



SOKRATHERM compact CHP units
modern power and heat technology



SOKRA[®]
therm
Cogeneration

Energy utilization of different systems (exemplary)

	Efficiency On site of energy generation			Efficiency On site of consumption (including transport losses)			Total efficiency
	Power	Heat	Losses	Power	Heat	Losses	
Large power plant without heat utilization	40%	0%	60%	38%	0%	62%	38%
Central heating plant large heating network	30%	55%	15%	29%	50%	21%	79%
Standard cogeneration unit district heating	38%	52%	10%	37%	50%	13%	87%
SOKRATHERM compact CHP unit object heating	38%	53%	9%	38%	53%	9%	91%



SOKRATHERM – tailored energy

power and heat from CHP units

flexible and eco-friendly

In conventional power plants the heat generated during the production of electrical energy is led into the environment via cooling towers. Less than 40% of the energy input reaches the consumer as electricity while more than 60% is lost as waste heat. Our core idea is to not waste the heat cogenerated as part of the power production but to make the best possible use of it.

Since 1977 we develop and work with efficient heat and power generation technologies. Based on this experience we have developed compact Combined Heat and Power generation (short: CHP) units which use the principle of cogeneration to produce electrical and thermal energy where also the heat can be used. This decentralized energy solution has the advantage of cutting the transportation losses from the energy equation and can therefore offer overall efficiency rates of above 90%.

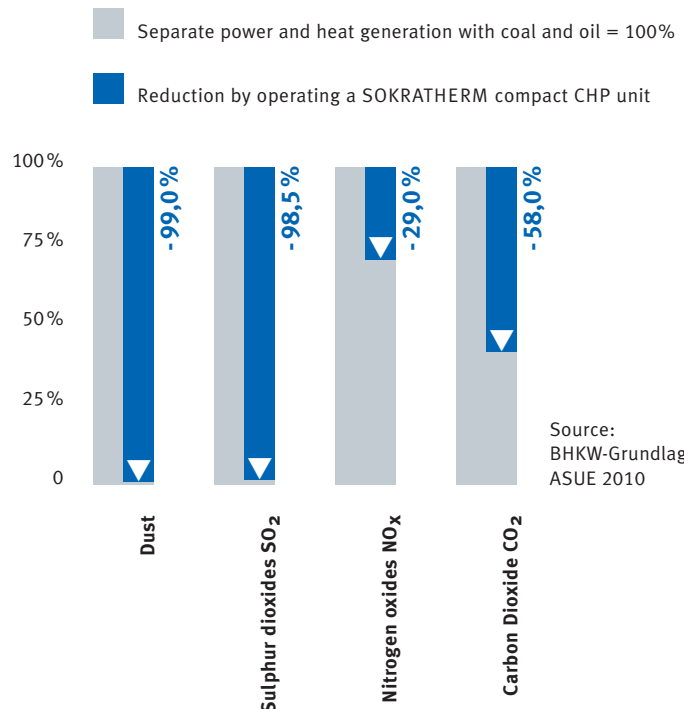
In contrast to the conventional energy supply CHP units powered with natural gas **reduce the primary energy consumption by over 30%** and the **CO₂ emission by up to 60%**.

Due to their ecological benefits CHP units are publicly supported in Germany and other countries. Their ability to be turned on and off or run in partial load within a matter of seconds (which common power plants are not capable of) makes them the perfect counterpart to the increasing number of fluctuating renewable energy sources. In order to achieve this, CHP units can be merged into **virtual power plants** which can provide balancing power in the range of several megawatts.

With their compact construction our CHP units use the shortest possible way to turn engine power and combustion heat into electrical energy and useable heat. The space requirements as well as the expenditures for inserting the CHP are minimized. Due to an advanced vibration decoupling system a separate foundation is mostly not necessary. All units are delivered with a sound absorbing case making sure that the unit can operate in sound sensitive objects such as hospitals, schools or even housing buildings.



Emission reduction of natural gas powered CHP units compared to conventional power and heat generation



SOKRATHERM compact CHP unit

compact, efficient, reliable

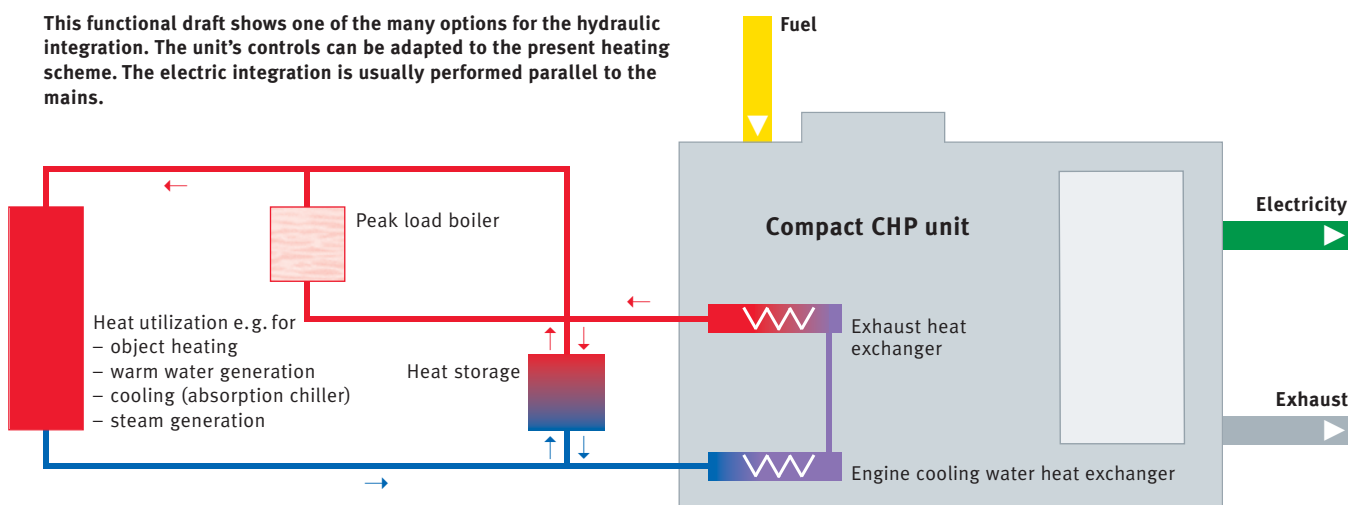


Core piece of the CHP unit is a gas engine which powers an alternator. The cooling water and exhaust heat are extracted with a system of heat exchangers and transferred to heating water. Engine, alternator and base frame are mounted with multiple vibration dampeners, the casing with integrated switchgear is fully sound-insulated.

Compact CHP unit GG 530 on the test bench

CHP unit integration

This functional draft shows one of the many options for the hydraulic integration. The unit's controls can be adapted to the present heating scheme. The electric integration is usually performed parallel to the mains.



Individual CHP plants to match the energy requirement perfectly



The combination of multiple CHP units allows an energy supply in the power range of Megawatts.

Multiple CHP unit plant in the specialised hospital Haldensleben

Special solutions

Our CHP units can also be fitted for emergency power operation and – with additional equipment and a special configuration – heat up thermal oil, generate steam for production processes or supply a chilling process such as air conditioning systems.

We deliver CHP units in various power classes for operation with **natural gas**, **bio-methane**, **biogas** or **sewage gas** in the range of 50 and 500 kW electrical power. This way we can provide tailored solutions for a broad span of applications such as swimming pools, hospitals, nursing homes, schools as well as housing and industrial sites.

Our compact CHP units are characterised by

- ▶ being delivered ready to connect
- ▶ needing especially little space
- ▶ making the best possible use of the fuel
- ▶ operating very safely, silently and with low emissions

Multiple unit plants

When facing high energy demands, several CHP units can be combined in size and number to match the heat and/or power requirement of the object exactly. By splitting the required amount of power onto several units the security of energy supply is improved because if one CHP is idle due to servicing the other units can keep operating.

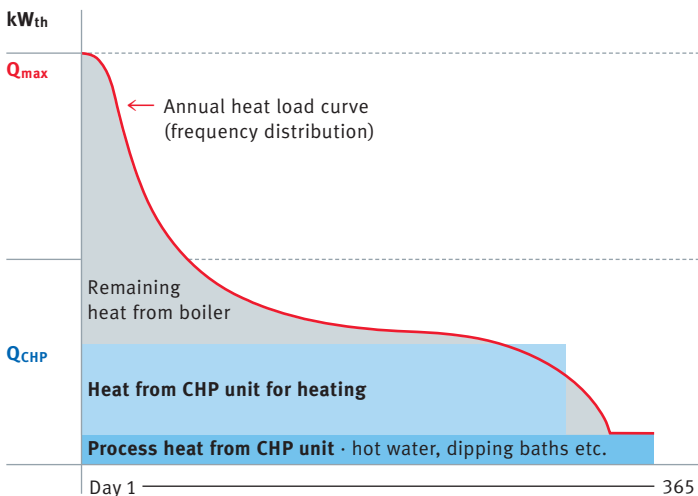
Several CHP units can be combined with our individually designed master control MaxiManager and regulated in combination with additional boilers and buffer management systems.



CHP sizing by heat demand

To achieve the best economic result with high utilization rates CHP units are mostly dimensioned according to the heat demand base load. This enables the unit to cover the major part of the energy demand. Electrical load peaks are covered by the mains and on especially cold days a peak load boiler can help to cover the demand for thermal energy. To find out the matching CHP size, the maximum heat demand (Q_{max}) is often used.

Depending on the climate zone and the prices for gas and electricity, a profitable CHP operation can be achieved when the CHP unit's thermal power is in the range of 10 to 30% of Q_{max} . In exceptional cases e.g. to cover electrical load peaks or provide emergency power the CHP unit is dimensioned according to the maximum power demand.



Sizing table

This table offers a first indication for the CHP unit size. Don't hesitate to ask our sales engineers which CHP size will fit best to your CHP project with your specific requirements.

Q_{max} (kW _{th})	CHP class (kW _{el})
300 – 800	50 kW
500 – 2,000	100 kW
900 – 3,500	200 kW
1,700 – 5,000	400 kW
2,200 – 7,500	500 kW
up to 20,000	individual sizing

CHP control

Every SOKRATHERM CHP unit comes equipped with an industrial PC control unit which not only monitors the fully automatic operation but can also adjust the CHP into partial load operation according to the current energy demand. The systems developed by us can control any number of CHP units including boilers and heat storages for best operation.

Our newly developed, web-based remote control and monitoring system enables the whole CHP unit to be controlled from a desktop PC, notebook or even a smartphone. A variety of interfaces can provide connections to other systems – from building management systems up to the integration into virtual power plants and providing balancing energy.

SOKRATHERM customer care

competence for your CHP project



The professional customer care provides for an economic and eco-friendly operation of the CHP unit. We not only build CHP units, we also help to find and train competent partners for servicing.

At SOKRATHERM, customer care means: Full commitment to your satisfaction. Our aim is not only to build excellent CHP units but to cooperate with the customer to achieve the best profitability, lifetime and operation reliability of the CHP project.

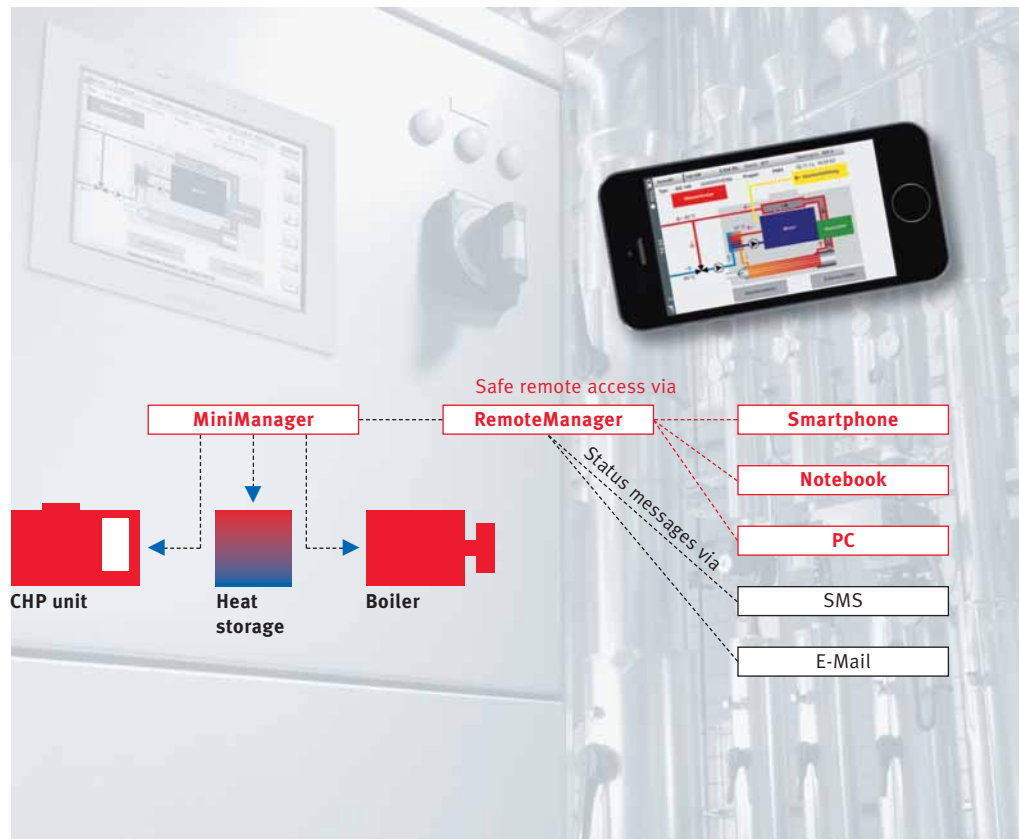
This is why our customers are comprehensively supported right from the beginning. Our sales engineers analyze the energy demand of the object, make first drafts of profitability calculations and proposals for integrating the CHP unit in existing systems – tailored to suit the building, the planned utilization as well as the technical and economic conditions. For every requirement we seek the best solution – and find it.

Our CHP units are delivered ready to be connected and can be set up very quickly. The complete implementation of the CHP project including commissioning on site and test operation is accompanied by our project engineers. With the Remote-Manager our engineers have full access to historic and real-time operation data and will help you with all issues concerning the CHP unit.

SOKRATHERM CHP control systems guarantee an economic, efficient and secure operation of a single CHP unit as well as heating centers with multiple CHP units. Alone or combined with other heating systems (e.g. building management systems) they create more transparency, faster reaction options and predictable savings.

+ MiniManager
Control of CHP unit, peak load boiler and heat storage

+ RemoteManager
Internet based remote monitoring and control



SOKRATHERM servicing quick and professional

Professional service is an important success factor for CHP projects. SOKRATHERM works with a network of international partner companies and can assist CHP operators in finding qualified service partners or train service staff locally. Our online servicing system transfers all of the data directly to the RemoteManager. Our service center can access the data directly and support the staff on sites around the world e.g. in Chile or Russia effectively.

Only reliable parts from well-known manufacturers are used for our CHP units. This guarantees a very low fault liability. If repair measures become inevitable this also ensures that our spare part supply works quickly and uncomplicated.



Competence based on experience over 35 years of know-how in cogeneration

We have an ISO 9001 quality management system which is regularly audited by the TÜV. This ensures a continuous process of improving our product quality and securing our customers' satisfaction.

After the final assembly and adaption of our CHP units according to the specific customer requirements an extensive test bench run is performed and followed by a first servicing.

The clear focus on quality in our product and service has provided SOKRATHERM with an excellent position: With numerous awards and over 1300 CHP units delivered worldwide we are one of the leading CHP manufacturers in our power class.

SOKRATHERM is a partner of the ›Exportinitiative Energieeffizienz‹ created by the federal German ministry for economy and technology with the trade mark ›Energieeffizienz made in Germany‹.

Plant Nordhausen: Built in 1996, enlarged in 2008 and 2012. Production, warehouse, service center and technical offices are situated in 3,500 m².



Trust in SOKRATHERM

proven solutions for all requirements

The SOKRATHERM technology is proven wherever thermal and electrical energy are needed – which is in a large variety of objects and buildings. The range of customers putting their trust in our hands is just as wide:

- ▶ local and large energy service providers
- ▶ contractors with ESCO projects
- ▶ municipalities
- ▶ heating center constructors

Typical application examples are:

- ▶ hospitals and nursing homes
- ▶ administration buildings
- ▶ residential housing and district heating
- ▶ hotels
- ▶ swimming pools
- ▶ industrial sites
- ▶ purification and biogas plants
- ▶ breweries
- ▶ food processing plants



® Containerized CHP unit for a shopping center in Magnitogorsk/Russia

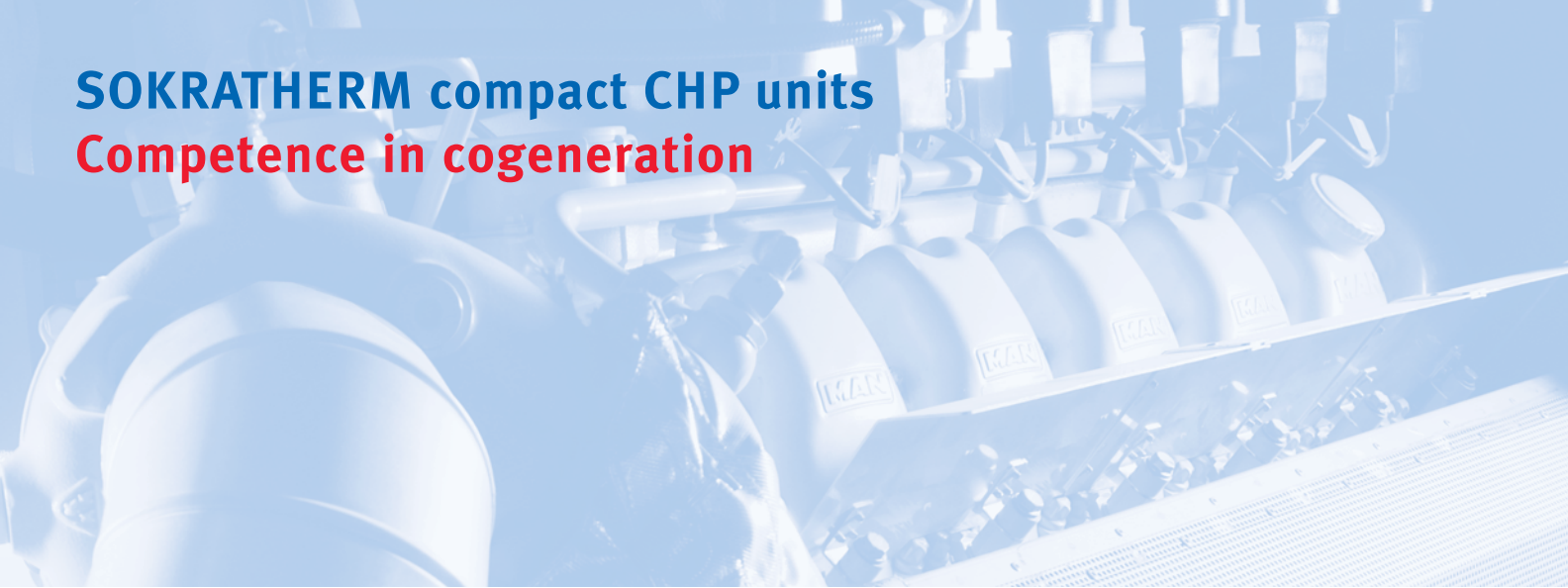


- ① Maritim Berghotel Braunlage, CHP plant of the year 2009
- ② Airport Brussels-Charleroi
- ③ Water purification plant Kielseng, Flensburg
- ④ Gräflicher Park Hotel & Spa, Bad Driburg
- ⑤ Badehaus Nordhausen
- ⑥ Schloss Biebrich, Wiesbaden
- ⑦ Care home Parkresidenz Rahlstedt, Hamburg

- ⑧ Hotel and sanatorium Rodina, Sochi/Russia
- ⑨ Cork Institute of Technology, Ireland
- ⑩ Biogas plant with micro gas network and 3 decentral CHP sites, Fellbach
- ⑪ Industrial site Röhm GmbH, Sontheim
- ⑫ Residential complex, Laatzen

SOKRATHERM compact CHP units

Competence in cogeneration



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