



# Offshore Heating Solutions





## **Innovating for a century and a half. Offshore for more than a generation. Dedicated for decades to come.**

For over 165 proud years, our family-run manufacturing plant has been churning out customized, high-quality heating and boiler solutions to global markets. Always with a painstaking eye for detail, always with the customer in mind.

Since we first entered the booming marine and offshore markets in the 1970s, our engineering qualities and superior products have continued to gain ground, and we're now proud to be Norway's number one supplier of steam and heat solutions.

Parat Halvorsen has long since gone global. Our products are put to the test every day, on every continent, and our excellence is long proven.

Trust us to keep it boiling.

# The heat is on.

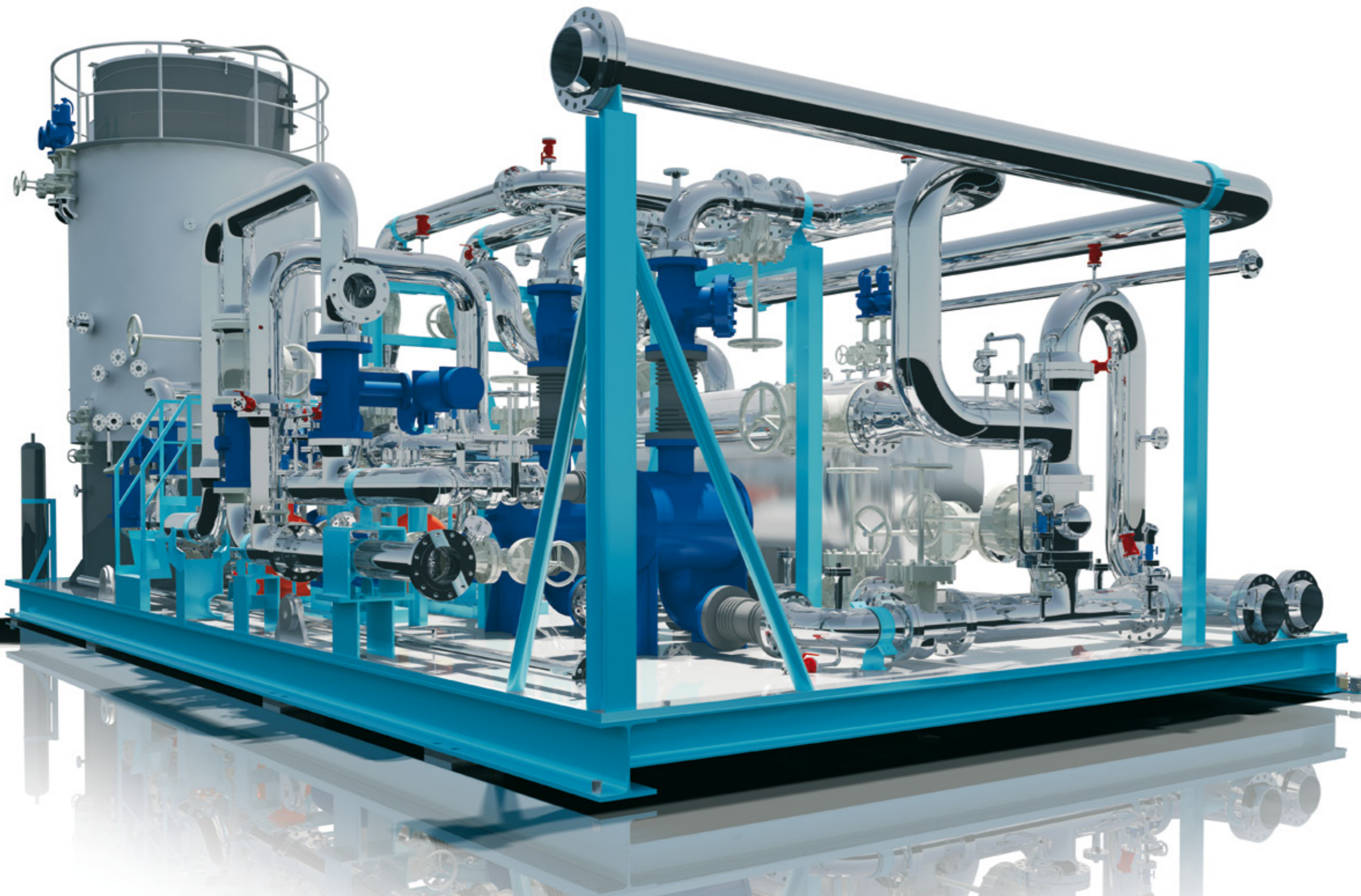


PARAT Halvorsen is right where we should be. We're staffed by top-tier skilled people, we're perfectly located for exports, we're innovation-driven and we're deeply dedicated to what we do:

Offer the most efficient, cutting-edge and high quality steam and heat solutions in the industry.

The marine- and offshore industries are quality-conscious like never before. We're proud to be a preferred partner for custom turnkey solutions for a large number of domestic and international players, and always strive for perfection.

When the heat is on, we stay in control.



PARAT Halvorsen has an extensive range of products for most heating requirements including waste heat recovery from diesel and gas turbines. For special requirements we can design electrical heating systems fully integrated in the power generation and heat recovery process. We can supply anything from small potable hot water modules to extensive and complex low and high pressure steam generation systems. Always fully optimized, customized and well documented.

#### **PLUG AND PLAY.**

PARAT Halvorsen manages the total project from initial study through detailed engineering, procurement and fabrication to installation, hook-up, commissioning and service. Our main philosophy is to provide complete turnkey systems that enable quick and efficient installation and start-up along with safe and reliable operation through the entire life cycle of the vessel/rig.

#### **GLOBAL SERVICE.**

PARAT has established a global presence for repairs, replacements, conversions, upgrades, refurbishments and modifications.

We can perform full service and overhaul of boiler systems and do detailed evaluations and operational analysis to ensure each system is operating at optimal performance.

We love a good challenge. And we always play to win.

# Heating medium

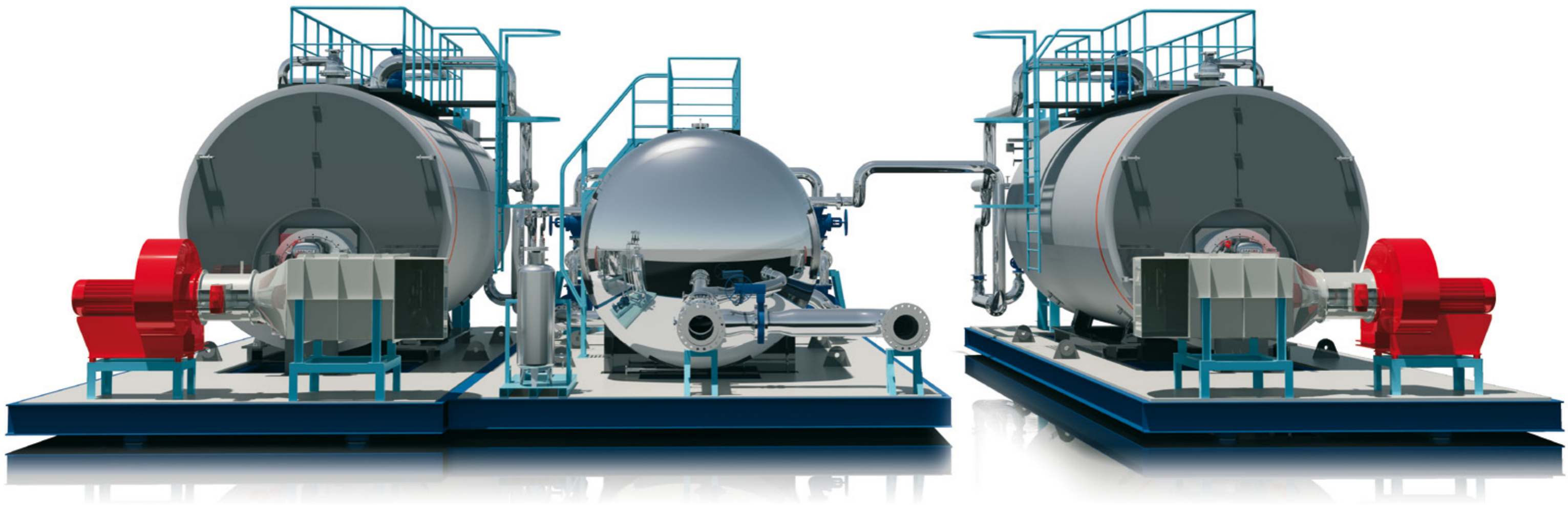
Topside processing facilities generally require a significant supply of energy in the form of heat. The most common medium for heat distribution is hot water which is easy to produce, transport and involves a relatively low safety risk compared to thermal oil or high pressure steam.

PARAT has extensive experience designing and supplying heating medium modules and packages for offshore installation and integration. We can provide any system based on any kind of fuel or heat source fully designed for safe and reliable operation. Give us your process criteria and we will give you the best possible solution to meet all your requirements.

We naturally focus on maximizing sustainability and work hard to utilize recoverable heat in all levels of the heating medium loop. Fully integrated waste heat recovery systems and exhaust gas economizers are an important part of any design.

We provide:

- **Steam based heating medium.**
- **Thermal oil heating medium systems up to 380°C.**
- **Hot water based heating medium systems up to 30 barg / 200°C.**
- **Complete EPCIC delivery of all systems mentioned above.**



# Emission free

## Conversion from POWER to HEAT

Sustainable power generation in upstream oil and gas exploration and production is coming more and more into focus as the reservoirs are located in increasingly deep waters and the hydrocarbon compounds are increasingly complex and heavy and therefore require more energy to transport and process.

In cases where it is logistically feasible, a sustainable way

to reduce emissions from offshore power production is to replace the power plant with power supply from an external source. This can be land based hydroelectric, wind, biomass or any other renewable energy source or possibly from offshore wind-farms or wave-power plants. In such cases the heating for process, cleaning, HVAC and other consumers will have to be generated on board using an electrical heater.

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- **Save up to 90% deck space**
  - **Reduce operating weight by up to 75%**
  - **Reduce investment and installation costs by as much as 50-70%**
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### EXAMPLE CASE:

FPSO located on the Norwegian Continental Shelf. The FPSO will be partly supplied with power from shore through a subsea cable. The calculated maximum heating requirement for process and tank-heating is 15MW. The medium is hot water at 130 degrees Celsius. The heating medium shall be generated using electrical power. To generate this hot water there are two different solutions; Low voltage heaters or a high voltage boiler.

### SOLUTION 1: LOW VOLTAGE HEATERS

To generate up to 15MW of heating medium based on low voltage immersion heater technology you will, of purely practical reasons, need to separate the total heating demand into separate smaller units. In this case 5x3MW is the most efficient. This gives a good redundancy and allows utilization of heaters with a relatively small footprint.

With low voltage heaters the overall installation will consist of the following main components that take up space on the floater.

- High to low voltage converters (5x3200kVA).
- Low voltage contactor panels or thyristor panels.
- Low voltage cables.
- Low voltage heaters (5x3000kW).
- Lifting arrangements for service and maintenance.

There are different solutions for how to fabricate the heater units. One large immersion heater installed in a simple shell will have the smallest possible footprint. For better service access and more water volume a traditional shell and multiple immersion heater should be chosen. For this case we will look at a traditional type with multiple smaller immersion heaters installed.

The total footprint of the three main installations, converter, panel and heater will be approximately 240m<sup>2</sup> excluding the space for piping, cabling and installations for access and maintenance. Total dry installation weight of main components would be approximately 60 tons (Operating weight 100 tons).

### SOLUTION 2: HIGH VOLTAGE BOILER

Electrode boilers utilize the conductive and resistive properties of water to carry electric current and generate heat. The electric current flows between the energized electrode and the neutral point. Since water has electrical resistance, this current flow generates heat directly in the water itself. Heat output is related to the water conductivity and immersed electrode surface. This means that the boiler can be made very compact in relation to the output.

With a high voltage boiler you can manage with a single unit to cover the entire heat load of 15MW. If there is a redundancy requirement 2x100% units can be installed. One complete 15MW high voltage boiler unit including internal circulation pump and process heat exchanger will require a deck space of 21m<sup>2</sup> and have an operating weight of 25 tons. No additional power converters, effect panels or low voltage cabling is required. High voltage boilers require very little maintenance and have only a few parts that need to be replaced at operating intervals.

### CONCLUSION:

In specific cases where significant amounts of the heating load is to be generated from electrical power the comparison shows that by utilizing high voltage boilers you will save up to 90% deck space, reduce the operating weight by up to 75%, significantly reduce maintenance time and costs and last but not least reduce investment and installation costs by as much as 50-70%.



# Hot water

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Reliable and safe potable hot water supply to accommodation, galley and other fresh water consumers is of critical importance to any offshore fixed or floating installation.

PARAT Halvorsen has the necessary experience to provide complete hot water modules for small

to large applications. We design the complete system including the calorifier, piping, structural and control. We can utilize any available heat source from electrical immersion heaters to steam or hot water coils and ensure a system design that eliminates any risk of contamination and bacterial growth.



# Product range



At PARAT Halvorsen, we've mastered the art of boiler engineering for more than a century. Our success has not only come from hard work and dedication, but also our ability to refocus and adjust our engineering expertise to every customer's need. Our products are well proven on both land and sea and cover most requirements for steam or heat applications in the small to medium/large range.

## Fuel fired boilers



PARAT MTW  
**Top-Fired Water Tube Boiler**

Capacity (t/h):  
**7.0 - 45**

Medium:  
**STEAM**

Pressure:  
**7 - 20 barg**

High capacity vertical water tube steam boiler with pin-tube section to reduce weight and cost.

Large special purpose cleaning hatches for easy maintenance.

Burner for HFO, MDO, MGO, LNG or Multifuel. Top-fired.



PARAT MPW  
**Vertical Pin-Tube Boiler**

Capacity (t/h):  
**0.4 - 6.5**

Medium:  
**STEAM**

Pressure:  
**7 - 12 barg**

Vertical steam boiler utilizing pin-tubes for reduced size and weight.

Pressure jet or rotary cup burner for HFO, MDO, MGO, LNG or Multifuel. Side-fired.



PARAT MSH  
**Horizontal Smoke Tube Boiler**

Capacity (t/h):  
**1.0 - 48**

Capacity (MW):  
**0.8 - 32**

Medium:  
**STEAM  
HOT WATER**

Pressure:  
**7 - 12 barg**

Horizontal smoke tube boiler for steam or hot water. Horizontal arrangement enables large steam volume and more robust operation parameters.

Can be supplied with dual furnace and capacity up to 48t/h.

Pressure jet, rotary cup or steam atomizing burner for HFO, MDO, MGO, LNG or Multifuel. Side-fired.



PARAT MVW  
**Water Tube Boiler**

Capacity (t/h):  
**8.0 - 30**

Medium:  
**STEAM**

Pressure:  
**7 - 20 barg**

Bare tube type, two drum water tube steam boiler.

Pressure jet, rotary cup or steam atomizing burner for HFO, MDO, MGO, LNG or Multifuel. Side-fired.



PARAT MVS  
**Smoke Tube Boiler**

Capacity (t/h):  
**0.2 - 6.5**

Capacity (MW):  
**0.1 - 4.3**

Medium:  
**STEAM  
HOT WATER**

Pressure:  
**7 - 12 barg**

Vertical bare tube type, steam or hot water boiler.

Pressure jet or rotary cup burner for HFO, MDO, MGO, LNG or Multifuel. Side-fired.

## Electrical boilers Heater Exhaust gas boilers



PARAT MEH  
**High Voltage Electrode Boiler**

Capacity (t/h):  
**4.5 - 75**

Capacity (MW):  
**3.0 - 50**

Medium:  
**STEAM  
HOT WATER**

Pressure:  
**7 - 25 barg**

Electrode boilers utilize the conductive and resistive properties of water to generate heat.

MEH is optimized for marine application and can be used for load balancing of large generators.

Horizontal version only.



PARAT MEL-C  
**Low Voltage Boiler**

Capacity (t/h):  
**0.2 - 15**

Capacity (MW):  
**0.1 - 10**

Medium:  
**STEAM  
HOT WATER**

Pressure:  
**7 - 12 barg**

Immersion heater type, electrical boiler for steam or hot water generation.

Can be supplied as combined hot water and steam unit and is also available in DC-version. (Direct Current)

Horizontal or vertical version.



PARAT ECS  
**Electrical Circulation Steam Boiler**

Capacity (t/h):  
**0.2 - 0.8**

Capacity (MW):  
**0.1 - 0.5**

Medium:  
**STEAM  
HOT WATER**

Pressure:  
**7 - 20 barg**

Compact, light weight electrical circulation heater designed mainly for retrofitting to existing aux. steam boilers.

Will allow operator to run aux. boiler on electrical power without having to run the burner.

Fully automatic with PLC control as option.

Standard size range 50 - 400kW. Other sizes upon request.



PARAT MEW  
**Water Tube Waste Heat Recovery**

Capacity (t/h):  
**0.2 - 18**

Capacity (MW):  
**0.1 - 12**

Medium:  
**STEAM  
HOT WATER**

Pressure:  
**7 - 20 barg**

Forced circulation, water tube type waste heat recovery unit.

Bare tube or finned tube dependent on operating characteristics.



PARAT MES  
**Smoke Tube WHRU**

Capacity (t/h):  
**0.2 - 15**

Capacity (MW):  
**0.1 - 10**

Medium:  
**STEAM  
HOT WATER**

Pressure:  
**7 - 20 barg**

Bare tube type, waste heat recovery unit.

Can be supplied with internal steam drum. Natural circulation in steam mode.

Horizontal or vertical version.





**PARAT**

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