

Customized solution for steam power systems

# SURFACE CONDENSER



Surface condenser is the commonly used term for a water-cooled shell and tube heat exchanger installed on the exhaust steam side from a steam turbine in thermal power stations: coal fired power plants, oil fired power plants, CCGT, concentrating solar power (CSP), district heating, desalination plants, among others. Surface condensers are also used in applications and industries other than in power plants.

When it comes to the performance of a turbine surface condenser in the operational field of a steam turbine cycle, you need utmost reliability and efficiency. Kelvion creates customized package solutions for each particular customer's needs.

Over the last 40 years we have forged long lasting relationships with top quality turbine makers, main EPC contractors, engineering companies and plant end users.

This expertise provides Kelvion with the right knowledge to advise customers of the most suitable application for their cooling problems. We provide engineering, manufacturing and after sales services.

## Our Know-how – Your Benefit

- Long-lasting relation with top quality turbine makers, main EPC contractors, engineering companies, end users and plant owners
- Advanced modern design software tools enable Kelvion surface condensers to meet the most stringent requirements like special tube bundle design for proper steam condensation and non-condensable release
- Dedicated project management in close collaboration with customers in bid, order and after sales stages

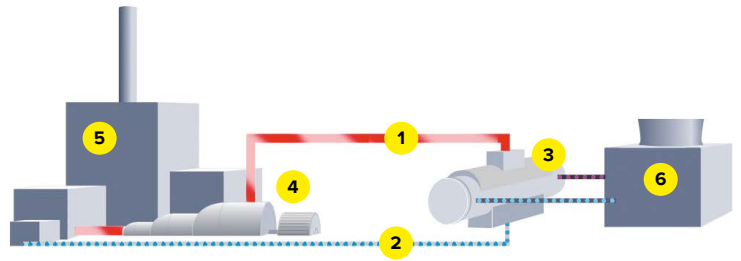
## Major certifiers have given us their trust

- Lloyd's registered
- TÜV
- DNV
- Germanische Lloyd
- Bureau Veritas
- ABS

### Designed for top performance

Main duties of any Kelvion surface condenser, together with vacuum units, are to convert the exhaust steam from its vapour to its liquid state at certain under atmospheric pressure, and also, to release non-condensable gases present in the steam cycle.

For any surface condenser, it is absolutely essential that its main duties must be performed in the most effective way since the lack of surface condenser performance has a strong influence in the overall efficiency of any steam turbine cycle. Hot cooling water leaving the surface condenser can be cooled down in a cooling tower (closed cooling system) or directly pumped to an open source (one through cooling system).

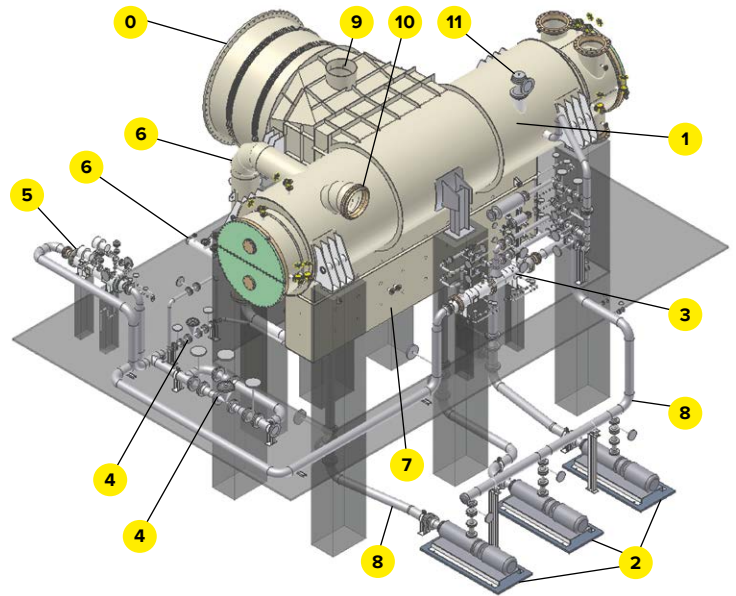


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|---------------------|-----------------|
| 1 Steam             | 4 Steam turbine |
| 2 Boiler feed water | 5 Power station |
| 3 Surface condenser | 6 Cooling tower |

### Total solutions individually tailored

Our scope includes the thermal and mechanical design, basic and detail engineering, procurement, manufacturing, testing, delivery and commissioning of turbine exhaust steam water cooled condensing units. Kelvion has a proven track record, with decades of experience, in the most efficient sizing of the equipment and in the correct selection of material and components for each customized solution.

Condensers are manufactured in diverse materials, depending on the quality and nature of the cooling water: sea water, cooling tower, river water, etc. Tubes can be made of carbon steel, stainless steel, Cu alloys, Ni alloys or Titanium. Tube plates can be made of different materials and can be either of the solid type or clad.



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|-------------------------|-----------------------------|
| 0 Steam duct            | 6 Flash tank & drain header |
| 1 Main condenser        | 7 Hotwell                   |
| 2 Condensate pumps      | 8 Interconnecting piping    |
| 3 Vacuum unit           | 9 Dump steam connection     |
| 4 Level control valves  | 10 Rupture disk             |
| 5 Gland steam condenser | 11 Atmospheric relief valve |

### Our standard supply includes

- Condensers: circular or rectangular cross-section with axial or vertical steam entry and with the highest degree of manufacturing preassembly
- Turbine to condenser exhaust steam duct including the necessary expansion joints
- Vacuum system: either steam-jet ejectors or liquid ring vacuum pump types flash tank, drain header and/or vacuum drains lifting system
- Dump tube and pressure reduction desuperheated system
- Condensate pumps system: pumps in vertical or horizontal arrangement; either motor or steam turbine driven; API 610, ISO5199 or standard manufacturer pumps design
- Control system: including level control valves; level, pressure and temperature indicators, transmitters, controllers, among others
- Ball tube cleaning system
- Interconnecting piping with filter, fittings and valves

### Expertise meeting every quality standard

- HEI –standards for: surface condensers, steam jet & liquid ring vacuum units PED 97/23/CE: pressure equipment directive
- ASME VIII – division 1 - pressure vessel design code AD-Merkblätter - pressure vessel design code CODAP - pressure vessel design code
- TEMA –standards for shell and tube heat exchangers ATEX 94/9/EC directive - for apparatus under explosion atmosphere
- ANSI; DIN; ASTM, ASME, ISO, API, U-Stamp; SQL; GOST-R, Rostechnadzor, NR-13

