Study of modular, flexible, customizable housing models for mass production, with low energy consumption
The goal
To identify housing models for mass production based on a small number of building components capable of generating a wide range of volumetric solutions without falling into homogenization and repetition of building types. A system with a limited number of easy-to-assemble, standardized and prefabricated components that can generate controlled, but extremely varied and flexible, configurations of domestic space, in order to accommodate different needs in relation to individual taste and different locations.

The main issues
- The search for architectural quality corresponding to the need for customization and modification of the house in time.
- Technological experimentation related to the issue of low energy consumption houses, during the entire cycle from construction to eventual dismantling and recycling of components and materials.

Research method
The research investigated the expressive possibilities of two prototypes of modular prefabricated houses to be massively produced allowing customization in two different locations: in a Northern and in a Southern region of Italy. During the planning stage we collaborated with production companies: Polifar srl of Mogliano Veneto (Treviso) for the residential housing "Idea 108" and Rubner Haus AG, Chienes (Bolzano) for the wooden prefabrication system "Dadomus".

The projects
The design of the two prototypes concerns two different spatial concepts, of distribution and formal features, but in both cases the choice is for "hybrid" construction systems. The purpose is to obtain versatility of the open system starting from a set of predetermined components (bearing panels, steel skeleton, curtain walls, roofing) similar to "Lego" parts, to which functional finished and furnished kitchens and bathrooms can be added, which complement the structural dimensions.
The house is inspired by the essential volumes of typical rural residences in Veneto. This spatial concept follows the logic of the constructive system Idea 108.

In terms of energy and environmental compatibility wood has optimal characteristics in all phases of its life cycle, from production of raw materials, to processing, disposal and recycling.
The house develops the idea of the Mediterranean house consisting of addition of rooms that can compose complex structures with infinite configurations, suitable for expansion over time.
The component of main structure:

structural steel pillars and infill panels consisting of a wooden lamellar frame braced with OSB/3 boards, covered by insulating material with a layer of plaster, used for wall.

The other elements are customizable on the basis of the building’s location and the taste of the owner.

The panels integrate an air chamber with constant ventilation to improve comfort and health in the building.

The size of each wall module is 108 cm in width and 432 cm in height.
**Idea108 housing prototype**

The house is based on a single full-height space that can be organize in two levels.

The presence of continuos ventilation chambre along the perimeter walls makes possible the passage of air from foundation to covering, realizing an organism with a controlled microclimate.
The assembly of 6 “module 108” (in length and wide) in a house for two people: 50 sqm
The assembly of 15 “module 108” (in length and 6 in wide) in a house for six people: 100 sqm

The assembly time for rough construction of a 100 square meters building is estimated at about 2 working weeks with a team of three persons. This housing prototype lends itself to the realization of single - and two-family houses and to the completion of urban fabrics.
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Dadomus Housing Prototype

The component of main structure: portals and wood pillars, bearing panels for ceilings and coverings, wall panels in solid spruce

The basic element of the system are cubes (base m. 4.46; height 4.20) and connecting elements in wood and glass. This combination makes the house particularly reversible and permeable, promoting interaction with exterior space, which benefits of natural ventilation.
The alternation of rooms and void spaces (paths, patios, gardens), generates an articulated organisms varied in size and aggregations available for different configurations. The finishes utilize natural fibers and wood fiber panels or fiber plaster obtained with a mixture of pure gypsum, recycled paper fiber and water.
This prototype lends itself to the formation of urban fabrics based on varied aggregations, highly adaptable to change over time and tailored to the need of the inhabitants.

The materials used the technological solutions (roof covering with integrated photovoltaic cells) and the proper plant design involving the use of heat pumps bring the building up to the A+ energy class.
Conclusions

The idea of the house as an industrial product, as opposed to cars and other mass production objects, can only work if mass production is limited to the basic elements of the system. The configuration of the final product in terms of spatial and architectural quality depends on three main aspects:
- The location, including the climate and dwelling culture in the various geographical areas the house will become a part of;
- The morphological structure and space of the house in relation to the culture and attitudes of the inhabitants;
- Flexibility, in type and size of the house, to respond to changes in family composition.

Differents spatial configurations and locations of Dadomus Housing Prototype
Thank you.