

**TEDOM**



# COGENERATION

Combined Heat and Power

# Our Story

*TEDOM was founded in 1991. Within a quarter of a century, a small-sized firm has grown into an international company with more than 500 employees that sells its own products in a number of countries worldwide.*

The company started with one CHP unit model with an output of 22kW. In no time, further models with higher outputs were added to the product line. As well as the natural-gas fuelled CHP units, TEDOM also developed biogas-fuelled CHP units. Today, the company offers a number of CHP units that operate on natural gas and biogas and have an output ranging from 7 kW to 10 MW.

Aside from stand-alone CHP units, TEDOM also supplies complex turn-key projects that include design documents, technologies delivery, and installation of the entire energy source.

Since 2003 the company does its own development and production of TEDOM engines. CHP units together with the engines form the basis of the product portfolio.

In 2010, TEDOM together with ČEZ Group founded a joint venture of ČEZ Energo where the joint company operates more than one hundred CHP units

connected to a virtual power station with a total electrical output of 85 MW.

In addition, TEDOM runs energy sources in the municipal recycling centres. These energy sources produce tens of thousands of megawatt-hours of green power annually.

There is also an extensive service network which includes remote online monitoring of the CHP units operation.

In 2016, TEDOM and the American company Tecogen founded a joint venture TTcogen which sells CHP units in the U.S.A. Furthermore in the autumn of the same year, TEDOM acquired the German company of SCHNELL, the leading supplier of CHP units for biogas plants. As a result, the number of employees in the TEDOM Group increased to 900 and the number of the common references exceeded 7000 CHP units.

## Savings for the customers

Production of the energy-saving equipment helps to cut down the costs of energy of our customers while remaining environmentally friendly. TEDOM doesn't fear innovation. It helps push us the envelope. The company continues to develop beyond the limits expected by its customers.

## The Use of Decades of Experience

So far, TEDOM has put into operation more than 3,700 CHP units and therefore has an extensive experience and knowledge within the design and installation field. Should you be interested in doing business with TEDOM, you can be assured that you will always be served by an experienced dealer who will assist you in establishing your optimum solution.

## World wide delivery

Many years of experience with CHP unit installations worldwide allows TEDOM to respond flexibly to the various requirements of any customer. Together with our business partners, we are always capable of finding a convenient solution with regard to the local conditions.



## Reliable Service

The key features for operators are machine reliability and on-time service. In the Czech Republic, we have an extensive service network with nine centres, with more than thirty crews and tens of professionally trained technicians. Our central warehouse has almost 100% spare parts in stock. The service partners we provide with both regular training and professional technical support are in charge of maintenance of the TEDOM CHP units abroad. By acquiring the German company of Schnell Motoren, we acquired an extensive service network with 200 service technicians.



# Top Quality assurance

So that Everything Operates Properly!

## State-of-the-Art Components

The technically advanced components from the verified suppliers are the basis of the reliability and long service life of the machines. TEDOM manufactures its own engines for a series of CHP units. TEDOM heavily invest into the development of its own products and ensures that close scrutiny is in place for quality assurance purposes. Due to high-quality craftsmanship and low operating costs, the TEDOM engines have proven to be competent and efficient in thousands of installations.

## Precise and Rigorous Production

The high efficiency of TEDOM CHP units is a result of the precise design of individual parts as well as the stringent procedures used in putting all the components together. Aside from the actual design, close attention is also paid to the engine optimization for its reliable operation on various gaseous fuels.

## Quality assurance

When designing the CHP units, we base our experience from the development and production of our own TEDOM combustion engines. However, we also design and produce our machines with engines from different manufacturers as, for example, MWM, Liebherr, Kubota or MAN.

In TEDOM company, all the production processes and procedures are subject to strict quality control. The company is a holder of the ISO 9001 Certificate. It is also important to be environment-friendly according to ISO 14001.

*Due to our series production, we are capable of supplying our customers with the required CHP unit model in top quality and in a timely manner. We set a long machine service life and adequate service intervals as our primary goals.*

## Elaborate Design

The design of TEDOM CHP units is finalized to the tiniest detail so that the start up followed by the operation of any unit is as smooth as possible. Spare parts are easily available if replacement is required. This makes the ongoing maintenance of the machine more effective and it reduces downtime. Prior to each machine being dispatched to a customer, an extensive final inspection is carried out, which includes a trial run of several hours.

## Remote monitoring

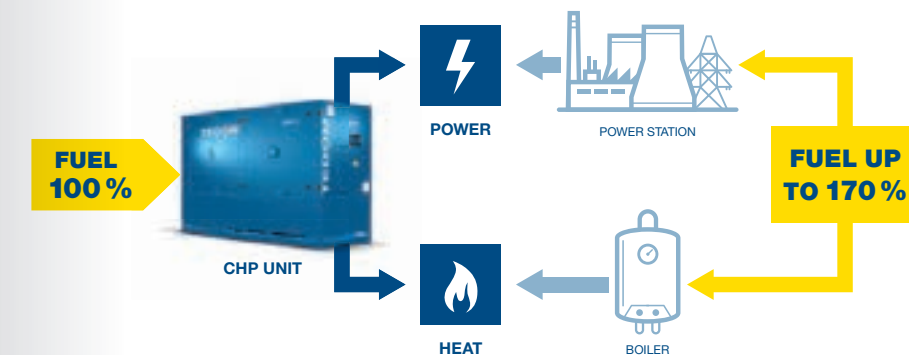
The new communication technologies available today enable TEDOM to monitor the CHP units for operation 24 hours a day from anywhere in the world and to control their operation remotely from computer or cellular phone. With this level of interaction, we can easily see any deviation from the normal CHP unit operation and we can draw the operator's attention to the necessary correction, if it is required. In addition, the remote monitoring reduces the repair time in case of failure, because the service technician sets out to the installation site already aware of the failure cause. Most frequently, mere consultation in regards to the CHP unit settings by phone is sufficient.

# Cogeneration

## Power and Heat from One Source

*Traditional power generation is usually very ineffective. The heat released during this process has usually no use. Additionally, the heat is produced separately in different sources. What about doing this differently?*

## Energy Saving Through Cogeneration



## Who benefits from Cogeneration

**Cogeneration can be applied in any structures where heating or cooling is necessary:**

- hospitals and clinics
- retirement homes
- hotels
- spas
- swimming pools and aqua parks
- shopping malls
- industrial establishments
- municipal heating plants, etc.

## Combined Production of Heat and Power

**The combined production of heat and power, or cogeneration, is the method of electric power generation during which the heat created during the manufacturing process is utilized efficiently. This results in a very high efficiency when the energy in the fuel is being used.**

The small-sized and medium-sized CHP units are mostly designed on the basis of gas-combustion engines. The engine rotates and drives the generator. The heat from engine cooling and from exhaust gases is used for heating, hot water preparation, and other purposes.

The power produced in CHP unit can either be exploited for internal needs or supplied to the power grid. In certain cases, CHP unit can also have a role as a backup source of power in case of power outage.

### Supplies Energy as Needed

The CHP unit size is usually designed depending on the amount of heat necessary. Produced power will be consumed on-site, sold back to the grid, or accumulated in a battery. As a result, CHP units are highly flexible sources of energy.

### Reduces CO<sub>2</sub> Emissions

The burning of fossil fuels is always associated with CO<sub>2</sub> emissions. The less fuel burned, the lesser the emissions produced. In this respect, the TEDOM CHP units are a highly effective solution: They utilize natural gas that has low emissions of CO<sub>2</sub> and at the same time, they are highly efficient due to the combined production process. Thus, it is a very environmentally responsible source of energy.

### Employs Non-Traditional Sources

CHP units burn both natural gas and LPG as well as various biogas types. Biogas is generated as a product of the biomass decomposition in agricultural biogas plants, municipal recycling centres, or during the waste-water treatment process. Other types of gas can be used for the production of power including mine gas, which is generated when coal is being mined, in closed mines, or at oil well heads.

### Flexible Source of Energy

When compared to renewable energy sources like sun or wind, CHP units have one great advantage: it is possible to plan production of power independently of any weather conditions. This is why the CHP units are a convenient alternative to other renewable sources of energy.



# TEDOM CHP Units

*We put our heart and soul into our products. We are proud of the tradition of Czech mechanical engineering and we intend to continue our efforts for further development. Thousands of installed TEDOM CHP units all over the world prove this...*

## 500–10 000 kW<sub>e</sub>

### QUANTO

high-output CHP units



## 50–500 kW<sub>e</sub>

### CENTO

medium-output CHP units



## 7–50 kW<sub>e</sub>

### MICRO

low-output CHP units



For the current overview of the produced CHP units visit [www.tedom.com](http://www.tedom.com)

# TEDOM MICRO

Compact Machines with High Efficiency



*Installation or replacement of technology in technical rooms of existing buildings pose a frequent problem, mainly because of the reduced accessibility. TEDOM took these obstacles into account when developing the Micro CHP unit. The design is compact and literally fits anywhere. As a result, the installation is quick and does not incur any significant extra costs. Even the follow-up service of CHP units does not require much space.*

## Maximum Utilization of Energy in Fuel

### A Lot of Energy Under the Small-Sized Sound Enclosure

The Micro series CHP units have a total efficiency of over 95 %. The water-cooled generator has a major role in this. If an additional condensing exchanger is used, the efficiency will exceed 100 %.

### Long Service Life

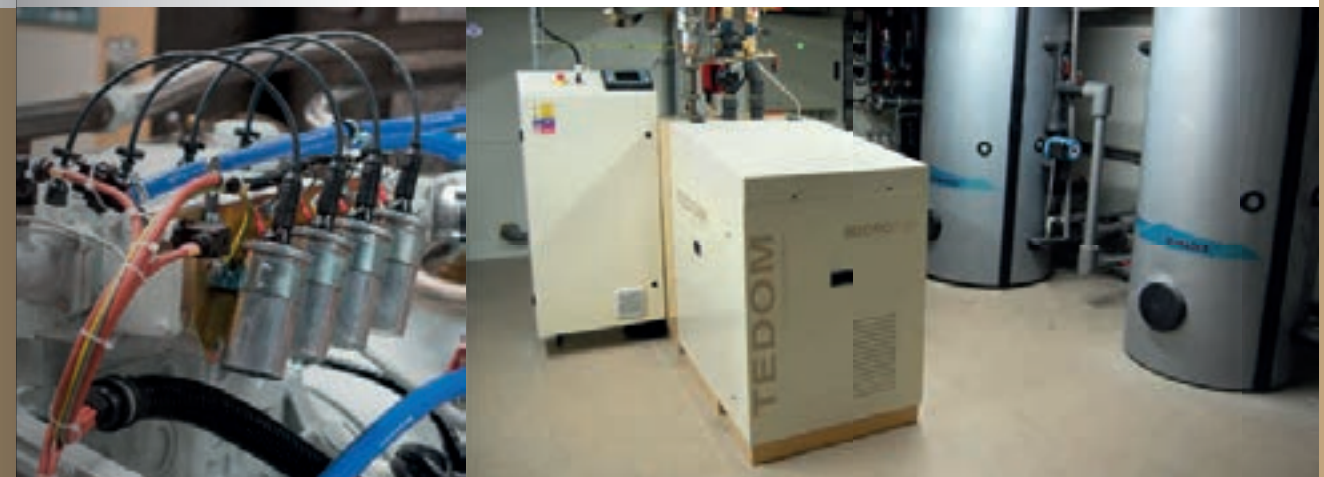
Smart conception and first-rate processing together with regular maintenance guarantees the life of CHP units tens of thousands of working hours.

### Low Demands for Space

The compact dimensions and low demands for the service area allows installation of the CHP unit into confined rooms and non-ventilated areas. Due to the rotatable control panel, the CHP units can fit through most doors which makes their installation in existing buildings much easier.

### Easily Accessible Components

The easily accessible sound enclosure allows trouble-free access to all the CHP unit's components. This feature shortens the time necessary for a possible service intervention and this is favourably reflected in its price.





# Easy Installation

## Plug & Play

The "all-in-one" design allows very easy connection of the CHP unit into the building's heating system. Due to the water-cooled generator, the CHP unit does not need ventilation. This makes complex construction modifications unnecessary.

## Automatic Operation

Due to the sophisticated control system, a CHP unit operates on a completely automatic basis. If the actual CHP unit status needs to be checked from time to time, it's as simple as taking a look at the control display to see the actual condition of the CHP unit. Additionally, TEDOM CHP units can be connected to the Internet to control their operation remotely through a computer or smartphone.

## Low operation noise levels

Because of the tightly sealed sound enclosure, the CHP unit operation is very quiet even in close proximity.

## Adjustable Power Control Panel

The separate control panel allows for an individual positioning layout, depending on how the CHP unit is positioned. This layout also protects sensitive electronic components against the heat generated by the engine.



# Examples of Micro CHP Unit Utilization



Hotel, Kaltenbach, Austria

## Hotels and Leisure Industry

Hotels and the leisure industry are typical places that benefit from the use of cogeneration. These are establishments which utilize power and heat mostly for their own needs. In these locations, CHP units can also be used as simultaneous emergency sources of power.

## Retirement Homes

Just like hotels, retirement homes demand permanent heat extraction and power consumption. The TEDOM CHP units are therefore very popular among the operators of these units.

## Water Treatment Plants

Gas containing methane is released from the sludge in water treatment plants. This gas can conveniently be used as a fuel for CHP units. Small-sized water treatment plants utilize the Micro series CHP units both for the generation of power that can be used to feed the water treatment plant's premises and for its sale back to the grid.



WTP, Nové Mesto nad Váhom, Slovakia



Hospital, Bristol, Great Britain

## Hospitals

Hospitals commonly use CHP units due to the need of a permanent supply of power and heat therefore these buildings greatly benefit from cogeneration. Depending on the building size, the higher-output series of the TEDOM CHP units can be deployed in hospitals.

# TEDOM CENTO

It Will Adapt to Your Needs

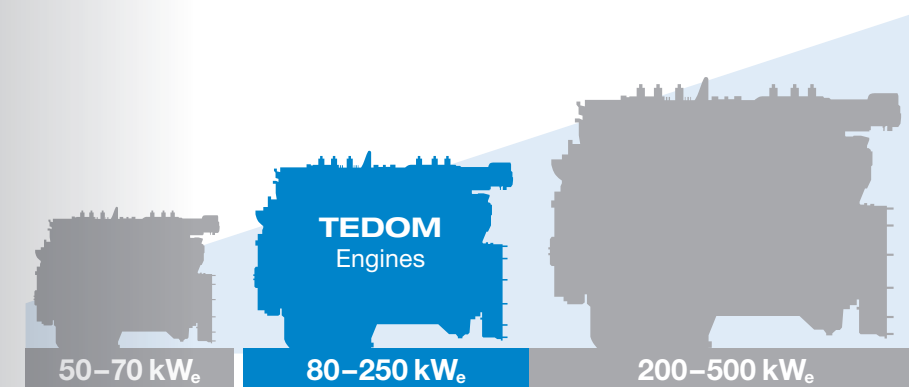


*Predominantly, you will find Cento CHP units in buildings with a high energy demand, for example, hospitals, schools, hotels, aqua parks or conference centres. Intelligent structure, variable design and a wide output range - it is these features that allow for installation of our CHP units wherever needed. It could very well be the local aqua park or school where our CHP units supply power and heat.*



## Choose the Output You Need

The Cento CHP units adopt several advantages shown below compared to the small-sized CHP units: the "all-in-one" solution, low noise level, and simple handling. However, they have higher outputs so they are more economical! The output of Cento CHP units ranges from 50 to 500 kW. Most frequently, it is our own TEDOM engines, developed and manufactured in our engine manufacturing facility in Jablonec nad Nisou, that are used for the CHP units. We use Swiss Liebherr engines for the higher-output CHP units and mostly German MAN engines for the smallest CHP units.



### Natural Gas and Biogas

We adapt the CHP units structurally to the operation of natural gas or biogas. If needed, the CHP units can be adapted for the combined operation of biogas and natural gas.

### Peak Heat Output

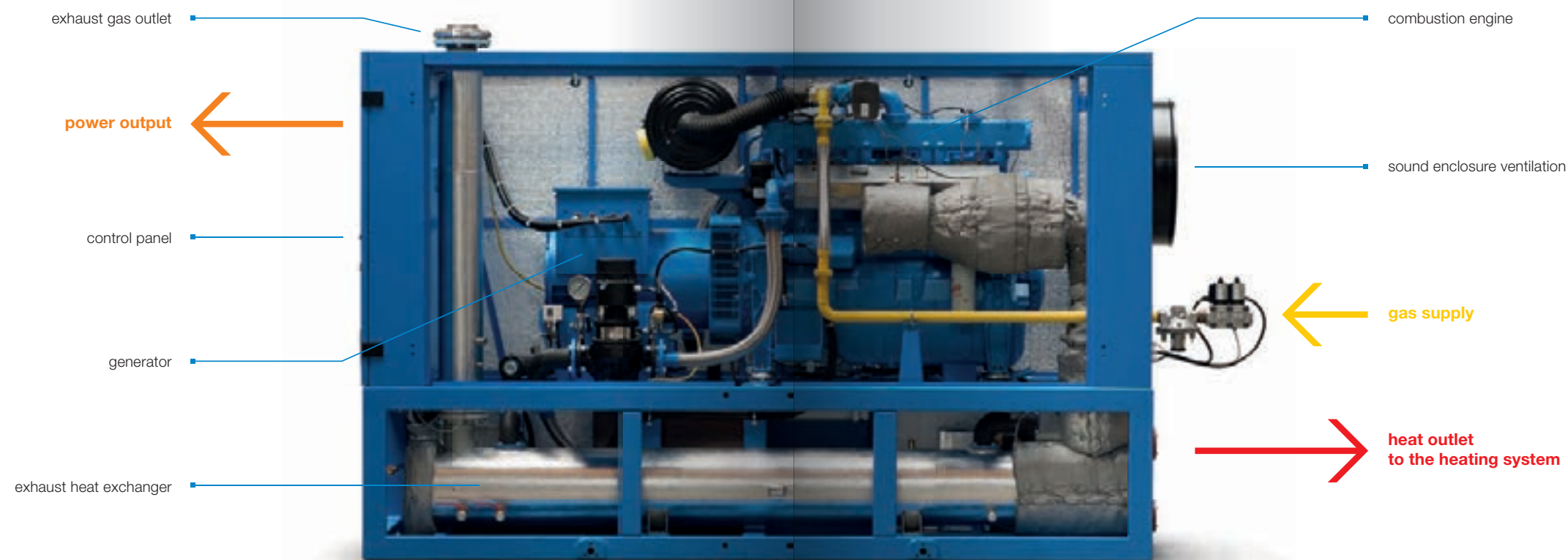
When requesting the maximum efficiency, our CHP units are operated with a condensing exhaust heat exchanger or economiser.

### Minimum Noise

To attain quiet operation, we adapt the CHP unit sound enclosure in such a manner as to minimize the transmission of noise. To achieve this, the engine is mounted to the frame in such a way to avoid unnecessary vibrations.



# Smart Construction Kit



## Cento CHP Unit Design

The Cento series CHP units are designed so that their separate parts fit into each other as part of a kit. The kit includes the motor generator, a set of heat exchangers, the power control panel and other essential elements of the functional CHP unit. The CHP unit's lower section accommodates the thermal module with the oil system. The CHP unit's upper section contains an actual motor generator with an air intake. The CHP unit's front face accommodates the control panel - its presence on the CHP unit's frame is a typical feature of the TEDOM Cento concept.

## Power outage? We are ready!

Even in their basic version, the TEDOM CHP units are ready for parallel operation with the power grid. Tedom CHP units have the ability to be equipped for emergency island operation if required such CHP units can continue their operation during a power outage functioning as the emergency power supply. The CHP units function in a similar way when in "island operation", that is, without connection to the public grid.

# CENTO

## Version Options

### Open Module

The CHP unit is one with a simple design and its own control panel that needs no special ventilation. You can access all of its components very easily - this makes a service intervention much simpler. It is ideal for installation into a sound-proof machine room. Above all, it is cheaper than our other versions.



TEDOM COGENERATION | CEN10



### Container

A CHP unit, as well as with any other equipment, can be placed cooperatively into a metal or concrete container. This version is intended for outdoor installations and therefore has several advantages:

- the container protects the CHP unit from adverse weather conditions
- a maximum of 3 cogeneration modules can be placed in one container
- the container colours can be modified to adapt the container to adjacent installations

### Sound Enclosure

The sound enclosure that encases the CHP unit is internally modified so that it absorbs the motor generator noises to the maximum extent possible and at the same time protects the CHP unit components from impurities and damage. This version is intended for installations in buildings.





# Trigeneration

Simultaneous Production of Power, Heat and Cooling

Trigeneration is referred to when a CHP unit is installed with a dry absorption cooler that allows for the transformation of cogeneration heat into cold energy.

## Trigeneration Advantages:

- lower operation costs of the dry absorption coolers as compared with electric compressor cooling
- low absorption noise
- low servicing costs
- long service life



## Installation Options

Trigeneration units can be operated when cooling is required. This is mostly air-conditioning for production areas, offices or residential rooms, however, it can also include the production of industrial cooling.

Trigeneration is frequently used, for example, to produce heat in winter months and cooling in the summer. However, there is also the possibility to simultaneously produce all three forms of energy.

# Examples of Cento CHP Unit Utilization



Sports Centre Brooks, Alberta, Canada

## Swimming Pools and Aqua Parks

Swimming pools and aqua parks are facilities with a high demand for heat, mainly to supply water heating. Simultaneously, they are ideal for the utilization of CHP units that assist in reducing the energy demand of these facilities by the common production of power and heat.

## Sports Facilities

Swimming pools are usually a part of sports facilities and leisure time centres. This is why CHP units will find their practical use in these multi-purpose complexes.

## Biogas Plants

The production of power from biogas generated by the fermentation of agricultural animal and plant wastes has become very popular in recent years. The TEDOM CHP units are in operation in hundreds of biogas plants in numerous countries worldwide.

## Municipal Waste Dumps

Older municipal recycling centres are a source of gas with a high methane content. This gas must be disposed of to prevent it from being released into the atmosphere. However, this gas can be simultaneously used as a fuel for CHP units. It can be used for the production of "green power".



Biogas plant, Hostouň, Czech Republic



Acibadem University, Istanbul, Turkey

## Schools and Universities

Schools and universities are buildings with high energy consumption. For this reason, in many such buildings, you will see CHP units used for providing the supply of power, heat and cooling.

# TEDOM QUANTO

The Basis of Your Power Engineering Project

## Big and Efficient

Quanto CHP units offer the power output above 500 kW. They feature the following properties:

- stand-alone motor generator
- modifiable power and control panel location
- engines made by renowned manufacturers
- generators for both low and high voltages
- various design options



*The Quanto series CHP unit offers a higher output. One of these CHP units is capable of reliably supplying heat to the entire urban settlement with two hundred and fifty apartments plus the adjacent primary school premises. They can also produce enough power to handle the consumption of a town with two thousand inhabitants. These CHP units will find further applicable use, for example, in energy-intensive industrial plants or when utilizing the non-traditional sources of energy, for example, mine gas.*





# QUANTO

## Focused on Output

### For the Municipal and Industrial Power Engineering

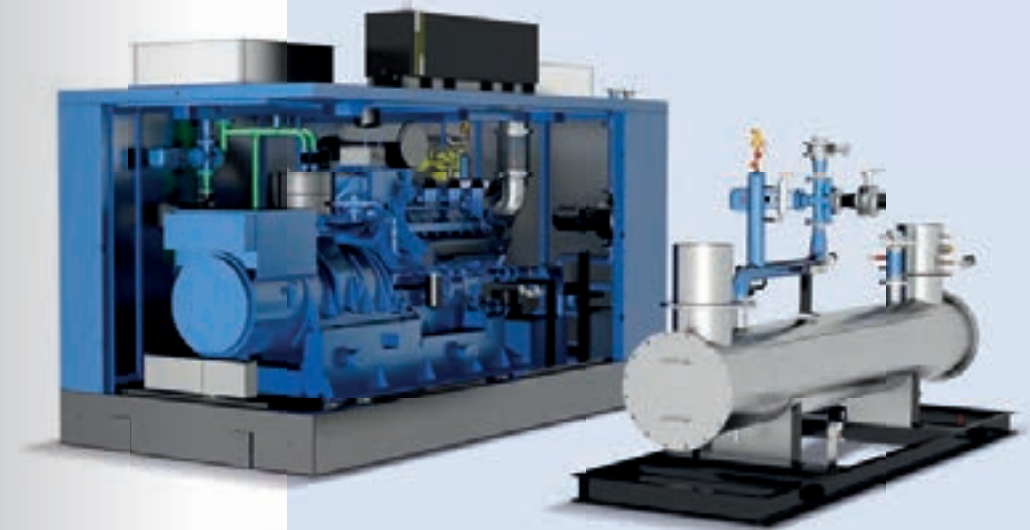
The Quanto series CHP units are frequently employed in district heating (CHS) systems where the heat from CHP unit is supplied to the heat distribution system and the power from cogeneration is sold to the electrical system. In addition, the Quanto CHP units are frequently employed in supplying industrial facilities with power and heat. Given their output, they may have a significant role in the support of power engineering services, for example, as a flexible supplement for renewable sources of energy. They are also important in the area of spare energy sources or in facilities that operate in an island mode.



### "Turn Key" Projects

The installation of a separate CHP unit into a machine room is often a mere sub-stage of the entire power engineering project. As a cogeneration technology manufacturer, we also provide our customers with "turn-key projects". This means that, besides the supply of CHP units, we also ensure reconstruction or development of the district heating facilities, corporate energy centres, etc.

TEDOM COGENERATION | QUANTO



### Optional Versions

We provide our customers with the Quanto CHP units in the three basic versions.

As a solution for buildings, we offer a version in a **sound enclosure** where individual technological elements are assembled in our production facility to be dispatched as a whole.

When placing a CHP unit into a sound-proof machine room, the version **without an acoustic shell** is often sufficient.

The **container versions** where the complete cogeneration technology is installed in a container are specifically designed for the outside environment.



# Cogeneration Modules 500 kW–10 MW

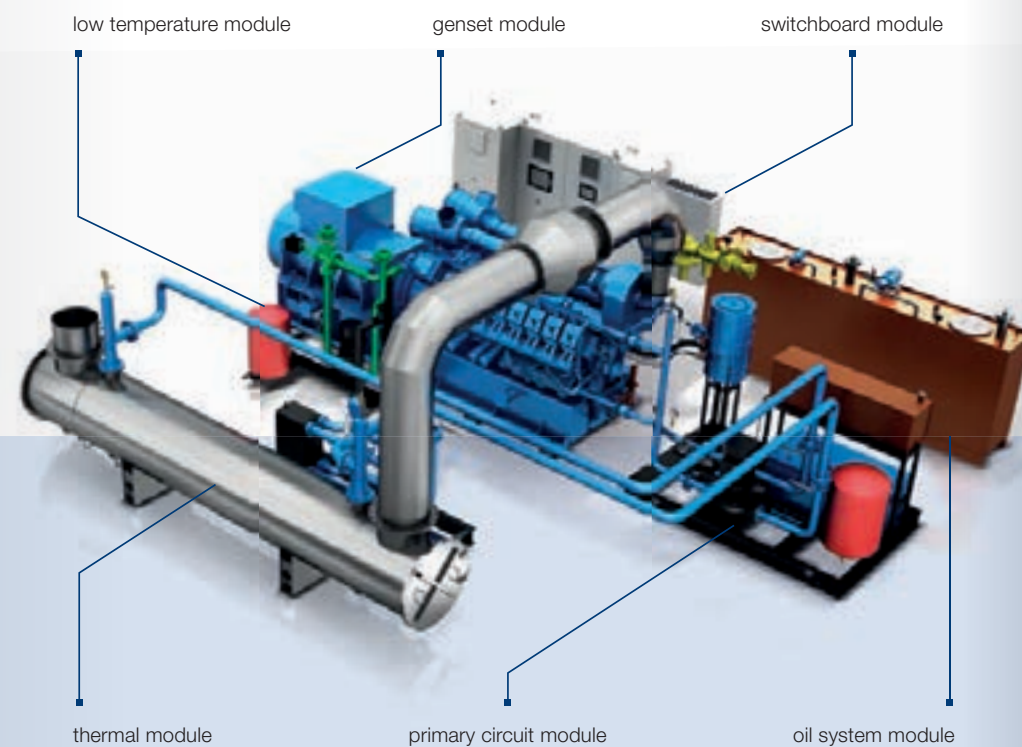
## Build your own CHP Unit

We've prepared a series of cogeneration modules with the output of 500 kW<sub>e</sub> to 10 MW<sub>e</sub> that burn natural gas for the investors that are capable of putting certain parts of cogeneration technology together on their own.

Should a customer be experienced in larger power engineering projects and have a desire to build a CHP unit on their own, the cogeneration modules could be the suitable solution. A typical example of this is the situation when a customer has a motor generator and they need assistance in supplying additional parts of the cogeneration technology system.

### Advantages of Modular Arrangement

- The customer will choose only such modules and services which are needed.
- The customer can make use of their own designing, manufacturing and/or assembling capacities.
- We will help in optimizing the project to exactly fit the customer's needs.
- The customer will have the well-proven TEDOM cogeneration technology.



# Examples of Quanto CHP Unit Utilization



District Heating Plant, Světlá n. Sázavou, Czech Republic

## District Heating System

The Quanto CHP units are frequently used as highly-efficient sources in district heating systems. They supply the produced power to the grid, and by doing so, reduce the heat production costs. They are usually equipped for efficient operation with a suitably dimensioned accumulation tank to hold the produced heat.

## Coal Mines

During and after mining activities, large amounts of gases remain accumulated in underground chambers. Due to their high methane content, these gases are a highly efficient fuel for CHP units. We've installed dozens of large CHP units in coal mining areas.

## Oil Well Head Gas

Gases that can be used as a fuel for CHP units also accumulate at oil well heads. These gases are frequently used as a cheap source of power in isolated mining areas.



Mines, Sosnica, Poland



Chemosvit industrial establishment, Slovakia

## Large Industrial Establishments

Large industrial establishments employ the Quanto CHP units mostly for their own requirements of power and heat. For these establishments, cogeneration is a very flexible source of energy that helps cut the costs in production for high energy demands.



# Gas Treatment Equipment

Gas treatment equipment is mainly intended to reduce the moisture content in biogas, landfill gas or coal mine gas to a level convenient for its application in CHP unit. The entire equipment is placed on the base frame. Individual parts of the assembly that come into contact with gas and all gas/fluid pipes are equipped with heat insulation with mechanical protection.

## Advantages of a Gas Treatment Equipment:

- higher operational reliability of both the CHP unit and the whole cogeneration technology
- failure rates reduced when compared with untreated gas
- longer service intervals means lower operational costs



## Options

**Desulphurization vessel** - allows for the reduction of hydric sulphide content in the gas. The desulphurization vessel can be used conveniently when hydric sulphide concentration cannot be stabilized reliably at the required value.

**Blower** - allows the increase of the gas pressure to a value suitable for supply to the CHP unit. Concurrently, it ensures gas pressure control and stabilization for assurance of the optimum conditions necessary for CHP unit operation.

# Gas Heat Pump

For Efficient Production of Heat and Cold

The gas heat pump is the newest product of Tedom. It is inspired by the TEDOM CHP units, however, contrary to the CHP units, the gas heat pump is not intended to produce power.

The gas heat pump combines a combustion engine and heat circuits to utilize heat from the engine and exhaust gas cooling like the CHP unit. Further heat is generated by the compressor circuit that is capable of efficiently utilizing the heat from external sources.

Because of its advanced conception, the gas heat pump is the most efficient heat production system. The pump can simultaneously produce heating and cooling and when this is utilized, the pump's efficiency is even higher.



## Installation Options

Suitable applications are, for example, food processing facilities, industrial establishments, aqua parks, winter stadiums, office buildings, schools, hospitals, hotels, and similar establishments.

The gas heat pump is utilized most frequently as separate equipment for the efficient production of heat or, if appropriate, heating and cooling. However, it can also be used to increase the heat efficiency of the Quanto series CHP units.

# TEDOM

## Services for you



### Remote Monitoring

Our TEDOM on-line monitoring is available 24 hours a day, 7 days a week. If the CHP unit is connected to the Internet, you can monitor its actual condition to prevent possible failures. Also, a qualified operator is always ready to help in solving any problem or answering questions relating to the actual condition of the CHP unit. If necessary, we send our service crew to the site, which are informed ahead of time about the possible problem and equipped with the necessary spare parts. By doing so, online monitoring facilitates mutual communication, reducing downtime, thus saving valuable time and the money of the customers.



### Cogeneration Without Any Investments

A series of power engineering projects based on the cogeneration technology were created without the need for the owner to buy directly or operate the CHP unit. We are ready to offer the design, delivery, installation, funding and operation of the CHP units directly to the customer's site. This way, costs are only reduced and we take care of everything else.



### Training Centre

We share our many years of experience in CHP unit operation and service. We provide training sessions for our business and service partners, CHP unit operators or for collaboration projection and implementation firms.

The training is provided by our most experienced employees. Most of the training sessions take place in the production facility of TEDOM, and some of them directly at the customer site.

# TEDOM

## In numbers

# 500

employees  
in TEDOM a.s.

# 3700

CHP units  
sold

# 940

megawatts  
of installed  
electrical output

# 900

employees in  
the TEDOM Group

# 7800

CHP units sold  
within the  
TEDOM Group

# 1800

megawatts of  
installed electrical  
output for the  
TEDOM Group

# 25

years in the  
cogeneration  
market

# 42

export  
countries

# 24/7

remote  
monitoring



# TEDOM **COGENERATION**

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