



# Fluid filled Distribution Transformers

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**Transformers are an integral part of the distribution network. To ensure the most cost effective and energy efficient configuration Land Logical Power is able to design, manufacture and deliver exactly to your specification.**

The UK manufacturing site is able to design and manufacture fluid filled transformers up to 4MVA, backed up by global design and manufacturing up to 100MVA power transformers.



Electrical  
Energy



Wind Farm



Oil and Gas

## Customer benefits



- ✓ Versatile range
- ✓ High quality and reliability
- ✓ Economically optimised
- ✓ Capitalisation of the losses
- ✓ Easy recycling
- ✓ UK manufacturing
- ✓ Optimised technology
- ✓ Reduced dimensions
- ✓ Solid construction
- ✓ Long life-cycle with low maintenance

# Fluid filled Transformers

## Up to 4 MVA - 36 kV



Your fluid filled distribution transformer should be designed to meet the needs of the application and distribution network, whilst offering versatility and flexibility.



### Quality based upon years of experience

With more than 80 years of experience and over two million oil-immersed transformers installed worldwide, you can be sure of investing in a proven technology, constantly enhanced in our competence centers.

### Your transformer solution

Our standard range of transformers is available as:

- Three phase units (single phase available on request)
- With ratings up to 4 000 kVA, 36 kV, 50/60 Hz
- With conservator or hermetically sealed type
- Ground, pad or pole-mounted
- Naturally cooled (ONAN), air forced (ONAF) or other type of cooling upon request
- With normal or low noise or loss levels

### Fast-Trans:

A rapid transformer and substation delivery service that meets the demand for delivery on site in the shortest possible time.

We also offer (upon request) higher ratings up to 100 MVA, 170 kV and transformers for special applications (rectifier, hazardous area, earthing, welding, transformers with OLTC, reactors, solar power plant, wind mill application etc.).

## The right transformer for your network

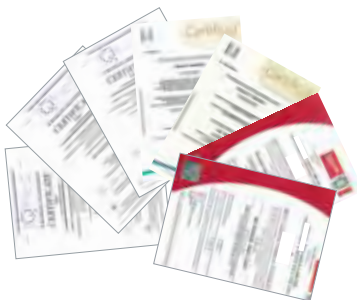
Our company follows a policy of continuous improvement taking into account the latest worldwide developments. This ensures that our transformers are state-of-the-art and fully compliant with the modern world's highest requirements: fast delivery, high quality, reduced size and, on request, very low noise and loss values.

Depending on applications and environmental influences, you may require a different type of fluid filled transformer. We can offer:

- Hermetically sealed or breathing type
- For outdoor applications: ground mounted but also pad or pole mounted
- For indoor applications in buildings or industrial plants and in compact distribution substations
- Low noise level for urban or residential areas
- Normal, low or very low level of losses

As customer satisfaction is our main concern, we constantly improve our manufacturing processes, thus we are able to speed up delivery times whilst ensuring a high level of quality.

All our production sites of Minera oil-immersed transformers are ISO 9001, ISO 14001 and ISO 18001 certified. To ensure this high level of quality, our Minera transformers undergo routine tests in accordance with IEC standards. We can also proceed to type tests or special tests on request.



ISO 9001, ISO 14001 and  
ISO 18001 Transformers  
units certifications

# High quality level for more reliability

## Magnetic core

The magnetic core of the transformer is manufactured from a high grade, cold rolled grain oriented silicon steel. The stacking of the laminations is step lap type. The magnetic core is a multi-layer, circular cross section type, where the cutting of the magnetic core is carried out by automatic machines. The magnetic core and its framework are carefully sized to minimise the vibrations and in particular, the magnetostriction effects which constitute the main sources of sound in distribution transformers.

In order to reduce the no load losses and / or the no load current of the transformer, the quality of the magnetic steel and the induction together with the design of the magnetic core are carefully chosen to meet the customers requirements.

## Surface protection

One of our major quality commitment is to provide high-quality surface protection. The coating (painting) type is chosen in accordance with the environmental conditions, considering the degree of pollution, humidity, etc. Choices include; zinc sprayed tank, galvanised radiators, plus other options.

## HV Tappings

Tapping switches allow voltage adjustment for a variation of the supply network voltages on the primary side of the transformer, or for increasing or decreasing the secondary voltage.

Tappings are provided on the primary winding and connected to an off-circuit tapping switch. The standard tapping range is  $\pm 2.5\%$  and  $\pm 5\%$ . However we can provide tapping ranges as per customer requirement. For adjustment operations, the transformer needs to be off circuit and de-energised.

## High voltage winding

The high voltage winding is wound using high grade pure copper. The shape of the conductor is either round or rectangular. To obtain a controlled temperature gradient, cooling ducts are added in the coil. High voltage coils comprise of multiple layers with interlayer insulation added during the winding process.

## Low voltage windings

The low voltage winding material used is high grade pure copper. The shape of the conductor is either; rectangular or foil type. The choice depends on the load losses and on the rated power.

To obtain a controlled temperature gradient, cooling ducts are added in the coil. An insulating barrier is wound around the low voltage coil in order to provide an electrical separation between the LV/HV coil, after which the HV winding is wound onto the LV windings. The complete HV/LV coil assembly is then placed onto the magnetic core.

## Construction

Cooling of the transformer is achieved by either using bolt on panel radiators or by using corrugated tanks (cooling fins form an integral part of the tanks).

To validate the oil-tightness after complete assembly, the tank, all radiators and gasketed joints are inspected to check for signs of leaks. For hermetically sealed transformers there is a pressure relief valve fitted to the tank lid to provide overpressure protection.



# Technical characteristics



Fluid filled distribution transformers	Free breathing or hermetically sealed
Manufacturing Standards	IEC, BS, etc.
Rated power	Up to 4 MVA (others rated powers on request)
Insulation level	According to IEC $U_M=1.1, 3.6, 7.2, 12, 17.5, 24, 36$ kV
Phases	3-phase (single phase is applicable on request)
Tappings	$\pm 2.5$ % and $\pm 5$ % (other options available)
Voltage regulations	With off-circuit tap changer
Short circuit impedance	4.75 % for $\leq 1000$ kVA, 5% for 1250kVA, 5.5% for 1500kVA and 1600kVA, 6% for 2000kVA, 6.5% for 2500kVA. Other impedance levels available
Rated frequency	50 Hz (60 Hz on request)
Vector groups	Dyn11 YN,d11 or any vector group according to IEC Standards
Material thermal class insulation	According to IEC 60085 class A
Temperature rise	Winding temperature rise: 65K, top oil temperature rise: 60K Ambient temperature in accordance with IEC 60076-1. The temperature of the cooling air should not exceed: <ul style="list-style-type: none"> <li>• 20°C yearly average</li> <li>• 30°C monthly average of the hottest month</li> <li>• 40°C at any time</li> </ul> For other ambient temperatures, winding and oil temperature shall be adapted.
Type of cooling	ONAN (Oil Natural Air Natural) or, KNAN (High Fire Point fluid Natural Air Natural)
Dielectric liquid	Mineral oil to IEC 60296 or Midel 7131 transformer fluid (high fire point fluid)
Short circuit withstandability	The transformers are designed to withstand the thermal and the dynamic effects resulting from a secondary short-circuit in accordance with IEC 60076-5
Sound level	The measurement (A-weighted sound pressure LpA) and the calculation of sound level (Aweighted sound power level LwA) are in accordance with IEC 60076-10
Installations	Indoor / outdoor
HV terminals options	Air insulated cable box, air insulated cable box mounted on liquid filled disconnecting chamber, ring main unit, Ringmaster range (circuit breaker or switch)
LV terminals options	Air insulated cable box, air insulated cable box mounted on air insulated disconnecting chamber, separate neutral, busbar chamber, LV cabinet or LV feeder pillar
Accessories	Standard:- bolted on cover, plain breather pipe, earthing terminals, thermometer pocket, base skid, jacking lugs, lifting lugs, fluid level indicator, rating and connection plate, filling hole and cover, drain valve and plug. Options:- hermetically sealed, oil filled conservator, gas & oil actuator (only with conservator), pressure relief device, dehydrating breather, liquid temperature indicator (with or without contacts), winding temperature indicator with contacts, marshalling box, vacuum pressure gauge, gas replenishing point, magnetic liquid level indicator, upper filter valve, padlockable drain valve & plug, plain rollers & axles, braced windings for motor starting, bi-directional rollers & axles, earth screen between primary and secondary windings, radiator valves.