



Industrial combustion and  
high-temperature process heating technology

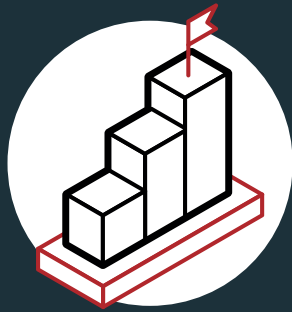
Complete system solutions from one source

# Decentralized heat generation | power generation

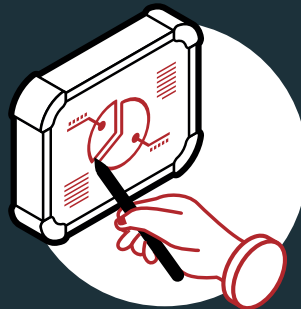
## Biomass & residual waste incineration | exhaust air / gas purification

Since the day we were founded more than 25 years ago, we at Classen Apparatebau Wiesloch GmbH ("CAW") have built a highly respected and valued name worldwide for exclusively high-quality and individually customized systems in high-temperature process heating technology.

We are THE specialists for the engineering and design, construction, and commissioning of complete industrial plants for heat generation, heat storage and heat distribution in the temperature range up to well over 400 °C.



> 25 Years  
of experience



> 500 Projects  
implemented



> 40 Countries  
worldwide



> 10 Partners  
internationally



# Off-the-shelf systems? We don't have them!

CAW takes on demanding engineering projects for you and challenges that others do not dare to take on. Our strength are integrated system solutions for the following applications:

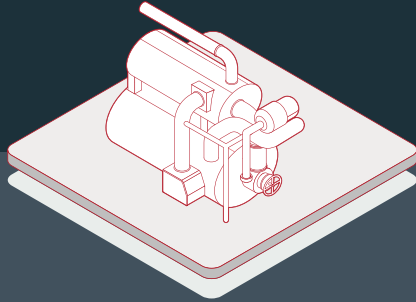
- High temperature process heating
- Incineration of waste streams
- Incineration of agricultural waste and biomasses
- Thermal oxidizers for exhaust air / gas purification and waste utilization
- Decentralized power generation and co-generation using ORC technology
- Hot gas generation
- Steam and hot water generation
- Waste heat recovery and efficiency optimization
- Heat storage and distribution

... and many more - come and talk to us!

CAW supplies you reliably with both, process heat and power – worldwide. We work worldwide in permanent partnerships exclusively with market-leading and well-known companies.



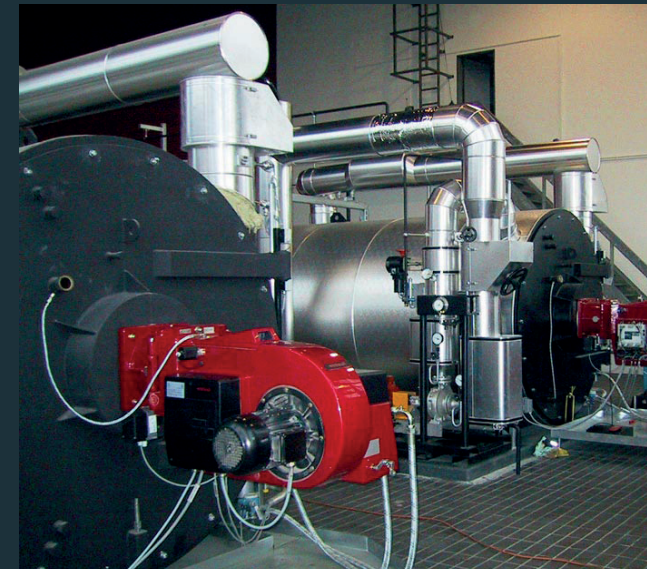




## The heart of every system

Our proven reliable and robust KONTAKTOMAT® thermal oil heaters – both, in single-pass design with separate radiant and convection heating surfaces as well as in three-pass design - are the heart of every CAW high temperature process heating system.

Fired directly with all liquid and gaseous fossil fuels, with numerous special fuels and production residues, but also as waste heat recovery systems, we build these in horizontal and vertical up- and down-fired design.





# High temperature process heating

## The KONTAKTOMAT® thermal oil heater

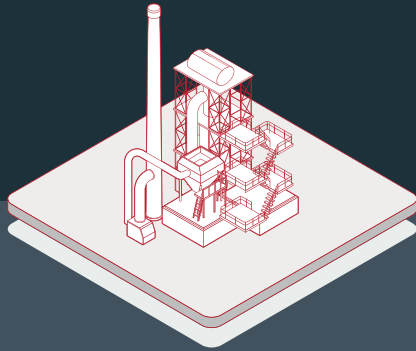
In addition to parameters such as combustion chamber and heating surface loads ( $\text{NO}_x$  formation, film temperature) as well as economic pressure losses (power consumption of fans and pumps), the heater design focuses essentially on efficiency and thus on the saving of primary energy. In combination with our combustion air pre-heaters and other downstream heating surfaces, we can achieve efficiencies of up to 95 % and beyond.

In a single unit, we cover a capacity range from 100 up to 25,000 kW in the temperature range of up to 550 °C. All technical heat transfer media are used - in addition to mineral and synthetic thermal oils, also warm and hot water as well as molten salts. Additional heat exchangers can also be used to supply heat consumers with secondary heating media such as steam, water or hot gas if required.

Depending on the country of destination as well as customer requirements, our heaters are designed, manufactured and approved in accordance with the applicable guidelines and regulations: PED 2014/68/EU, ASME „U-Stamp / Section VIII Division 1“ and „S-Stamp / Section I“, ML for the People's Republic of China, etc.

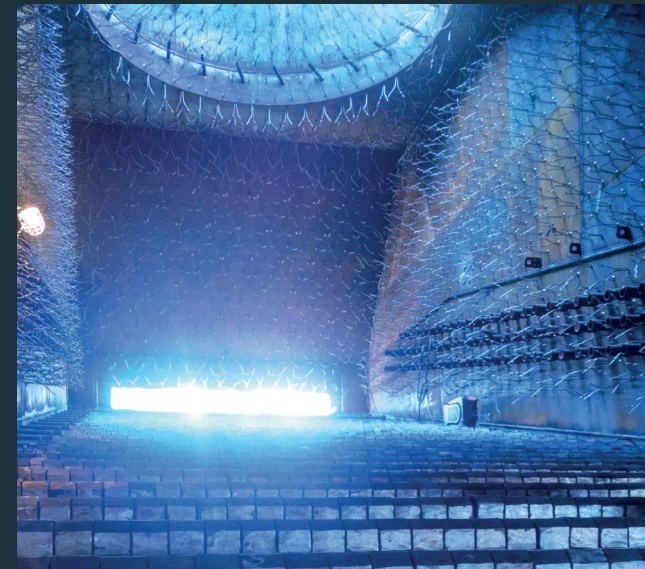






## Long life cycles, efficient safety and low emissions

With our solely air-cooled reciprocating firing grates in both, inclined and plane designs, we burn production waste and all types of biomasses. These are mostly wood waste from industrial production processes, but also residues from agriculture and forestry.





# Incineration of production waste

## Ecological use of waste streams

Strongly fluctuating calorific values, high water and ash contents, a wide range of lump sizes and sometimes low ash softening temperatures place special demands on the design of the firing grates, the design of the combustion chambers, the fuel dosing systems and the combustion control, with simultaneous requirement for complete burnout and minimum emissions.

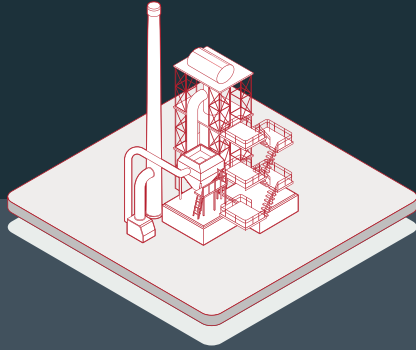
In the capacity range from 4,000 to 60,000 kW in a combustion chamber, we simultaneously generate process heat by means of thermal oil, steam, warm / hot water, and hot gas.

Our KONTAKTOMAT® thermal oil heaters and waste heat recovery systems are equipped with highly efficient cleaning systems for long, uninterrupted operating cycles and uptimes. Continuous automatic ash removal from the combustion chamber is also a matter of course. Our firing and heating systems have demonstrated availabilities of > 8,200 operating hours per year in the harsh everyday operational environment without being shut down for cleaning purposes. We consistently apply state-of-the-art automation and safety concepts as well as emission reduction measures.

For residues that are not suitable for incineration on our reciprocating firing grates, we optionally combine both, rotary kilns, and fluidized bed furnaces with our waste heat recovery systems.







## Power and heat from organic waste and biomasses

With our solely air-cooled reciprocating firing grates in both, inclined and plane designs we ensure both, environmentally friendly and economical thermal utilization of any type of biomass - for heat and power generation.





# Incineration of agricultural waste and biomasses

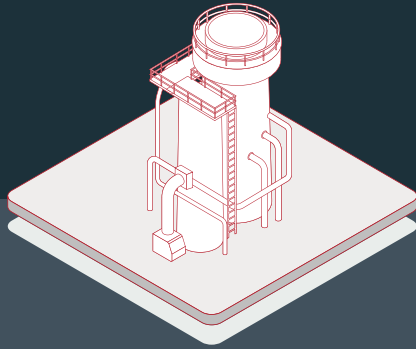
## Energy-efficient use of organic waste

Depending on national laws and historical customs, much waste from classic and mostly intensive agriculture and forestry that maximizes for yield are still simply burned openly, left to rot, or at best plowed under. In addition to fire hazards, the release of pollutants from uncontrolled combustion and the generation of odor emissions, the often-considerable energy content of this waste remains unused.

Typical residues that are suitable for incineration are, for example, cereal hulls and rice husks, fruit kernels, fruit pomace and empty fruit bunches, but also waste from landscape and forest maintenance, such as branches and green cuttings. The incineration of these wastes poses special challenges to the furnace: High levels of volatile contents and minerals, high nitrogen contents and physical moisture contents along with frequently low-melting ashes.

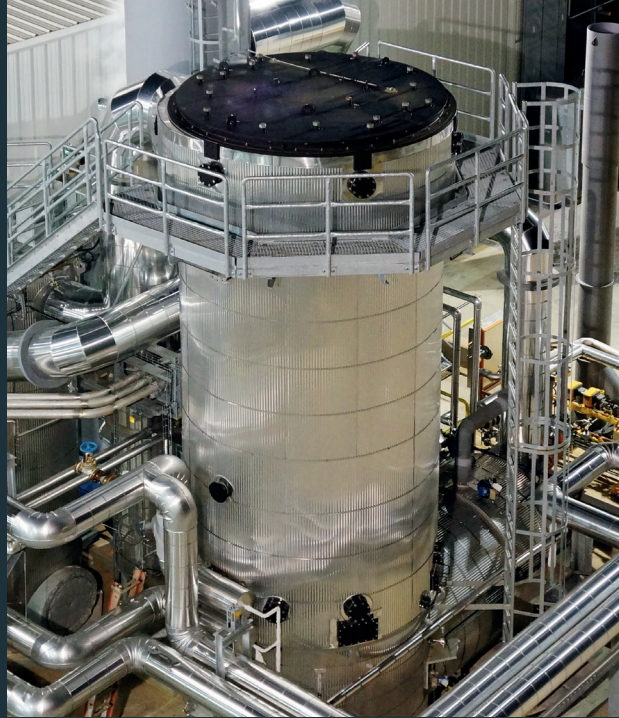
In combination with appropriately designed combustion chambers and waste heat recovery systems, our thermally low loaded, air-cooled reciprocating firing grates enable the environmentally friendly and economical thermal utilization of a wide range of agricultural waste for both heat and power generation.





## The holistic solution from CAW

In addition to our systems for the thermal utilization of solid production waste, we also offer highly efficient systems for the oxidative cleaning of gaseous and liquid waste streams.





# Thermal exhaust air / exhaust gas purification and waste utilization

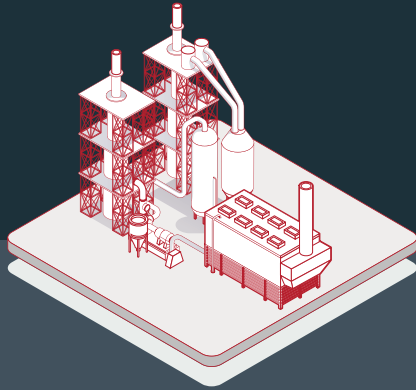
Our systems are used wherever volatile organic compounds (VOC), solvents, BTEX and other pollutants and odors need to be reliably eliminated from production processes.

Systems for the thermal evaporation of organically polluted wastewater as well as „pure“ incineration plants without waste heat utilization are sometimes required. The co-incineration of, for example, black liquors, organic liquid residues, solvent residues as well as lean gases and gas mixtures from the ventilation of storage tanks or from drying and heat treatment plants is just as self-evident as consistent compliance with the current emission limit values and those expected in the future.

Innovative system solutions with individual combustion chamber designs, post-combustion chambers with defined residence times for complete burnout of organic contents, staged combustion, SCR and SNCR de-NOX devices, purely electric flameless „FLOX“ combustion, heat recovery with all technical heat transfer media, maximum operating and operator safety - we offer holistic and operationally reliable solutions for all applications up to 50,000 Nm<sup>3</sup>/h.







## Reliable complete solutions from a single source

Decentralized power generation and combined heat and power using ORC turbogenerators in combination with our state-of-the-art low-emission combustion and waste heat recovery systems.





# Decentralized power generation and combined heat and power generation using ORC turbogenerators

As proven experts for modern and low emission reciprocating firing grate furnaces as well as highly efficient thermal oil heater systems, it is obvious that we also use our reliable and robust systems in well proven and heavy industrial design for decentralized power generation.

Also in this field of application, we consistently rely on the best possible quality and operational reliability – thus, we only use ORC modules from the market-leading suppliers that have been tried and tested over many years.

In the power range from 500 to 15,000 kW<sub>el</sub>, we offer complete solutions from a single source.

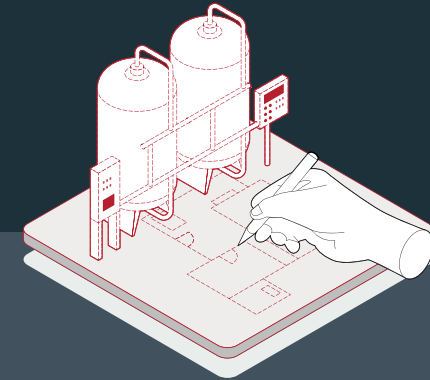


# Engineering & planning services

**We accompany you right from the start**

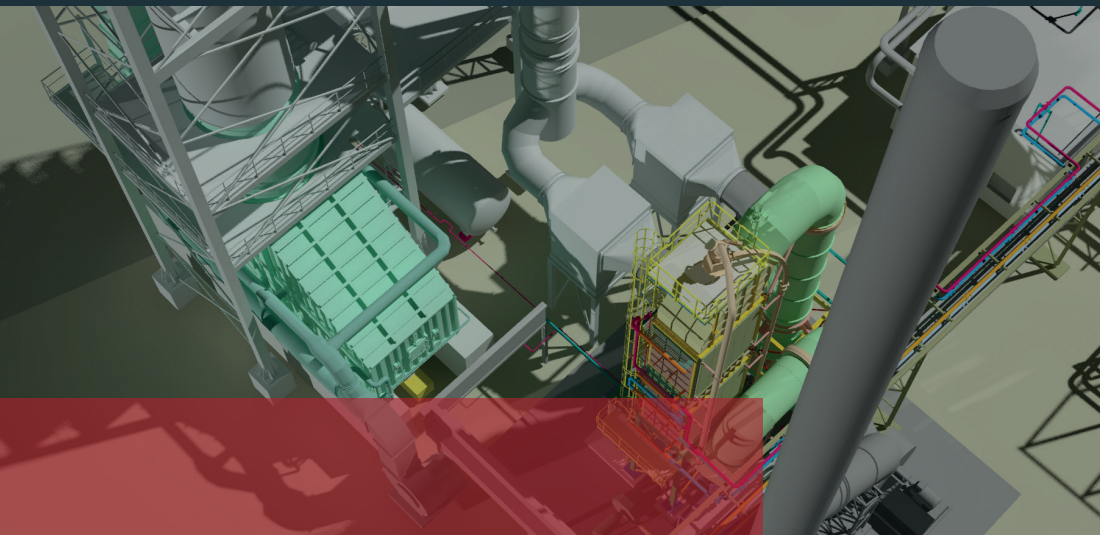
Hardly any plant is built on a greenfield site". Almost always, the task is to renew existing plants or to integrate new equipment into existing infrastructures and grown factory complexes. Together with our clients, our experienced engineers develop customized plant concepts and implement them on both, time, and budget. In doing so, we take all operational, economical, and ecological aspects into account and provide comprehensive advice as early as the development of the requirements profiling stage.

We provide support from the initial ideas, feasibility studies, drafts and economic studies through the complete process and systems engineering to the handover of the turnkey installed complete system. At the same time, we provide support in obtaining permits for the construction and operation of the plants.



## From the first idea to the executed plant

In addition to high-quality system components, reliable and sustainable system concepts require, above all, comprehensive and careful engineering.





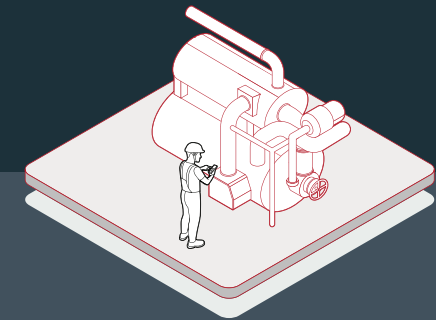
# Assembly supervision by experienced specialists



Regardless of the size or capacity, only a perfectly planned, designed, manufactured and subsequently professionally installed system can meet the rightly high expectations of our clients regarding sustainable reliability and availability. Our qualified field engineers with many years of international experience are therefore possibly on site right from the start.

In doing so, they already document and coordinate the receipt of goods as well as the proper and assembly-compliant on-site storage of the systems components and pieces of equipment.

They routinely and systematically manage the qualified assembly of the entire system with all necessary milestone checks. The assembly is usually carried out on behalf of our clients by specialized third-party contractors.



## Puzzle challenges for true professionals

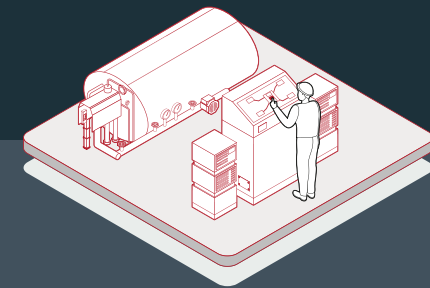
In addition to functionally tested assemblies and pre-assembled large components, our equipment often consists of numerous individual parts and units. Let our experts help you set up your new system on schedule and avoid possible consequential damage due to incorrect assembly installation!

# Commissioning

Upon request, you can get turnkey installations

After completion of the installation, all final tests and documentation, the initial commissioning of your new system takes place. This is followed by comprehensive protocols for loop checks, leakage, pressure and functional tests, divided into the cold and hot commissioning phases. Depending on the fuel(s), firing and thermal capacities, type, design, and complexity of the system, this can take from a few days to several weeks - especially in the case of large-volume combustion chambers with multi-layer refractory linings, that have to be heated up to their final operating temperatures under defined drying times with specified heating curves and breakpoints.

Only when these demanding activities have been completed, the system will be officially handed over to our clients and our work on site is done for the time being.



## Reliability from the very beginning

Avoid sensitive setbacks right now on the home stretch. Our project and process engineers know all the tricks of the trade from many completed projects and will professionally put your system into operation.



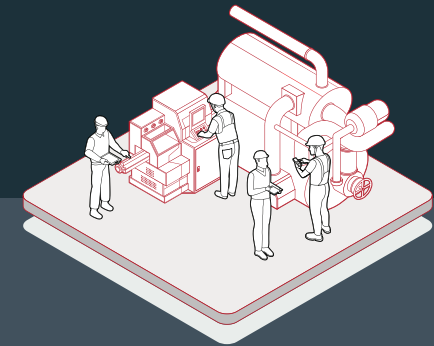


## Training & staffing services

### First-hand know-how for your employees and operators

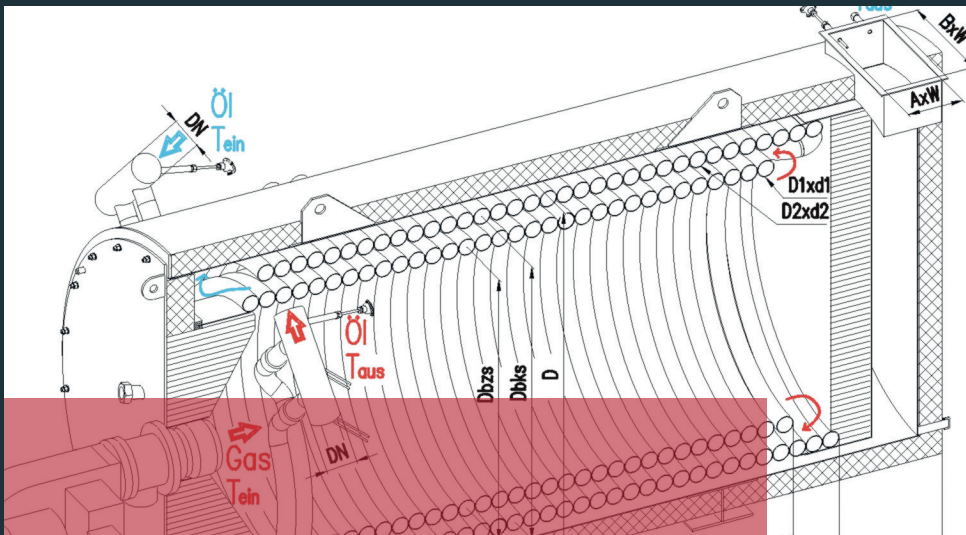
The operators and maintenance personnel designated for industrial operation of the system receive intensive training on operation, safety devices, maintenance, and servicing of the equipment. We also prepare the comprehensive and customized training documentation, of course, in the respective national language. At the end of the training seminars, written success checks are also carried out at the clients' request, on the basis of which the learning success can be documented.

In addition to the initial trainings, we also conduct refresher training courses and support you from the first day of systems operation both, in the planning of preventive maintenance and in the procurement and stocking of spare and wear parts.



## Knowledge transfers from the professionals

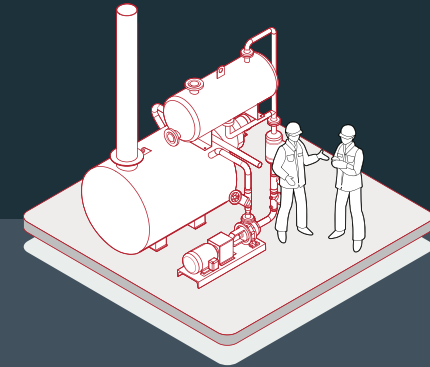
Any industrial plant is only as good as the personnel who operate it. For us, it is therefore part of our range of services to complete the efficiency of our systems through highly qualified training and familiarization of your staff and operators.



## Useful system supplements — which can be retrofitted at any time

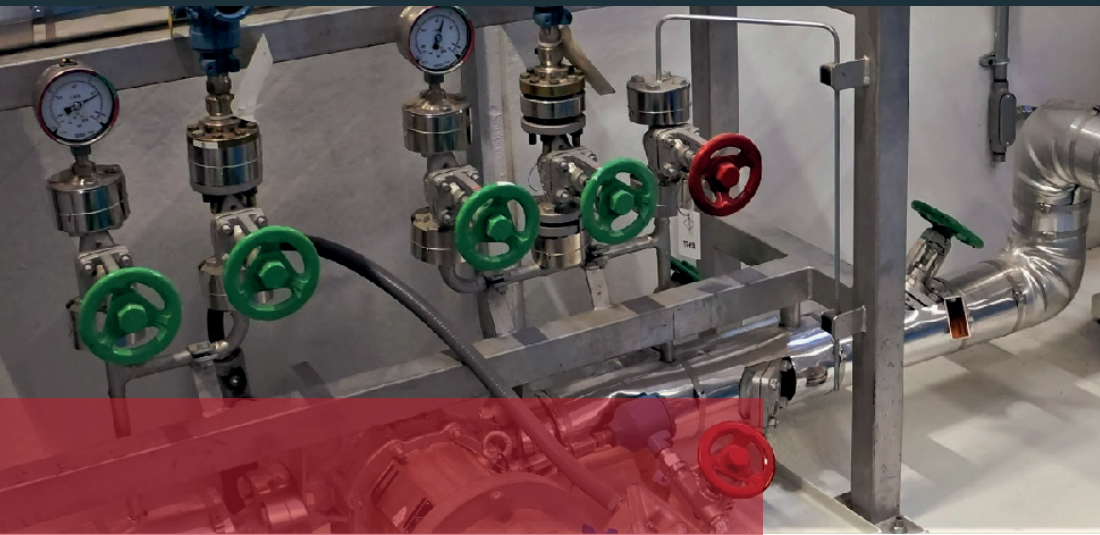
It is not uncommon for operating and production processes, heat consumers and their heat requirements, load patterns and / or fuel and residues to change over the course of many years. Your CAW system is fit for the future and can do more.

Let our engineers advise you comprehensively and competently and choose the right ones from the custom-fit system supplements we have developed in-house.



## Something is still possible

Have you been operating your CAW system for some time and suddenly find yourself up against new operational requirements or official regulations? From the outset, we make already good things even better for you.





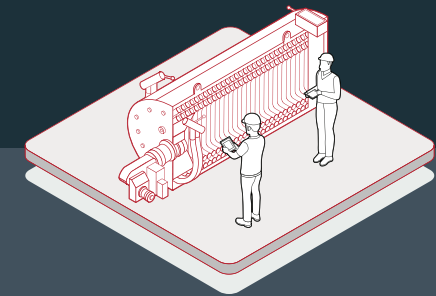
# After-sales service and spare parts

## Long live your heating system!



We make no compromises when it comes to quality and reliability - the first thermal oil heater we manufactured in 1998 is still in operation today at the same location. Nevertheless, the wear and tear of thermally and mechanically highly stressed components is unavoidable. We offer spare parts for all systems and equipment supplied by us throughout their entire service life. We also manufacture necessary components for replacement, such as e.g., complete heating surface systems, based on our drawings and bills of materials. Following your technical documentation and the respective tag and item numbers, we can still identify every component that we have supplied, even after many years.

You should not take any risks when purchasing spare parts. Buy from the manufacturer of your system! By the way: You can also obtain spare parts for your system from us if it is exceptionally not "Made by CAW".



## We do not forget you!

Your heater system has been doing its job perfectly for many years? Congratulations, the longevity was what we planned. To keep it that way, we provide you with all spare and wear parts for a long life of your plant.



# Classen Apparatebau Wiesloch GmbH ("CAW")

— the true Wiesloch heater specialists



Classen Apparatebau Wiesloch GmbH  
Ludwig-Wagner-Str. 9/1  
69168 Wiesloch, Germany

Phone: +49(0)6222 5726-0  
Fax: +49(0)6222 5726-10  
e-Mail: [sales@caw-wiesloch.de](mailto:sales@caw-wiesloch.de)



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