

Copper or Aluminium Transformers

Originally all transformers were built with windings made of copper. This prestigious conductor was easily accessible, and its cost was not excessive.

The outbreak of the Second World War and a huge demand for copper by the military industry caused copper to disappear from the market and increase its price disproportionately. We might also witness the same in the post covid world. Transformer manufacturers have had to adapt to the market situation by using an alternative conductor, i.e. aluminium.

The first experiments were not particularly successful, but with time and by carrying out all the appropriate modifications of the transformer design, the aluminium proved to be an excellent conductor with the same copper characteristics. The first AL strips were used already in the 60's in the USA and successfully largely accepted and utilized by European transformer manufacturers.

The Transformer Company is offering both Cu and AL based transformers according to the client's needs.

The choice of conductor material depends on many important aspects such as the use (type of application) of the transformer, the size and weight allowed, the budget available and the availability and delivery times of the transformer. Let see the main positive and negative aspects of both conductors.

THE MAIN POSITIVE ASPECTS OF COPPER CONDUCTOR

- Excellent electrical conductivity
- Excellent thermal conductivity
- Excellent electrical and mechanical features in case of huge power transformers
- Compact form (small dimension)
- Excellent Straight & reduced physical expansion

THE MAIN NEGATIVE ASPECTS OF COPPER CONDUCTOR

- High and variable price subject to speculations
- Limited reserves available
- High weight
- Different expansion values between Cu and cast resin by extremely low temperature may lead to cracks on the coil.
- Reduced malleability during the winding process

THE MAIN POSITIVE ASPECTS OF ALUMINIUM CONDUCTOR

- Low and stable market price
- Lower weight compared to Cu winding
- Excellent malleability during the winding process
- Very suitable for distribution transformers and small power transformers
- Similar expansion values between Cu and cast resin by extremely low temperature

THE MAIN NEGATIVE ASPECTS OF ALUMINIUM CONDUCTOR

- Less efficient thermal and electrical conductivity compared to Cu
- Larger dimensions compare to Cu
- AL external connections are not suitable in case of installation in mines or similar environments due to possible chemical reaction with gas or corrosive substances.
- Huge Power Transformers are difficult to construct using AL Conductors.

In case of copper connectors special bi-metal plates are required (connection Al-Cu)

There are many technicians, including some copper transformer manufacturers, who believe that copper windings are more resistant to short circuit effects. They also claim that transformers with aluminium windings have significantly higher losses than copper transformers.

We must dispel these claims. Based on our design and production experience, there are no differences in losses or short circuit resistance. Our aluminium transformers are designed and studied with an innovative design and electrical and mechanical solutions capable of guaranteeing the same level of losses and excellent electrical and mechanical strength as a copper transformer.

We are convinced that there are many applications of transformers, where it no longer makes sense to use copper as a conductor. Copper transformers are too heavy for installation in the modern structures and result in an expensive choice.

In case of special applications, we strongly advise our customers to choose copper as a conductor to guarantee the required performance.