
THERMO
ELECT
SELF-SUFFICIENT
WITH WOOD ENERGY
A WOOD GASIFICATION CHP UNIT
HEATS AND ILLUMINATES
THE ENTIRE HOUSE

SEEBECK - JUST LIKE THE DISCOVERER OF THE THERMOELECTRIC EFFECT IS THE NAME OF OUR NEWLY DEVELOPED CHP PLANT.

Status as of: April 2018
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CONTENT

SEEBECK

Energy, central heating & hot water through thermoelectricity and wood gasification

- **> 250 watt energy-yield through thermoelectric generators (TEG) for private consumption**
- 10-20 kW for heating and hot water with wood gasification technology, water-bearing
- Emergency generator in the event of power failure, isolated operation possible
- > 90% efficiency, low exhaust temperatures
- 60 liter filling capacity for logs up to 35 cm
- Up to 4 hours burning time with one load of wood
- Meets the strict “BImSchV level 2” emission limits for boilers
- Available as boiler for boiler rooms
- Can be combined with solar and photovoltaic systems
- Connection for external supply air from behind or below, automatic regulation
- Chimney connection 150 mm
- Weight empty approx. 350 kg
- Doors can be tacked left or right
- Inno Award Winner 2017
- Finalist in the US competition “Wood Stove Design Challenge“, Washington D.C., Auslober U.S. Department of Energy and Alliance for Green Heat
- TÜV Rheinland approved
- **Made in Germany by Thermoelect GmbH**

LIVING ROOM

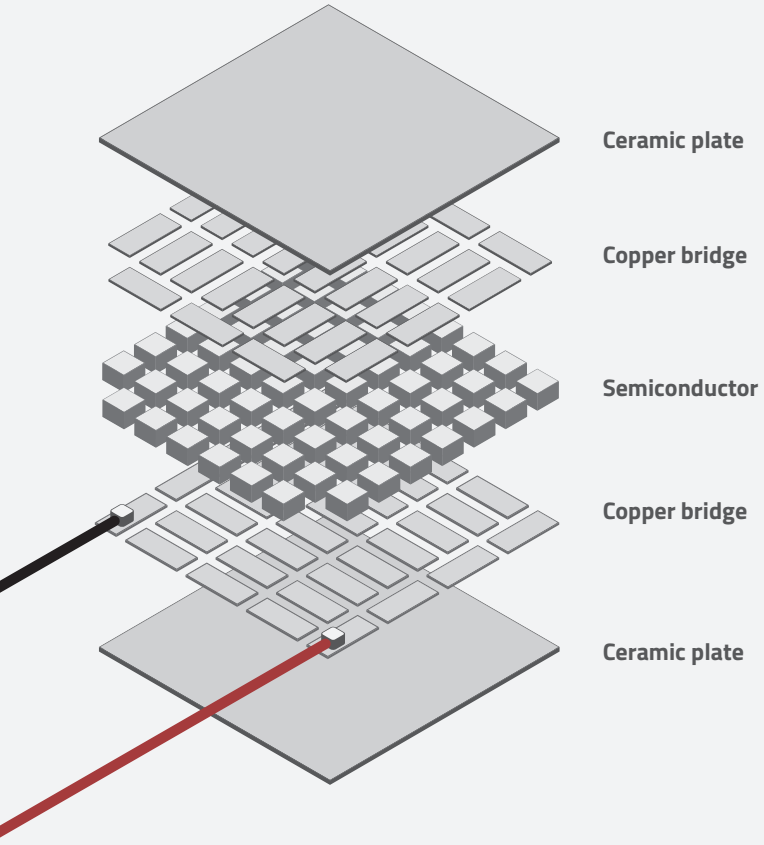
Custom design from glass ceramic to sandstone

In order to offer a great range of styles and designs, we developed a modular stove cladding. In the standard model, you can choose your Seebeck metal cover in black or anthracite.

You can also consult with our product design department to choose from a full range of materials and colour options according to your individual needs and wishes.

Sandstone, granite, soapstone as well as powder-coated materials and glass ceramic are possible options.
In principle, all non-combustible building materials in class A1 are eligible for a stove cladding. Please talk to us about your wishes and options regarding materials. We'll be happy to assist you in your selection. For more inspiration, you can find some ideas and combinations online at **www.thermoelect.com**

THERMOELECTRIC TECHNOLOGY



POWER GENERATION

Through thermoelectric generators (TEG)

Our wood gasification stove generates power through thermoelectric generators (TEG), which allow a direct conversion of heat from the wood fire into electric energy. Thermoelectric generators consist of special alloys and semiconductor junctions and generate power due to a difference in temperature of the materials (Seebeck effect).

Maintenance free and silent

In contrast to conventionally operated CHP units with high maintenance Stirling engines, thermoelectric modules are completely maintenance free and operate silently.

Thermoelectric Generators and Space Technology

The first technical applications of thermoelectric generators were in the mid-20th century in space probes for the exploration of distant regions in space. In contrast to other energy conversion technology, the generators do not require any moving components and are therefore highly durable and long-lasting.

SEEBECK-EFFECT

Seebeck – The discoverer's name

Thomas Johann Seebeck was a German physicist. In 1821, he discovered the thermoelectric effect that is today known as Seeberg effect. In 1823, he set up a thermoelectric series, and in 1825, he published "Magnetic polarization of metals and minerals by temperature differences", Treatise of the Prussian Academy of Sciences.

Our wood gasification CHP unit for the residential sector is the first in the world to use the Seebeck effect with TEGs to generate electricity. Just like the discoverer of the thermoelectric effect, the name of our newly developed CHP plant is "Seebeck".

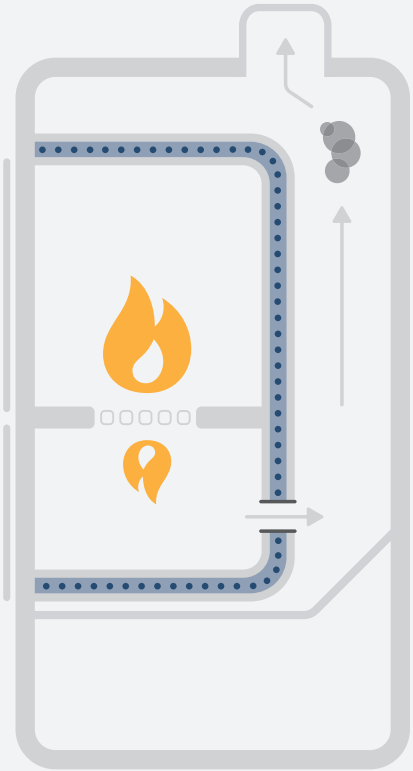
Thermoelect GmbH is a member of the Deutsche Thermoelektrik-Gesellschaft e.V. (German Thermoelectric Society).

DTG Deutsche Thermoelektrik-Gesellschaft e.V.

WOOD GASIFICATION TECHNOLOGY

UP TO 800 °C
UPPER COMBUSTION CHAMBER

UP TO 1,150 °C
LOWER COMBUSTION CHAMBER



WOOD GASIFICATION

The Seebeck follows the principle of wood gasification and has two combustion chambers. The upper chamber is filled with logs, which are a regenerative energy source.
The exhaust gases from the upper wood chamber are redirected to a second lower chamber by combustion nozzles for afterburning. Only then do the hot exhaust gases from the lower chamber tunnel flow into the flues of the back of the furnace and lead to the chimney pipe around a water heat exchanger. On the way up, the exhaust gases heat up the water in the heat exchanger.

Environmentally friendly

Wood is biomass, a renewable raw material and an alternative, natural energy source. The energy utilization of logs is increased by > 90% by the technology of wood gasification.

Advantages

- Universally applicable and can be combined with any heating technology
- High energy utilization
- Also available for boiler rooms

LIVING SPACE HEATING

Due to its high thermal performance, the Seebeck wood-fired CHP unit can be either used as additional heating, a living room stove or as a standalone heater and hot water generator for the entire house.

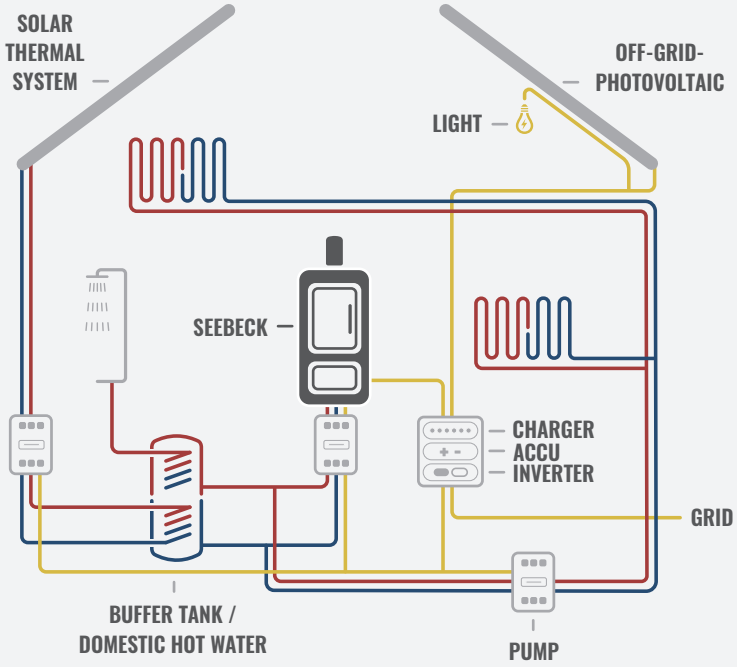
Self-sufficient – Electricity for your own consumption

Depending on the specifics of the electrical engineering, the generated electricity can be used directly for consumption or stored in an appropriate battery system. Furthermore, it can also be used via an island inverter as an emergency power supply for heating, refrigerators, chargers and the like.

Service

A heating engineer of your choice usually performs the installation. If necessary, Thermoelect GmbH can support the heating engineer in the planning phase.

We will discuss all technical options with you at your location before purchasing a BPH module. If you are planning new premises, we are happy to discuss your plans also with your architect and your heating engineer. We will give you free advice without any commitment from your side. You are welcome to visit our factory or users in your area to see the Seebeck in action.



WATER-BEARING

Fireplace feeling plus smart heating system

The water-bearing wood gasification CHP Seebeck emits only a small amount of its heat to the installation room. The remaining heat is fed into the central heating system via a heat exchanger and buffer storage. This heat is used for room and water heating.

Advantages

- Save on heating costs
- Independent of fossil fuels like gas and oil
- Romantic fireplace feeling plus smart heating system constant heat output
- The buffer storage gives off heat when needed
- Installation room and other rooms will be heated through the central heating system

Main requirements for installation

- Sufficient chimney height, 5 meters effective height
- Enough room for the buffer storage

EMERGENCY POWER

Stay self-sufficient and cozy

The fire from the wood gasification CPH Seeberg keeps the house warm and heats up the shower water. The generated electricity supplies heating pumps, the control system, LED lighting etc. – self-sufficient and without any public energy supply, for example, in wooded regions and rural areas. In case of a power outage, it can be used as an aggregate for power generation. Equipped with peripheral accessories such as rechargeable batteries and inverters, the Seebeck generates electricity, heat and hot water as an island system.

Regenerative and silent

Conventionally, in order to fill supply gaps in the power generation, noisy emergency power generators powered by Diesel or gasoline engines are used. We are convinced that wood as a regenerative fuel - in combination with wood gasification and silent thermoelectric generators – is a more eco-friendly solution. If conventional heating and electricity systems are missing, the Seebeck is the best alternative to create a cozy home using firewood.

THERMOELEKTRISCHES MODUL MIT CA. 5 WATT STROMLEISTUNG

SEEBECK IN NUMBERS

>250 watt of electricity for the entire house

- Furnace as energy consumer (control system + fans) **50 W**
- Boiler pump **20 W**
- Heating circuit pump **15 W**
- LED lighting, 14 LED lamps each 5 Watt 70 W Fridge/Freezer A++ (Privileg PRB376, 196 l Fridge, 111 l Freezer, peak load 150 W) 233kW/h each year with average load of **27 W**
- MacBook Pro in grid operation (100% brightness, MP4 Film) **20 W**
- Charge iPhone **10 W**
- Charge tablet **10 W**

The remaining electrical energy will be stored in the battery.

Numbers of the Seebeck in standard tests, measured by TÜV-Rheinland

At 10 KW partial load and 13% O_2

- CO content 179 mg/m³
- NOx content 126 mg/m³
- CnHm 10 mg/m³

At 20 KW full load und 13% O_2

- CO-content 118 mg/m³
- NOxcontent 148 mg/m³
- CnHm 2,60 mg/m³
- Dust content 15,8 mg/m³

PRODUCT LIST

WOHNZIMMER

Seebeck 250W

For generating electricity and heat for central heating, service water, and room heat with thermoelectric generator > 250 watt

Seebeck zero, as entry model

Water-bearing with highly efficient wood gasification technology for central heating, hot water, and room heat. Ready for a subsequent installation of a power module with > 250 watt

Power module 250W for retrofitting

> 250 watt, for retrofitting in the wood gasification CPH Seebeck zero.

Stove cladding

Metal cladding, black or anthracite, is included. Other materials and designs are available upon request.

BOILER ROOM

Also available as a boiler for boiler rooms.

Europäische Fonds EFRE, ESF und ELER in Mecklenburg-Vorpommern 2014-2020

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MBMV

Silent participation of the state-owened "Mittelständische Beteiligungsgesellschaft Mecklenburg-Vorpommern mbH"

DEVELOPMENT

The construction of the wood gasification CPH units, the development of the thermoelectric generators (TEG) and the constant control and optimization of the product are conducted by Thermoelect GmbH. Based in the technology and research center of the Hanseatic city of Wismar, Thermoelect GmbH, formerly known as HE Energy GmbH, has developed this unique technology in cooperation with partners from research, science, and education, starting in January 2016.

- Deutsches Zentrum für Luft- und Raumfahrt (DLR e.V.), Köln (German Aerospace Centre – DLR, Cologne)
- Deutsches Biomasseforschungszentrum gGmbH (DBFZ), Leipzig (German Biomass Research Center – DBFZ, Leipzig)
- Fraunhofer-Institut für Physikalische Messtechnik (IPM), Freiburg (Fraunhofer Institute for Physical Measurement Techniques – IMP, Freiburg)
- Fraunhofer-Institut für Keramische Technologien und Systeme (IKTS), Dresden (Fraunhofer Institute for Cermaic Technologies and Systems – IKTS. Dresden)
- Hochschule Wismar mit den Fakultäten Gestaltung und Wirtschaftswissenschaften (Hochschule Wismar with the faculties Design and Economic Sciences)
- Institut der Hochschule Wismar, Institut für Polymertechnologien e.V. (IPT), Wismar (An- Institute of the Hochschule Wismar, Institute for Polymer Technologies – IPT, Wismar)

DISTRIBUTION

The distribution of all products of Thermoelect GmbH is handled exclusively by Thermoelect GmbH in Wismar and HEE - Horst Erichsen Energy in Hamburg.

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