

Elpanne technik



LOCAL TTS P-34.34-3

THE WORLDS LEADING SUPPLIER OF HIGH VOLTAGE ELECTRICAL BOILERS

RESTORE POINT FIELD FLOW CONTROL P-34.34-3 FIX

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HOT WATER BOILER

RESTORE POINT FIELD FLOW CONTROL P-34.34-3 FIX

High Voltage Hot Water boiler

Power: 4 - 60 MW

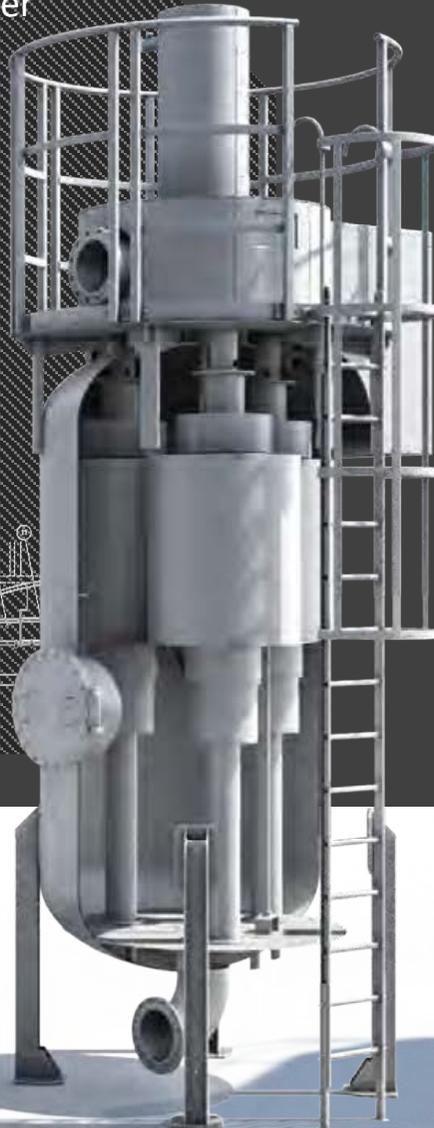
Voltage: 6 - 14 kV

Low voltage Hot Water

Element boilers

Power: 100 kW – 5 MW

Voltage: 400 - 690 V

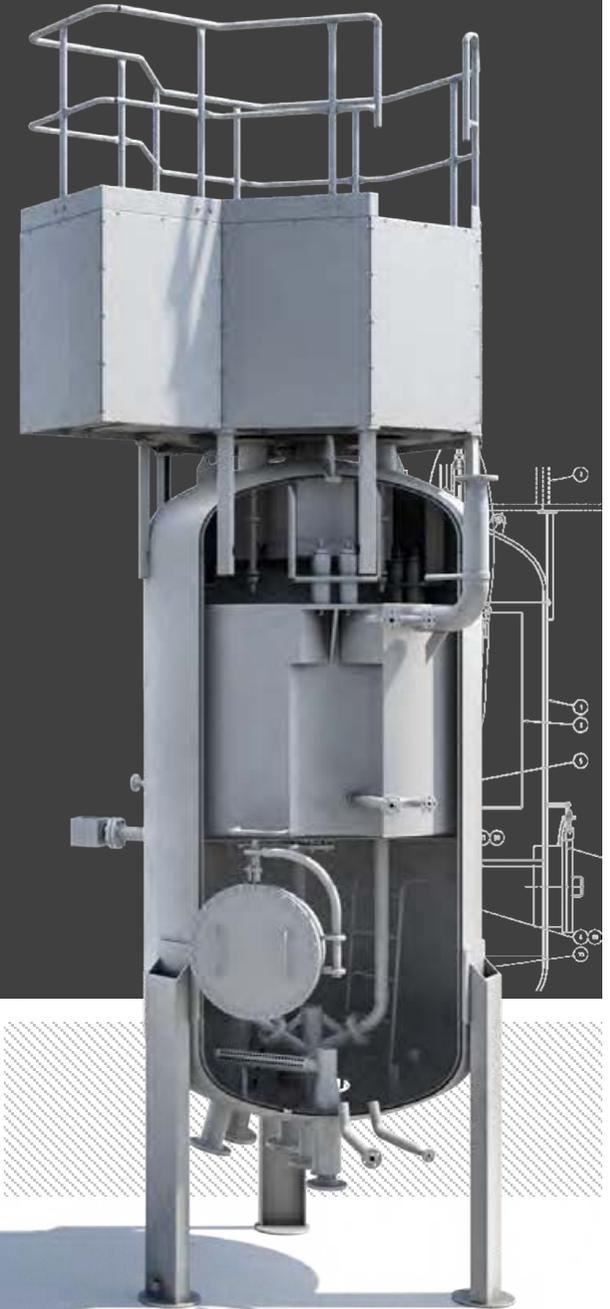


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STEAM BOILER

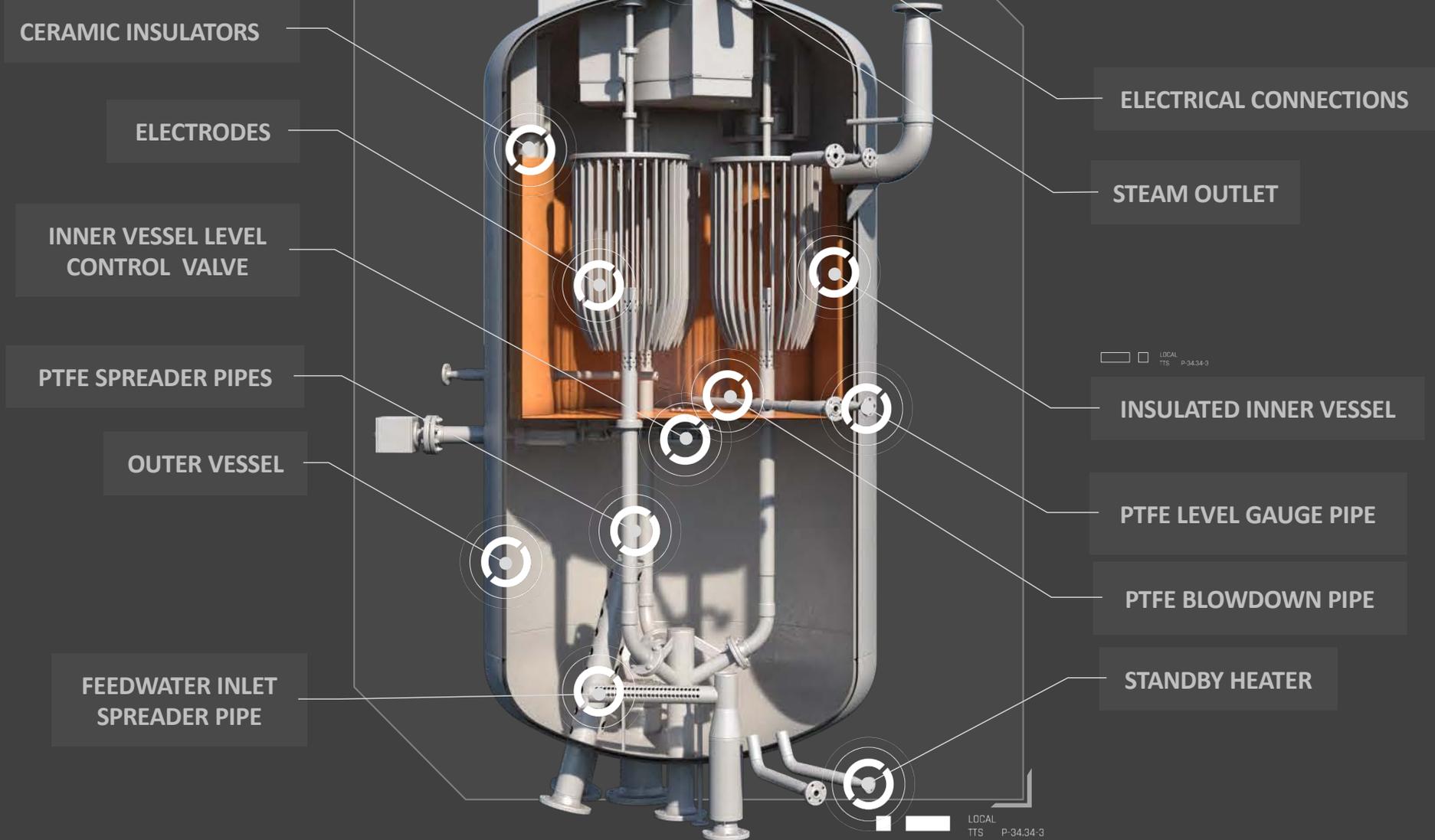
High voltage
Electrode Steam
Power: 4 - 60 MW
Voltage: 6 - 14 kV

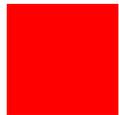
Low voltage Steam
Element boilers
Power: 100 kW – 5 MW
Voltage: 400 - 690 V



ELPANNETEKNIK HIGH VOLTAGE ELECTRODE STEAM BOILER

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MAJOR COMPONENTS

PRESSURE VESSEL AND INNER VESSEL

- The Boiler Pressure Vessel (outer vessel) is a pressure rated and ASME or PED registered pressure vessel.
- The Inner Vessel, which constitutes the neutral point, is electrically insulated from the outer vessel and ground. This design limits the current to ground, should an unbalance between phases occur.

ELECTRODES AND CERAMIC INSULATORS

- The electrodes and water circulation system are designed and optimized to minimize wear and eliminate arcing. The expected electrode lifetime is more than 10 years. When a change must be done, it's only the electrode rods which need to be replaced. The electrode plate and bolts will last much longer.
- The one-piece ceramic insulators are specially designed to resist electrical and water leakage and are expected to last more than 3-5 years.

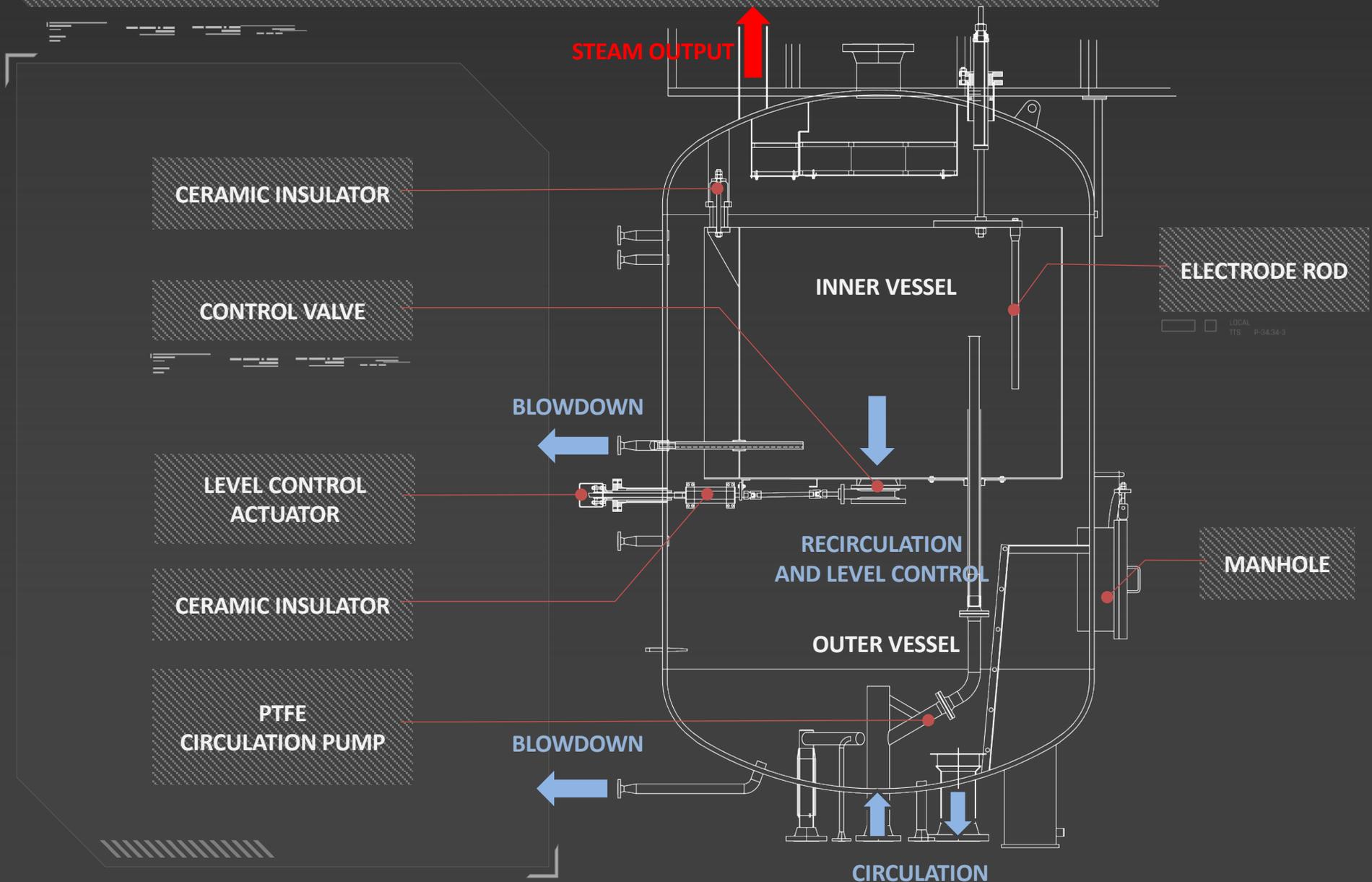
CIRCULATION PUMP AND STANDBY HEATER

- The circulation pump transfers water from the outer vessel to the inner vessel and the level in the inner vessel determines the power output of the boiler.
- There are two low voltage immersion heaters in the outer vessel to maintain steam pressure and water temperature of the boiler during standby for fast start-up and for avoiding material exhaustion when there are many on/off maneuvers, e.g. at so called "off-peak" operation.

AUTOMATIC BLOWDOWN AND CHEMICAL DOSING

- The automatic blowdown system limits the conductivity of the boiler water. The blowdown losses can be recovered by using a Blowdown Separator with built-in Heat Recovery System.
- The dosing equipment maintains proper chemical content by adjusting the conductivity and pH.

Water/steam flow diagram



HIGH VOLTAGE STEAM SYSTEM

FEEDWATER TANK
AND DEAERATOR

ELECTRIC BOILER

FEEDWATER PUMPS

CIRCULATION PUMPS

DOSING STATION

FLASH TANK



PRINCIPLES OF OPERATIONS

FEEDWATER SUPPLY

Demineralized and deaerated water is pumped from the feedwater tank into the outer vessel to maintain constant overall water volume.

WATER CIRCULATION

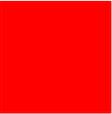
The circulation pump transfers the water from the outer vessel to the inner vessel. For redundancy two pumps are installed. If the pump in operation fails, the other pump starts automatically. Water level in the electrically insulated inner vessel is regulated by the amount of water pumped in and the inner vessel control valve that allows water to drain out into the outer vessel.

POWER AND STEAM OUTPUT

Power and steam output is determined by the water level in the inner vessel in contact with the electrodes and the conductivity of the water. Power can be regulated from 2% to 100%.

BLOWDOWN

Automatic surface blowdown maintains the appropriate conductivity in the boiler water, and we expect efficiency loss with a blowdown recovery device to be less than 0.1%.



ELPANNETEKNIK IMMERSION-TYPE ELECTRODE STEAM BOILERS

HIGH ELECTRICAL STABILITY

- Elpanneteknik's Electrode Steam Boilers have no problems with foaming and arcing, because of the design, the requirement for demineralized make-up water, the strict control of boiler water conductivity and chemical additives.
- Elpanneteknik's Electrode Steam Boilers have an electrically insulated neutral point (the inner vessel), with a high resistance to earth, which limits the current to earth at a short circuit between a phase and neutral point to approximately 5A, therefore allowing our boilers to be connected directly to the common electrical grid - without using a dedicated, directly earthed, transformer.

HIGH STEAM QUALITY AND PURITY

- Elpanneteknik's boilers are designed with steam quality in mind, with a large steam space and water surface (similar to fire-tube boilers) and low steam velocity that minimizes water droplet formation.
- The steam's quality and purity are high enough to be used as gland sealing steam in turbines in Nuclear Power Plants with a requirement for a sodium content of less than 5 ppb.
- Due to our strict control in boiler water quality, we can assure a high steam purity with a low salt content in the steam (which otherwise can cause corrosion, coatings and other problems in connected equipment).

HIGH RELIABILITY

- The only major moving parts in our system are our circulation pumps and we can provide redundancy in the circulation system to maintain a near 100% uptime.
- Immersion-type Electrode Steam Boilers are simple in concept and in operation and do not have complicated nozzle arrangements present as in jet-/spray-type boilers that quickly wears out and require frequent maintenance to function optimally.
- Elpanneteknik's boilers meet the strict reliability requirements as dictated by Europe's largest nuclear power plant operators. 

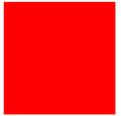
EASE OF MAINTENANCE

Elpanneteknik's boilers have long-life and low-maintenance electrodes and ceramic insulator designs and do not require external cranes to remove and service the boilers.



HIGH EFFICIENCY

- Elpanneteknik's boilers utilize blowdown recovery device to minimize energy loss due to blowdown. The overall efficiency, including blowdown losses, is more than 99.9%.
- Immersion electrode boilers can operate from 2% to 100% power level with the same efficiency of close to 100%. 



IMMERSION ELECTRODE BOILER SAFETY FEATURES

A-TYPE ALARM FUNCTIONS THAT SHUT DOWN THE BOILER DIRECTLY VIA POWER CONNECTION:

- HighHigh pressure (also disables heating elements)
- HighHigh water level in outer vessel
- LowLow water level in outer vessel
- Circulation pumps failure (both pumps)
- Alarms from high voltage switchgear (i.e. protection devices that trips the power breaker)
- HighHigh conductivity
- Emergency Stop 

EXAMPLES OF B-TYPE ALARM FUNCTIONS THAT WARN THE OPERATOR, BUT DON'T SHUT DOWN OPERATION:

- High pressure
- High water level in outer vessel
- Low water level in outer vessel
- Circulation pump failure
- High conductivity
- Signal out of range (for each 4-20mA transmitter signal) 



COMPETITIVE ANALYSES

IMMERSION VS. JET-TYPE

The main difference between Jet type and Immersion type is its use of a high-powered pump to maintain constant water pressure in the nozzle header and control output by covering a higher or lesser number of nozzles by means of a shield that is operated via drawbar and a motor actuator on top of the boiler.

The benefit of the immersion type is that you have faster start-up, more precise control, less risk of arching, thereby less maintenance cost and an inner vessel as a neutral point, increasing safety and reducing investment cost for additional transformer. Due to the benefits of immersion type, including a higher steam quality, it's the preferred solution for nuclear power plants. 

BENEFIT OF ELPANNETEKNIK'S IMMERSION TYPE BOILERS VERSUS COMPETITORS USING SAME TECHNOLOGY

The main difference between Elpanneteknik's immersion type boilers versus its competitors using same type is a built-in demister, improved electrodes, ceramic one-piece electrode insulators with leak-free gaskets and control system.

Elpanneteknik is able to supply immersion type electrode boilers from 10 to 100 bar and electric superheating as an option. Insulated neutral point or directly connected to earth can be chosen. This provide the company the opportunity of presenting an objective analysis optimized for each customer and application. 

ADVANTAGES

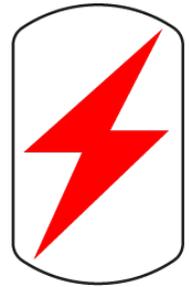
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**Elpanne
teknik**

99,9% EFFICIENCY

NO POLLUTION - ZERO EMISSIONS

NO FUEL HANDLING

LESS INSTALLATION COST

HIGH RELIABILITY

**FAST START-UP AND PRECISE
CONTROL**

LESS MAINTENANCE

UP TO 60 YEARS LIFE TIME

CERTIFICATES

Meeting the highest Quality demands – even within Nuclear and Offshore

