# MINERGIE®

Mehr Lebensqualität, tiefer Energieverbrauch
Higher quality of life, lower energy consumption

Planning and project

# The MINERGIE®-Standard for Buildings

INFORMATION FOR ARCHITECTS

- MINERGIE®: The Standards
- The Limiting Values of Energy Consumption
- Energy weighting factor
- Equipment efficiency
- Standard Solutions


MINERGIE® MADE IN SWITZERLAND

# MINERGIE®: The Standards

MINERGIE® is a registered quality label for new and refurbished buildings. This trademark is supported by the Swiss Confederation, the Swiss cantons and the Principality of Liechtenstein along with trade and industry. The trademark is firmly protected against unlicensed use.

Within the framework of the MINERGIE® registered trade mark, several products are offered:

- **Looking after the regular MINERGIE®-Standard** for buildings is MINERGIE®'s main activity. The standard requires that general energy consumption must not to be higher than 75 % of that of average buildings and that fossil-fuel consumption mustnot to be higher than 50 % of the consumption of such buildings.
- **The MINERGIE-P®-Standard** defines buildings with a very low energy consumption, it is especially demanding in regard to heating energy demand. This standard corresponds to the internationally-known passive house standard.
- **The MINERGIE-ECO®-Standard** adds ecological requirements such as recyclability, indoor air quality, noise protection etc. to the regular MINERGIE®-Requirements.
- **MINERGIE®-Modules are building components** and building equipment elements which are certified as being exceptionally well-performing with regard to energy efficiency.
- **MINERGIE® offers a great variety** of information material, planning tools, seminars and conferences as well as training courses.

The following focusses on the regular MINERGIE®-Standard for domestic buildings. The detailed regulations (in German and French) can be downloaded free of charge from the MINERGIE® website.

Comfort is the central theme – the comfort of the users living or working in the building. This level of comfort is made possible by high-quality building envelopes and the systematic renewal of air. Specific energy consumption is used as the main indicator to quantify the required building quality. In this way, reliable evaluation can be assured. Only the final energy consumed is relevant. To maintain feasibility and general use the additional costs for MINERGIE® must not exceed 10 % of the building costs.

**New building appartment-house and office, Gams, SG-115**

The MINERGIE®-Standard is widely accepted. There are many reasons for this, the most important being the objective-oriented approach: If builders and planners – in other words architects and engineers – can meet the standard, they have complete freedom both in their design and choice of materials and also in their choice of internal and external building structures. In 2009, 15 000 buildings with a total of more than 15.9 Million $m^2$ gross floor area have been certified as MINERGIE®-Buildings.

Apart from general requirements such as a ventilation system and moderate extra costs, a detailed quantitative proof of energy performance (for heating, hot water, ventilation and air conditioning) has to be delivered. This proof is the core of the MINERGIE®-Certification process. The appropriate forms for all projects applying for a certificate are verified and random tests on the building sites are performed. The following table shows an example of the principles behind the proof of the data.

# The Limiting Values of Energy Consumption

| Value in kWh/m² | Useful energy | Equipment efficiency | End use energy | Energy weighting factor | Primary energy |
|---|---|---|---|---|---|
| Heating energy (acc. SIA 380/1) | 50 (A) | | | | |
| Savings by ventilation heat recovery | -15 (B) | | | | |
| Effective heating energy | 35 (C) | 0.91 (D) | 38.5 (E) | 1 (F) | 38.5 (G) |
| Hot water solar-thermal | 14 (H) | ? | 9.8 | 0 | 0 (I) |
| Hot water electricity | | 0.9 (D) | 4.7 | 2 | 9.4 (I) |
| Electricity for ventilation | | | 3 (J) | 2 | 6.0 |
| The energy performance value (EPV) | | | | **Sum** (K) | **53.9** ≦ 38 ? |

**Table 1: The energy performance value (EPV) in kWh/m² of a single family house, heated by oil and domestic hot water produced 70 % with solar-thermal collectors and 30 % with electricity.**

| Value in kWh/m² | Useful energy | Equipment efficiency | End use energy | Energy weighting factor | Primary energy |
|---|---|---|---|---|---|
| Heating energy (acc. SIA 380/1) | 50 (A) | | | | |
| Savings by ventilation heat recovery | -15 (B) | | | | |
| Effective heating energy | 35 (C) | 3.2 (D) | 10.9 (D) | 2 (F) | 21.8 (G) |
| Hot water | 14 (H) | 2.9 (D) | 4.8 | 2 | 9.6 (I) |
| Electricity for ventilation | | | 3 (J) | 2 | 6,0 |
| The energy performance value (EPV) | | | | **Sum** (K) | **37.4** ≦ 38 ? |

**Table 2: The energy performance value (EPV) in kWh/m² of the single family house above, but with heating and domestic hot water provided by a water-to-water heat pump.**

**Explanations to the calculation**

**Heating energy** (A)**:** The heating energy demanded is calculated according to SIA-Standard 380/1 which is based on EN ISO 13790 (formerly EN 832). The result has to be less than 90 % of the limiting value of SIA 380/1 (edition 2009).

**Heat recovery** (B)**:** The standard calculation according to SIA 380/1 does not take ventilation heat recovery into account. Hence this has to be done separately to get the effective heating demand (C).

**Equipment efficiency** (D)**:** The heating energy demand (useful energy) is divided by the conversion efficiency leading to the end use energy.

**Heating:** The end use energy (E) is multiplied by an energy weighting factor (F), leading to the weighted energy use for heating (G).

**Hot water:** The amount of energy consumption for hot water (H) is given for single-family houses (14 kWh/m²). The same procedure using efficiency and energy weighting factor leads to the weighted energy demand for hot water (I).

**Electricity for ventilation:** The electricity consumption for ventilation (J) is taken at the end use level and analogously processed to obtain the weighted energy demand.

**Sum = EPV:** The sum of all weighted energy demand components (K) has to be compared to the limiting value, i.e. 38 kWh/m² for residential buildings.

**Notes and remarks**

- The energy demand and limiting values are given as specific values in kWh/($m^2$a) whereby the $m^2$ represent the heated gross floor area, called the Energy Reference Area (ERA).
- SIA 380/1 defines how to apply the energy balance algorithm for buildings, as defined in EN ISO 13790. In this way, any software referring to this European standard should deliver results comparable to those of SIA 380/1 and therefore be suitable as input data for MINERGIE® calculations.
- The building stock is sectored into 12 categories with different uses. Some of them have differing limiting values and all of them have their own standardised input data, such as indoor air temperature, air change rate, specific electricity demand etc. For all categories, significantly less stringent limiting values exist for the MINERGIE® renovation standard (e.g. 60 kWh/$m^2$ for residential buildings).
- Whereas the requirements on the heating demand (90 % of SIA 380/1-limiting value) is just a barrier to ensure that the MINERGIE®-Standard is not reached with regular insulation standard by technical means (heat pumps or renewables) only, MINERGIE-P® requires a very good insulation standard. Typically, the insulation thicknesses are around 20-25 cm for MINERGIE® and 25-35 cm for MINERGIE-P®.
- There is a set of default values available which may be used. Better performance has to be proven. For example, it is easily possible to use less energy than the standard value for ventilation. But if so claimed, the technology used has to be defined and, also, installed.
- The energy weighting factors represent a simplified approach for taking the conversion losses from primary to end use energy into account.

The example shown above obviously does not fulfil the MINERGIE®-Standard's limiting value. Various measures can be taken to improve the building (project) in order to reach the MINERGIE®-Standard: For example the heating energy demand can be lowered by improving the insulation, part of the hot water can be produced with solar-thermal collectors and heating and hot water can be provided by a heat pump. The latter is illustrated in table 2.

| **Energy weighting factor** | |
|---|---|
| Energy carrier, energy source | Weighting factor |
| Solar and ambient heat | 0 |
| Biomass (wood, biogas) | 0,7 |
| Waste heat [1)] | 0,6 |
| Fossil fuels | 1,0 |
| Electricity | 2,0 |

**Table 3: Energy weighting factors according to MINERGIE®**

| **The most important presets and default values** | | |
|---|---|---|
| Conversion efficiency | | |
| | Heating | Hot water |
| Oil or gas furnace | 0,85 | 0,85 |
| Oil, condensing furnaces | 0,91 | 0,88 |
| Gas, condensing furnaces | 0,95 | 0,92 |
| Wood-fired furnaces | 0,75 | 0,75 |
| Wood pellet furnaces | 0,85 | 0,85 |
| District heating [1)] | 1,0 | 1,0 |
| Heat pumps: | | |
| outside air monovalent | 2,3 | 2,3 |
| ground source | 3,1 | 2,7 |
| ground water, direct | 3,2 | 2,9 |

**Table 4: Standard values according to MINERGIE®**

1) Incl. waste incineration and sewage treatment plants, industry

**New building Business Park, Liebefeld, BE-575**

# Standards Solutions

In order to offer easy procedures to obtain MINERGIE®-Certification there is a possibility offered by the use of standardised solutions for buildings and building-technology equipment (limited to residential buildings). It is then sufficient to choose one of the five given accepted standard solutions for heating and hot water and to fulfil a few additional conditions.

**The five standard solutions are:**

1. Ground-source heat pump for heating and hot water (all year).
2. Wood-fired systems for heating and hot water in winter, thermal collectors for hot water in summer.
3. Automatic wood-fired systems for heating and hot water (all year), e.g. pellet-furnace.
4. Use of waste heat (industry, waste incineration and sewage treatment plants) for heating and hot water (all year as single source).
5. Air-to-water heat pump (outside air) for heating and hot water (all year).

**Additional conditions consist of:**

- A fan-assisted balanced ventilation system (or comfort ventilation system as it is called by MINERGIE®) with a heat recovery unit with an efficiency of at least 80 % has to be installed. The ventilation has to be driven by a DC- or AC-motor.
- A set of U-Values for the building envelope must not be exceeded, e.g. 0,15 W/m$^2$K for walls, roof and floor, 1,0 W/m$^2$K for windows and 1,2 W/m$^2$K for doors.

**New building single-family home, Hergiswil, NW-031**

**New building appartment-house, Baar, ZG-010**

**New building school, Wohlen, AG-090**

# Organisation and Implementation

MINERGIE® is a registered trade mark and therefore enjoys complete protection. The MINERGIE® label may only be used for buildings that actually meet the MINERGIE®-Standard. Apart from buildings, products and services can also conform to MINERGIE®-Standards. The same applies to building modules such as systems, components and materials. MINERGIE® is organised as an association and is registered in the Swiss Trade Register. A governing board of eight people is in charge of strategic decisions. There is a head office who is supported in operational decisions by the MINERGIE® Building Agency. The certification and all related contacts and support activities are executed by MINERGIE® Certification Units located at the administrations of the 26 Swiss cantons and the Principality of Liechtenstein. Hence there is a decentralised system of implementation.

**Further Information**
MINERGIE® is well documented on its website, though the information is only in German and French, www.minergie.ch. In particular, forms and tools for verification are offered for download free of charge.

**New building appartment-house, Zürich Affoltern (ZH-1100 – ZH-1113)**

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