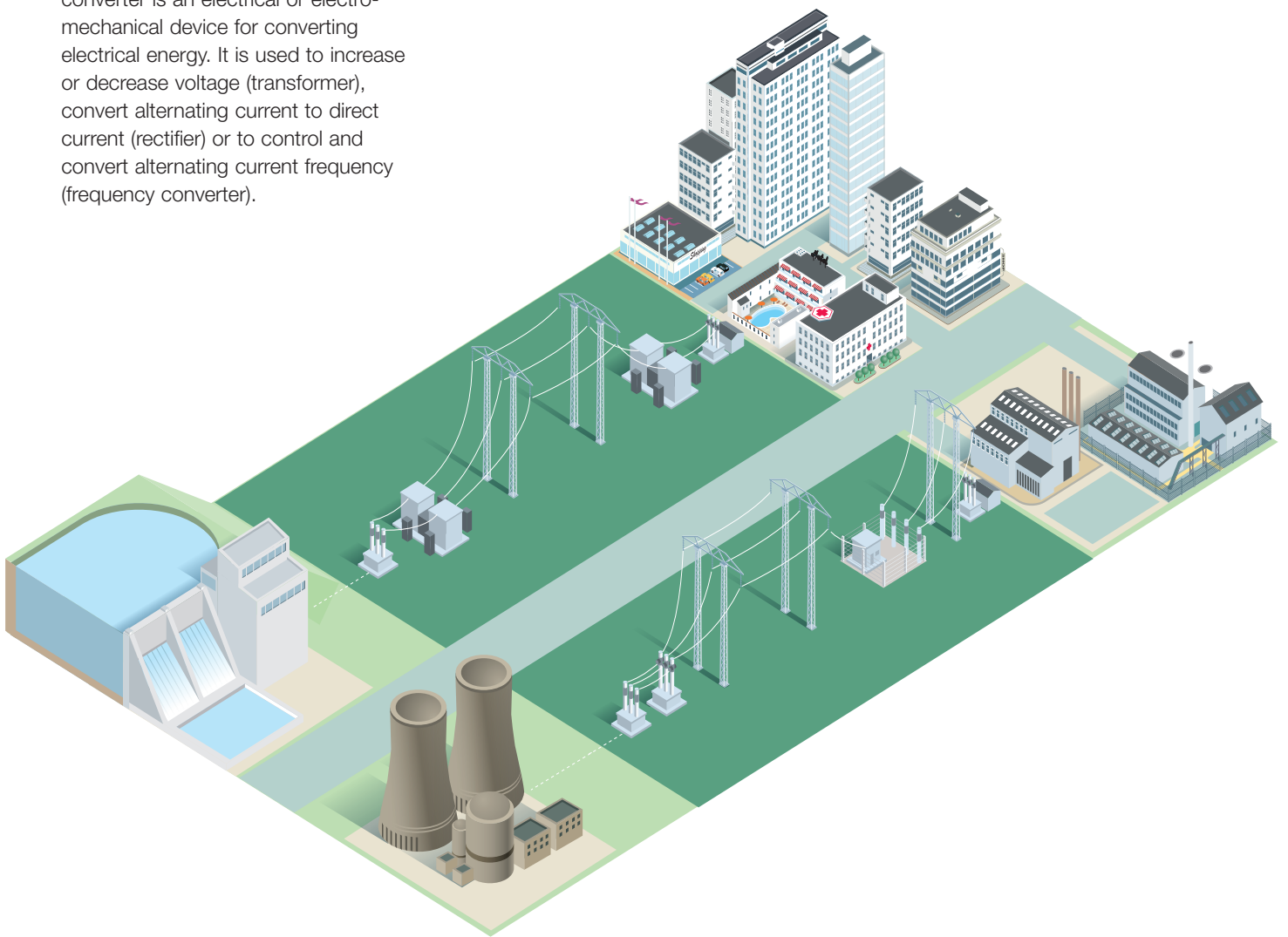




Power converter cooling

Power converters are present all along the electricity distribution network and in basically all types of process and manufacturing industries. A power converter is an electrical or electro-mechanical device for converting electrical energy. It is used to increase or decrease voltage (transformer), convert alternating current to direct current (rectifier) or to control and convert alternating current frequency (frequency converter).

Conversions of electrical energy generate heat and hence the converters need to be cooled.





Transformer cooling

A transformer is a static electrical device that transfers energy by inductive coupling between its winding circuits. A varying current in the primary winding creates a varying magnetic flux in the transformer's ferromagnetic core and thus a varying magnetic flux through the secondary winding. This varying magnetic flux induces a varying electromotive force, or voltage, in the secondary winding.

Transformers range in size from thumbnail-sized units hidden in micro-phones to units weighing hundreds of tons used in the power grid. They are essential for the transmission, distribution, and utilization of electric power.

The transformer core and windings are insulated in transformer oil, a highly refined, low-viscosity mineral oil, which is stable at high temperatures. The

purpose of this oil is to insulate and cool the transformer core and windings.

The oil is cooled either by natural convection or by forced air or water. The cooling abbreviations OFAF (Oil Forced Air Forced) or OFWF (Oil Forced Water Forced) in particular indicate a need for heat exchangers. By maintaining the oil at a low temperature, a higher electro load is allowed in the transformer on a constant basis or during periods of peak demand.

Intermixing of oil and water can be devastating for the transformer. For that reason, double-wall heat exchangers are used as a safety precaution in OFWF-cooling.

Alfa Laval offers a complete range of high-quality solutions for cooling transformer oil by forced air (OFAF) or

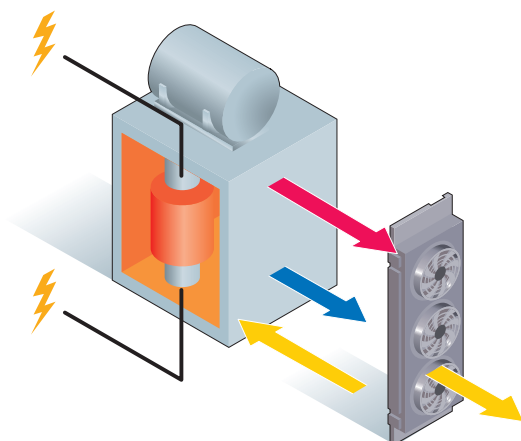


by forced water (OFWF). The offering includes:

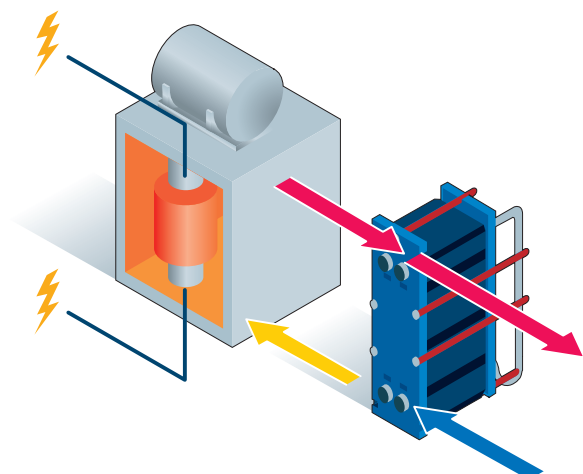
- Air heat exchangers – AlfaBlue transformer oil coolers
- Gasketed plate heat exchangers – double wall.

Alfa Laval can also supply efficient, maintenance-free transformer oil pumps.

Transformer cooling with air



Transformer cooling with water





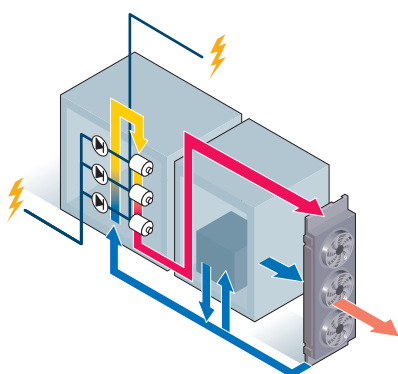
Rectifier cooling

A rectifier converts alternating current (AC) to direct current (DC). The vital part in a rectifier is a thyristor valve or diode. A thyristor valve or diode is a semiconducting device which in operation releases heat and needs to be cooled. Compact rectifiers are normally cooled directly by air while medium and high current rectifiers are more commonly cooled by deionized water. Especially on HVDC (High Voltage Direct Current) thyristor valves, deionized water has replaced pressurized air and oil due to its high cooling efficiency and insulation characteristics. Apart from cooling the thyristor or the diode the deionized water can also cool fuses and other components in a rectifier module.

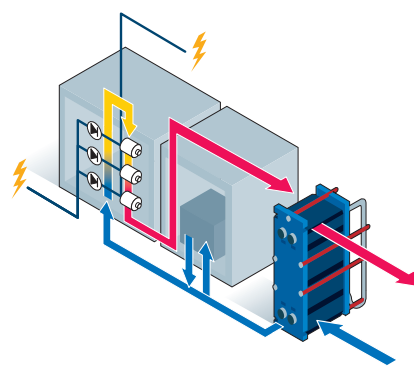
Because of the deionized water, material selection in the heat exchanger is vital. Stainless steel is standard. Rectifiers can also be combined with transformers with the whole unit cooled by two separate cooling circuits.

Rectifiers are to be found in a wide range of applications within different industries. Some examples are HVDC transmission stations, surface treatment and process lines in the steel industry, the chemical industry, metallurgical industry and various electrolysis processes.

Air cooled rectifier



Water cooled rectifier



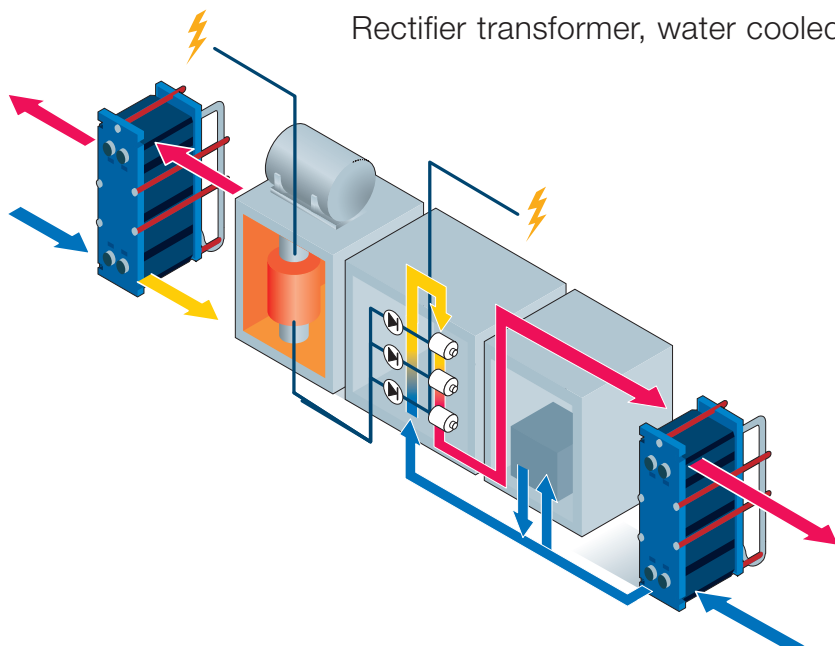
For rectifier cooling

Alfa Laval offers:

- AlfaBlue and AlfaBlue Power air heat exchangers
- Gasketed plate heat exchangers
- AlfaNova fusion-bonded plate heat exchangers.

The compact fusion-bonded heat exchanger in 100% stainless steel is particularly well suited for pure water when space is limited.

Rectifier transformer, water cooled





Frequency converter cooling (AC drives)

An electrical drive or AC drive is a system for controlling the rotational speed of an alternating current (AC) electric motor by controlling the frequency of the electrical power supplied to the motor. AC drives are also known by various other names such as adjustable speed drives (ASD), adjustable frequency drives (AFD), variable frequency drives (VFD), variable speed drives (VSD) and frequency converters (FC).

AC drives are widely used in e.g., speed control and soft starting of fans, pumps, blowers, compressors, rolling

mills, extruders, marine propulsion systems and wind power generators.

Applying an electrical drive to an electrical motor offers major energy saving potential. Small drive systems are mostly air cooled while larger drives are increasingly liquid cooled. The cooling medium used is deionized water or, on older drive systems, tap water.

When using direct air cooling on a drive system the heat dissipates into the surrounding air. Liquid cooling offers a major benefit – the heat will be

dissipated in the water and the heat loss to the surroundings will be practically eliminated.

For drives cooling

Alfa Laval offers:

- Gasketed plate heat exchangers
- AlfaNova fusion-bonded plate heat exchangers
- Copper brazed plate heat exchangers.

The compact fusion-bonded Alfa Nova in 100% stainless steel is particularly well suited for pure water when space is limited.

Drives cooling

