



# ClinX

**POWER AND HEAT FROM WOODEN RESIDUES**

Classic combustion system with innovative micro gas turbine

Decentralized. Robust. Resource-efficient.

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„We convert electricity and heat  
from your wooden residues.“



## REVEALING HIDDEN ENERGY RESERVES

### Combined heat and power generation from mixed wooden residues

The implementation of the energy transition is central to an environment-friendly and economically prosperous future. Since our foundation in 2012, we have made it our task to enable a sustainable use of existing energy reserves and thus contribute to the success of the energy transition.

We are convinced that heterogeneous wooden residues with a high proportion of branches and bark must be used much more efficiently than is often the case to date. This is why we are developing decentralized CHP systems that combine a classic combustion process with an externally fired micro gas turbine.

The technology is convincing, both through innovative components and through its robust and durable construction. With our systems, you become an energy supplier yourself and increase your independence.

We offer turnkey systems as well as customized solutions. With our know-how in the development of micro gas turbines and in plant construction, we are happy to assist you. Create your personal energy transition with us.



Together into a sustainable Future - **Sebastian Kießling** | CEO



# EXPLOITING POTENTIAL WITH ClinX

## Decentralised heat and power generation from waste wood

ClinX is the combined heat and power system from B+K. The decentralised plant extracts electricity and heat from heterogeneous, wooden residues. This is based on the combination of a combustion chamber and an externally fired micro gas turbine.

The special feature of ClinX is that the system can even process wooden residues with a high proportion of branches and bark and high moisture content in the decentralised power range.

The system is available in two sizes, either as a 50 kWel version with up to  $\approx 150$  kWth, or as a version with 150 kWel and up to  $\approx 400$  kWth. ClinX is versatilely applicable, especially where wooden residues are produced or affordable energy is needed.



CHP system with combustion chamber and externally fired micro gas turbine



Environmentally friendly energy from renewable resources



Available in two sizes

ClinX 50

ClinX 150





**Residual forest wood**

Crown wood, root wood  
small-diameter wood



**Landscape maintenance**

Roadside wood, wood from  
the maintenance of parks and  
biotopes



**Industrial waste wood**

Sawdust, wood chips, rinds,  
wood dusts



**Damaged timber**

Storm- or snow-damaged tim-  
ber, wood with pest infestation,  
e.g. bark beetle

**Use residual materials as low-cost fuels**

ClinX is designed for the utilization of residues, especially natural wood residues which are very heterogeneous and cannot be converted by most of commercially available CHP systems.

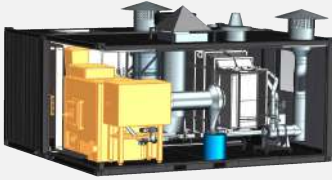
Impurities are no problem for the plant. Combustion chambers are available for a wide range of applications. These are combined according to requirements, e.g. for waste wood with a high proportion of branches and bark and a high water content. ClinX thus enables to exploit low-cost fuels.

The fuel consumption of ClinX depends on the plant size and the type of wood, as well as the water content and the calorific value of the wood. More detailed information can be found in the technical data sheets.

**Water content:  
up to 50 percent**

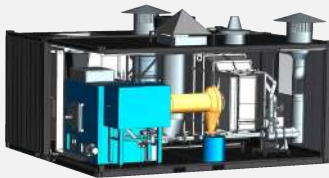
**Grain size:  
P16-P45**

**Ash content:  
up to 2 percent**



**Combustion chamber**

Designed especially for the respective fuel, with moving grate and automatic ash removal



**Particle separator**

Minimizes ash deposits and thus the attrition in the following modules



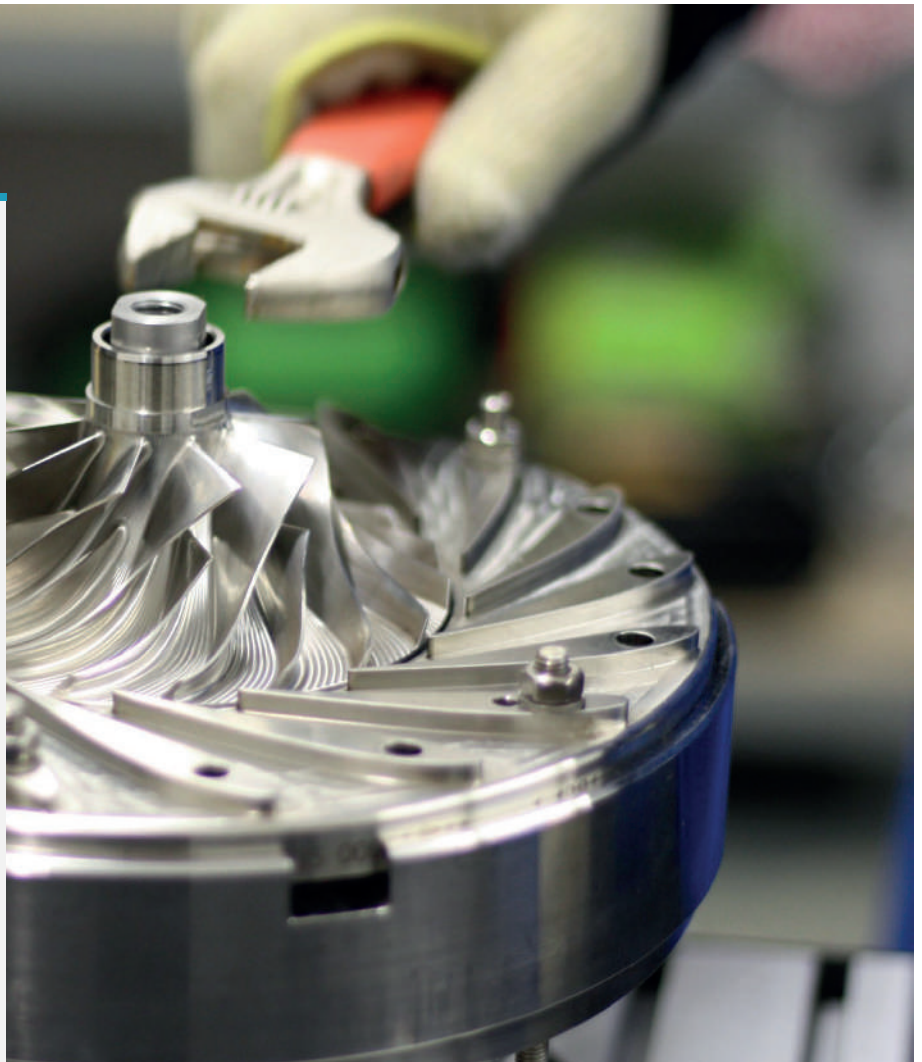
**Heat exchanger**

Counterflow principle with flow-optimised design and high temperature resistance



**Micro gas turbine**

with innovative air bearings for low-maintenance operation without lubricant or coolant



**Proven design meets high technology**

ClinX combines innovative technology, durable materials and German engineering in one system. The plant is characterized by robust individual components and a long product life.

The externally fired micro gas turbine has innovative air bearings so that no lubricants or coolants are required. The two gas flows (hot flue gas from the combustion system and compressed ambient air) are separated from each other so that no flue gas particles enter the air flow of the micro gas turbine.

In combination with the air bearing technology, this enables low-maintenance operation, high efficiency and a long turbine lifetime.

## COMBINED HEAT-POWER PLANT (CHP): DOUBLE ENERGY GENERATION RETHOUGHT

### Innovative combination of small power plant technology and externally fired micro gas turbine

The basic principle of combined heat and power generation is quickly explained: When a fuel is burned, heat is converted first. This heat drives a turbine and a generator produces electricity by converting the mechanical energy into electrical energy. The efficiency of energy generation is particularly high, since the same primary energy is converted into both usable heat and electricity.

In ClinX this principle is realized by the combination of a combustion chamber and an externally fired micro gas turbine. In the combustion chamber, the residues burn at gas temperatures of up to 1200 °C. The hot flue gas is passed through a high-temperature particle separator. Ash particles are separated there before the flue gas is fed into the heat exchanger.

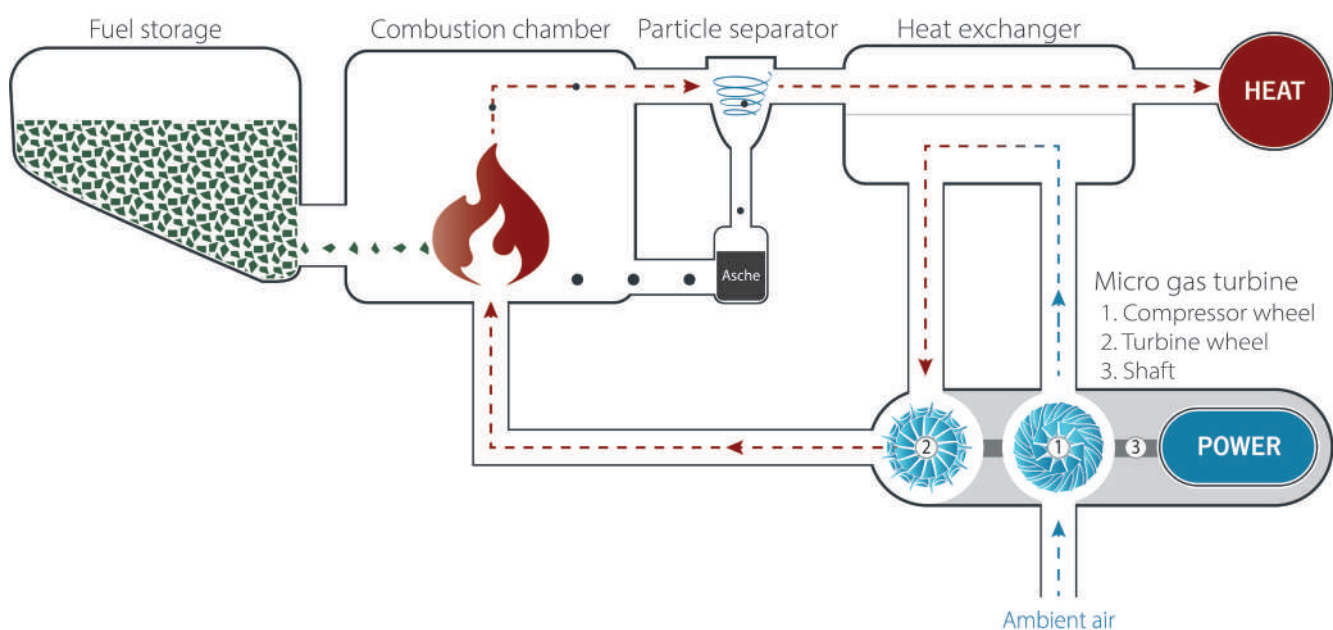
For the combustion process, clean ambient air is drawn

in via the turbine. This air is first compressed and fed into the heat exchanger. In the heat exchanger the heat is transferred from the flue gas to this compressed ambient air which is then directed to the turbine wheel.

The expansion of the hot, condensed air causes the rotation of the turbine wheel, which is coupled to the generator via a shaft. The generator converts the rotation into electricity.

The turbine exhaust air is fed back into the combustion chamber at around 550 °C. Compared to a conventional boiler, ClinX generates additional electricity for the same heating output, actively saves fuel and enables a particularly efficient primary energy supply.

Usable waste heat is extracted at a temperature level of up to 300 °C and used for downstream heating, drying, hot water or cooling processes.





**VERSATILE IN USE**  
and tailored to your requirements

ClinX is a versatile product combining a micro gas turbine with plant technology from the small power plant sector. The plant is suitable wherever wood residues are produced or affordable energy is required.

The turnkey system can be easily integrated into existing production processes. The technology offers a wide range of applications, depending on the available material flows.

The system is modular and can be expanded according to requirements. The central combustion unit with subsequent energy conversion module can be supplemented with a cooling generation or water treatment module as required.



**Woodworking companies**



**Forestry and Agriculture**



**Hotel and Wellness**



**Public Institutions**



**Industry**



**Local heating networks**





### THAT'S HOW ClinX PAYS OFF

ClinX converts residual materials directly at the place of origin, thus minimizing transport and logistics costs.

Use your own low-cost fuels and benefit from low energy production costs and, if applicable, from avoided waste disposal costs.

ClinX also provides a diversification of business models: excess power and heat can be profitably fed into the grid.

### YOUR CONTRIBUTION TO ENERGY TRANSITION: decentralised and environmentally friendly energy



Due to the CHP technology ClinX uses heterogeneous material flows particularly efficiently. High resource efficiency is also ensured by the robust design of the plant, which ensures a long product life. ClinX can be operated either with grid connection or in stand-alone operation.

ClinX converts energy from renewable resources, substitutes fossil energy sources and thus contributes to the avoidance of additional CO<sub>2</sub> emissions and climate protection. High German air pollution control standards are met by ClinX.

Decentralised CHP plants make an important contribution to securing the base load with their continuous power output. ClinX- plants contribute to the grid-stability and make the companies to a certain extent independent of central power supply and rising energy prices.

## HEART OF THE PLANT

### Also available as individual component



Powerhead with turbo group

Low maintenance, a compact design and high speeds - all this makes the micro gas turbine a valuable core component of our decentralized energy systems.

Micro gas turbines with innovative air bearings have the advantage that, unlike conventional systems, no lubricants or coolants are required. Since there is hardly any friction in the bearings during operation, energy loss is reduced and service life as well as maintenance intervals are increased.



Air bearings

The central element of the micro gas turbine is the turbine group, consisting of turbine wheel, compressor wheel and connecting shaft.

The turbine group is the only moving assembly of the micro gas turbine. In addition to the turbo group, the modules of the micro gas turbine include the generator, power electronics and control system.



## SUCCESSFUL TOGETHER

Our ClinX CHP works closely with the absolute cutting-edge technology of selected cooperation partners. For example, with the microturbines of the American world market leader for liquefied gases Capstone. The Capstone turbines are compact, recuperated single-stage micro gas turbines.



For its part, B+K has mastered the technology of externally fired microturbines. Several systems in the 35-300 kW electrical power range have already been developed. This makes us one of the world's leading players in microturbine technology in this field.

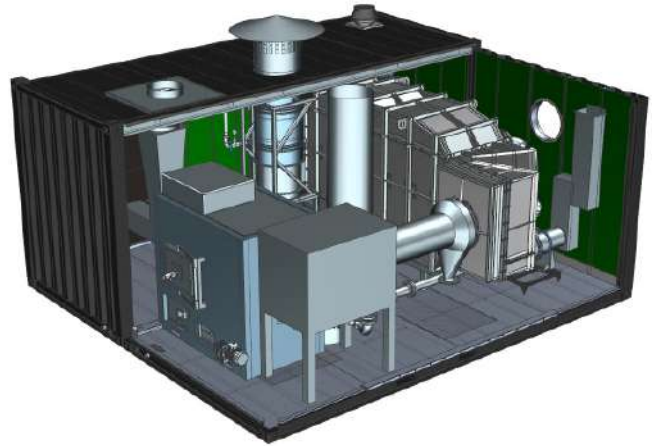
# ClinX 50

## Technical Data \*

Electric gross capacity [kW]	50
Electric net capacity [kW]	40
Electric on-site power [kW]	< 10
Rated thermal input [kW]	350
Flow / return temperature [°C]	90/70 or 80/60 **
Reference temperature flue gas [°C]	150

## Dimensions and technical connections

Dimensions	2 pcs. 20' Container **
Foundation load	≤ 20 t
Connection to heating system	min. DN40
Voltage / Frequency	400 VAC / 50 Hz
Communication	2 Mbit/s internet connection



## Performance data depending on water content \*

	Water content [%]	10	20	35	50
Caloric value [kWh/kg]		4,5	4	3	2,2
Fuel consumption [kg/h]		51	59	83	131
Fuel input capacity [kW]		230	236	249	282
Thermal useable power [kW]		110	114	126	149
Electric gross efficiency [%]		21,8	21,2	20,1	17,8
Electric net efficiency [%]		17,4	16,9	16,1	14,2
Thermal efficiency [%]		47,9	48,3	50,6	52,9
Overall efficiency [%]		69,7	69,5	70,7	70,7

## Fuel

Untreated, wooden biomass  
 Grain size: P16 - P45\*\* (DIN EN 17225-4)  
 Maximum water content: 50 %  
 Maximum ash content: 2 %

## Fulfilled emission limit values\*\*\*

Total dust	< 20 mg/m <sup>3</sup>
Carbon monoxide	< 400 mg/m <sup>3</sup>
Noise	65 dB(A) in 10 m

\* At following conditions:  
 Ambient air temperature: 15 °C.  
 Humidity: 80%.  
 Elevation: standard elevation zero.

\*\* Customizable to customer requirements.

\*\*\* According to 1. German Federal Immission Control Act, Technical Instructions on Air Quality Control ("TA-Luft") and Noise prevention ("TA-Lärm").

Reference oxygen content: 13%.

Technical changes reserved.

# ClinX 150

## Technical Data\*

Electric gross capacity [kW]	150
Electric net capacity [kW]	130
Electric on-site power [kW]	< 20
Rated thermal input [kW]	850
Flow / return temperature [°C]	90/70 or 80/60 **
Reference temperature flue gas [°C]	150

## Dimensions and technical connections

Dimensions	2 pcs. 40' Container **
Foundation load	≤ 40 t
Connection to heating system	min. DN65
Voltage / Frequency	400 VAC / 50 Hz
Communication	2 Mbit/s internet connection



## Performance data depending on water content \*

	Water content [%]	10	20	35	50
Calorific value [kWh/kg]		4,5	4	3	2,2
Fuel consumption [kg/h]		136	158	223	350
Fuel input capacity [kW]		612	632	669	753
Thermal useable power [kW]		287	298	328	392
Electric gross efficiency [%]		24,5	23,7	22,4	19,9
Electric net efficiency [%]		21,2	20,6	19,4	17,3
Thermal efficiency [%]		46,9	47,2	49,0	52,1
Overall efficiency [%]		71,4	70,9	71,4	72,0

## Fuel

Untreated, wooden biomass  
 Grain size: P16 - P45\*\* (DIN EN 17225-4)  
 Maximum water content: 50 %  
 Maximum ash content: 2 %

## Fulfilled emission limit values\*\*\*

Total dust	< 20 mg/m <sup>3</sup>
Carbon monoxide	< 400 mg/m <sup>3</sup>
Noise	65 dB(A) in 10 m

\* At following conditions:

Ambient air temperature: 15 °C.

Humidity: 80%.

Elevation: standard elevation zero.

\*\* Customizable to customer requirements.

\*\*\* According to 1. German Federal Immission Control Act, Technical Instructions on Air Quality Control ("TA-Luft") and Noise prevention ("TA-Lärm").

Reference oxygen content: 13%.

Technical changes reserved.

## SUMMARY OF OUR GREENTECH PORTFOLIO

### Green Energy Systems Combined Heat and Power Plant (CHP) - Everything from a single Source

Individual consulting for energy generation plants & green energy systems from Germany! We see ourselves as our customer's partner. From the first idea of decentralized energy generation or post-combustion biomass conversion,

to the complete realization and acceptance of our Combined Heat-Power Plant (CHP) ClinX. In addition to our core products ClinX WOOD and ClinX HEAT we offer various other services and products.



Accompanying the customer throughout the whole project — we want to remove every obstacle that is in the way of the path to project implementation.



We want to continually expand our service scope to include service trades and subsystems. For this purpose, we are establishing more cooperation and expanding our offer.



Clarity about our services — services and products can be bought only if the customer understands what we offer.



Let's work together to further improve your Energy efficiency - **Lucie Töpfer** | CFO

#### Our performance modules:

**MODULE 1:** Energy Generation Plants Consultation & Pre-Project Phases

**MODULE 2:** Approval Support & Accompanying Engineers

**MODULE 3:** Energy Generation Plants Consultation & Pre-Project Phases

**MODULE 4:** Green Energy Systems (ClinX HEAT & ClinX Wood)

**MODULE 5:** Individual Subsystems (e. g. Electricity storage, Peak load boiler, Sliding floor dryer)

**MODULE 6:** General energetic services and consultations



### **RELIABLE ACROSS THE BOARD**

In project developments, we operate along the entire value chain - from the blank sheet of paper to the plants initial operation.

We are happy to support you, even with projects that require an individual solution.



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