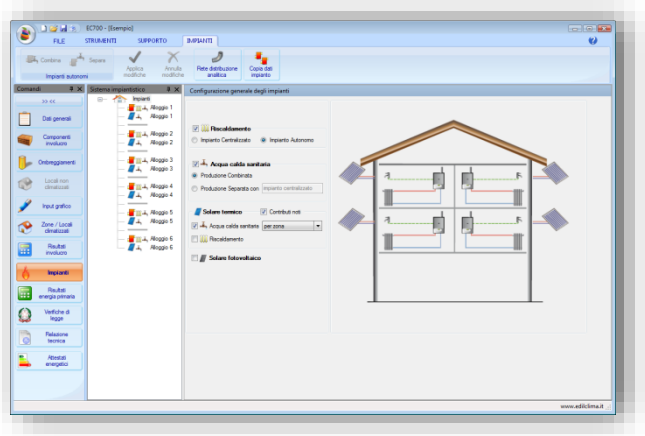
Graphic editor main features

- Draws external walls, internal walls and window modules. When using a "background" image of the building plan, if the source is a DXF or DWG file a "snap to background" function is available to speed up drawing and increase accuracy.
- Uses the building elements archive (opaque building elements, window modules, thermal bridges, etc.) to describe the building envelope properties.
- Allows to handle two different floor type and/or two ceiling type within the same room.
- Supports fanlights.
- Supports multiple buildings on the same drawing.
- Supports buildings with internal courtyards or internal unheated spaces (example: staircase, internal courtyards).
- Supports rooms with tilted ceilings and walls (such as under-roof spaces).
- Supports displaying / hiding drawing layers.
- Includes editing functions of floors, such as "copy" function.
- Generates automatically the lists of the building element, rooms and zones of the building.

Heating and domestic hot water system

A distinctive feature of EC700 software is the advanced **systems modeling** that supports any combination of technical systems types: centralized and/or individual heating and/or domestic hot water systems and any combination thereof (example: centralized heating system and individual domestic hot water systems in one building).

For both services, EC700 performs a detailed calculation of **heating system operating temperatures** to be used for the calculation of distribution losses and generation performance.



This calculation takes into account the emitter type, its sizing compared to the heating needs, the control strategy (heating curve, with or without mixing valve, 2 or 3 ways control valve, etc. …) and the type of hydraulic connection of the generator (direct, through a heat exchanger, with independent flow rate…). Operating conditions calculation can be fine tuned by manually setting minimum temperatures, reference temperature differences, nominal flow rate, etc.

The software supports **multiple heating circuits** with different heat emission and control systems within any thermal zone..

Resulting calculated temperature are displayed both in tabular and graphic format.

Boiler efficiency calculation supports single stage/modulating burners, condensing/standard boilers and can be performed according to the three methods allowed by UNI/TS 11300-2 Technical Specification:

- Using full load and part load efficiencies declared by the manufacturer according to **boiler Directive 92/42/CEE** (EN 15316-4-1 "case specific" method, § 5.3).
- Using the **boiler cycling method** according to data declared by the manufacturer or measured/estimated on site (EN 15316-4-1 "boiler cycling" method, § 5.4).
- Using precalculated values, suitable for the most common generator typologies according to UNI/TS 11300-2 Technical Specification.

EC700 software can also calculate energy performances of many other generator typologies. **Multiple generation systems** are supported as well. Priorities can be established to set which generator is running first.

The following generation systems are supported in addition to boilers:

- **heat pumps,** electrical, absorption and combustion engine driven (using the bin method);
- **biomass boilers** with automatic and manual feed;
- **district heating**;
- small and micro **cogeneration**.

The software supports mechanical ventilation systems, either single flow (only extraction or supply) or balanced flow. All ventilation systems may include a heating coil and/or a humidifier. A heat exchanger can be included in the description of a balanced flow system. The software calculates:

- the required heat input to the AHU heating coil;
- the required heat input heat to the humidifier;
- the auxiliary energy use of the fans.

The heat required by the heating coil of the AHU and by the humidifier can be considered as generated by the heating system or by a dedicated heat generator.

The software supports the calculation of energy use for lighting of non-residential buildings according to EN 15193 and UNI-TS 11300-2. The following contribution are taken into account:

- the energy use for lighting of indoor spaces;
- the energy use for external lighting;
- the energy used for auxiliary and emergency lighting devices.

The thermal solar generation calculation is integrated within the whole building energy performance calculation. Thermal solar calculation is performed according to **EN 15316-4-3** and **UNI/TS 11300-4**.

The photovoltaic electricity calculation is integrated into the whole building energy performance calculation. Photovoltaic generation is calculated according to **EN 15316-4-6** and **UNI/TS 11300-4**.

Calculation results

Building envelope calculation (heat load, heating needs and cooling needs) is launched **pressing a single button, "heating needs",** and all results are displayed in a single window.

This window consists of dedicated tabs (for heat load, heating needs and cooling needs), where a detailed report about losses, gains and needs is available. Losses and gains can be summarized for each type of building element (either opaque or window) to immediately spot any weak point of the building envelope.

Energy need data can be displayed by thermal zone and by month.

Another single button launches **primary energy calculation,** taking into account contributions by renewable sources. Both thermal energy and auxiliary energy needs are calculated. The results display includes delivered energy and efficiencies of all subsystems.

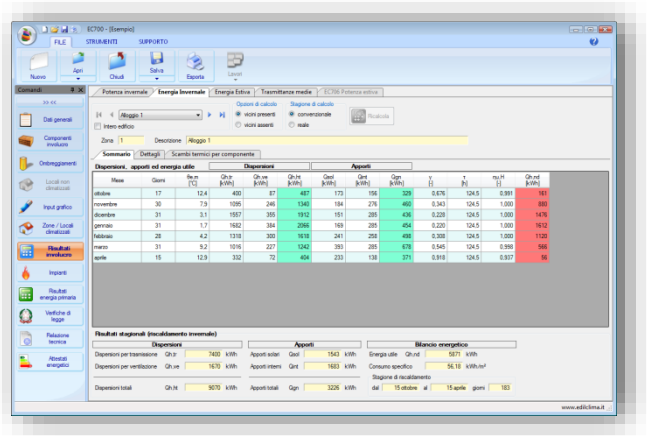
A separate tab is dedicated to each service (heating, domestic hot water and renewable sources contribution). Both seasonal and monthly results are available.

Calculated water temperature for each system section (emitters, distribution and generator) is displayed graphically and in tables.

All calculation results that are displayed on screen can be **copied and pasted into another software** for further processing.

Dedicated graphs display additional information and facilitate a quick understanding and evaluation of the resulting energy performance. Examples of such graphs are:

- a graph with the monthly flow and return temperature in the different section of the heating system (emission, distribution, and generation);
- a graph of the share of the building needs covered by each generator;
- the design energy signature of the building, that can be calculated assuming continuous (24/24) or intermittent operation;
- the monthly energy production of thermal solar panels and a comparison of energy needs with and without solar collectors. ,



Printed reports

All calculation results, for both building and technical systems, and all details about building elements losses are available as .**RTF format reports**. The user can complete and customize the report before final printing.

Archives

EC700 comes with a Number of extensive supporting archives. Default archives are continuously updated and can be extended by the user itself. They include:

- **climatic data** for 8000 Italian municipalities;
- **building materials** archive according to UNI 10351, UNI 10355 and EN ISO 10456, which includes more than 1000 materials;
- **precalculated building elements**, that includes over 300 different building element types;
- **linear thermal bridges** archive according to EN ISO 14683, with accompanying pictures to facilitate selection;
- **boilers, heat pumps, air heaters** solar panels and solar collectors archive with manufacturer data.

ADDITIONAL MODULES TO EC700

EC706 Cooling loads for cooling system sizing according to the accumulation factors method (Carrier - Pizzetti).

EC709 Thermal bridges calculates the value of many types of linear thermal bridges according to relevant characteristic dimensions and properties according to EN ISO 14683 and EN ISO 10211.

EC720 Improving actions evaluates the effect of possible energy performance improving actions, to support choosing the most cost effective recommendations.