Three decades of manufacturing excellence
VISION
“A GREAT GLOBAL COMPANY THROUGH TECHNOLOGY & PEOPLE”

MISSION
DELIGHT THE CUSTOMERS BY PROVIDING TRANSFORMERS & SWITCHGEAR PANELS ON TIME WITH EXCELLENT QUALITY
LTL was established in 1982, as a joint venture of Ceylon Electricity Board the Power Utility of Sri Lanka and European Investors initially to produce an indigenous transformer. The Company’s production line developed with an ongoing Technical Collaboration Agreement with ABB AS of Norway and today the Company’s state of the art production facilities manufacture very high quality transformers conforming to international standards and meet the entire Sri Lankan requirements while about 50% of its productions are exported.

Over time the production range expanded to special transformers such as Earthing, Dual Ratio, Isolation, Auto, Rectifier Transformers, Switchgear Panels, Package Substations and a host of others.

The awards the Company has received for their transformers hail their achievements locally and internationally and underline the reason for their 100% local market share and rapidly growing export orders.

All our transformers are optimized to meet customer satisfaction with regard to energy loss, noise level, dimensions and weight. Precise and thorough quality control before, during and after each stage of the manufacturing process ensures that all LTL products meet the very highest international quality standards. The transformers are renowned for their high performance and proven reliability.

We offer a full range of after sales services to all our customers to ensure the reliability of our products.
Product Range

POWER & DISTRIBUTION TRANSFORMERS:
• Capacity from 5 kVA up to 5000 kVA
• Varying voltages up to 33 kV
• Frequency: 50/60 Hz or as per customer requirements
• Tap Types: Off Circuit Tap links/Off Circuit Tap Changer/ On Load Tap Changer
• Temperature Rise: as per customer requirements.
• Silicone/Mineral Oil or other fluids filled Transformers as per customer specifications. Biodegradable oil is also available for environmentally sensitive areas.
• Cooling: ONAN / ONAF

TANK AND COOLING DESIGNS:
• Hermetically Sealed type Transformers with corrugated tanks (fin walls)
• Hermetically Sealed type Transformers with gas cushions
• Conservator type Transformers with free breathing

COMPACT AND PACKAGE SUBSTATION WITH TRANSFORMER:
• Oil immersed Transformers up to 2000kVA ; 33kV

SPECIAL TRANSFORMERS:
• Rectifier / Converter Duty Transformers
• Earthing / Grounding Transformers
• Isolation Transformers
• Completely Self Protected Transformers
• Dual Voltage Ratio Transformers
• Multi Winding Transformers
• Auto Transformers
• Low Voltage Air Cooled Transformers
• Pad Mounted Transformers (Dead Front) as per ANSI standards.
ADVANTAGES OF HERMETICALLY SEALED TRANSFORMERS:

- Hermetically Sealed Transformers are used in high humid environments, where there is limitation of maintenance services and limited space for installation such as pole mounted transformers, package or compact substations.
- The oil will not come in contact with air, thus ensuring preservation of its dielectric integrity.
- Virtually no maintenance required, e.g. no checking required of silica gel breather, and no need to monitor water ingress.
- Transformers occupy smaller space leaving more room for connections in compact installations.
- High reliability of the tanks which is proven by stringent fatigue and over pressure tests carried out on transformers of this type.
The Package Substation is a compact arrangement, which simplifies conventional substation designs. Substation housing is divided into three compartments i.e. the HV compartment, the transformer compartment and the LV compartment.

**Significant Features**
- Design conforms to IEC 62271-202 and customer specified other standards
- Fully compartmentalized design
- Removable roof with single lift complete unit
- IP 23 standard degree of protection available for enclosure as per IEC (higher IP class can be provided if required)
- Designed to withstand electrical impulses, thermal and dynamic stresses
- Compact, and occupies less floor space
- Easy to install, operate and maintain, with a theft proof design
- Special durability in extreme weather conditions
- Tailored configuration to meet customer requirements
- Enclosure with guaranteed corrosion protection

**Main Advantages**
- Reduced Electrical losses as Package Substations can be provided near load centres
- Cost effective
- A high degree of safety and operational reliability is achieved by HT and LT Switchgears and protective relays, to avoid overloading
- Reduction in logistic costs as Package Substations are delivered as single units
- Low civil/ foundation cost
Package Substation Configuration and Components

**HV Compartment**
- Extensible & Non Extensible Ring Main Units (RMU) with following options:
  - Switch Disconnectors
  - Fuse Switches
  - Vacuum/SF6 Circuit Breakers
  - Current & Potential Transformers for Metering & Protection

**Transformer Compartments**
- Oil Immersed Transformers with choice of arrangement for termination with HV & LV Switchgears Panels

**LV Compartments**
- LV Distribution Board
- LT Control Panel with Incomer ACB & Outgoing MCCB
- Automatic Power factor Correction Panel
- LV switch fuse units
- Instrumentation & Metering

**Accessories & Controls**
- Internal Lighting & Door Limit Switches, Earth Fault Indicators for Network, Door Stoppers, Steel Meshes to Cover Louvers.

**APPLICATIONS**
Reduced installation space, which will be advantageous in case of dimension limitations & high price of land.

Short erection time & maintenance free solutions for your energy supply.

They are ideally suited for new residential and commercial complexes as it can be placed on Ground, partially or totally below / above ground level.

Mainly used by Power Utilities, Multiplexes, Hotels, Hospitals, Shopping Malls, Software Parks, Residential Complexes, Airports etc.

*LTL Package Substation installed in Jordan*
LTL Transformers are designed to fully meet all the latest national and international standards, including IEC, BS, ANSI and often even exceeding the standards applicable to concerned markets.

With a commitment to Continuous Improvement, paving a way for vertical integration, the Research and Development wing of LTL Transformers (Pvt) Ltd has been painstakingly and continuously working to develop new products, better and improvised manufacturing processes, use of modern technology and better materials for the benefit of customers. This would not only be economical in terms of cost and energy, but would also give an all time superior product, providing total satisfaction to the end user.

Special software programs developed in technical collaboration with ABB Norway and the in-depth expertise of our engineers and designers ensure the accuracy and reliability of all designs with respect to optimization of various factors.

OUR MAIN CONCERNS ARE

- Improvement of efficiency by reducing on load and no load losses
- Emphasis on lowering costs by economizing the use of materials and planning manufacturing processes that would optimize labor inputs
- The designs are satisfactory with respect to dielectric strength, mechanical endurance, dynamic and thermal withstand of winding in event of short circuits
- Using available materials economically in order to achieve lower cost, lower weight, and reduce size and better operation performance
- Specified performance characteristics such as temperature rise, noise level, impedance etc.
- Mechanical design, final finish and accessories
- Ability to withstand high impulsive voltage surges
- Overload capacity
- Elimination or reduction of stray losses, hot spots, electrical gradients, etc. by electrical and magnetic field analysis
The Core Design

The core is made from high-quality, grain-oriented silicon steel and sheets are cut to length by latest GEORG cutting line. The stacked core provides a superior flux path by utilizing a step-lap that joins the core legs to the top and bottom yokes. The effective support for the core together with a step-lap joint ensures optimum performance in relation to existing currents, sound levels and iron losses.

We do our core design so that the core efficiently fills the opening in the coil, leaving a minimum of unused space. The short yoke between the legs of the core reduces the external flow between the active leg core materials, resulting in an increase in efficiency. The stacked core is more uniformly and firmly supported with metal or laminated wood clamps to prevent movement of the core structure so as to improve sound level characteristics and mechanical strength to withstand short circuit forces.

MAIN CHARACTERISTICS

- The 45\(^\circ\) cut of the core sheets and step-lap design guarantees optimum flow of magnetic flux in the core joint area resulting in reduction in no load loss and no load current
- Low sound levels are achieved using the step-lap stacking pattern
- Various types of magnetic steel (Laser treated / Amorphous etc) are chosen to match the desired loss level
- The simple supporting structures and clamping devices of the core contribute to the compactness of the design
The low voltage winding is done with foil or rectangular conductor extending along the full height of the coil. The layer to layer insulation is a thermally upgraded kraft paper which is coated with a diamond pattern of epoxy adhesive. The high to low insulation barrier is fitted over the low voltage winding and high voltage winding is wound directly over the low voltage to ensure a high strength coil assembly. For HV winding enameled insulated round or rectangular conductors are used.

Corrugated oil ducts extend along the height of the coil to provide cooling in the winding. The staggered, diamond epoxies bonds help assure effective oil flow through the winding. Normally tapings are provided in HV winding. Both copper and aluminum material can be used for winding.

**SPECIAL FEATURES OF WINDINGS DESIGN**

- Any high voltage ampere turn asymmetry which, might occur is compensated automatically by an appropriate internal current distribution in the low voltage foil.
- High short circuit strength due to use of epoxy dotted paper as inter-foil and inter layer insulation
- Accurately located taps in HV winding and LV foil design keep unbalanced ampere-turns to a minimum which make the design stronger under short circuit stresses.
- Minimum stress loads on the dielectric
- The layer-type winding results in a low ground capacity, which gives a nearly straight line surge distribution throughout the winding. A compact, high-impulse-strength coil is the result.
- Low eddy losses
- More even heat distribution through the windings
- Automatic winding techniques can be used
Assembly

The active part of the transformer consists of the magnetic core; windings and other accessories such as tap selectors etc. Before drying all connections between windings and bushings and the connections between the high voltage tapings and the tap changer are made. All the high and low voltage leads are supported rigidly so that there will be no dangerous movements during severe faulty conditions. Tapings are normally provided at high voltage winding due to lower current in it.

High quality laminated wood or pre fabricated steel clamps are used for clamping. High quality press board insulations are used to support the windings axially. Pressboards are used as phase barriers between the high voltage windings as well as between core and low voltage windings. The design and the process ensure adequate clearance between various components and parts to ensure uniform and optimum electric field distribution which guarantees long life of the transformer.

Drying and Oil Filling

The entire finished core and coil assembly will be dried by the transformer core oven. The temperature and duration of the drying process ensures the curing of epoxy coated insulation and removal of moisture within active part assembly.

After the drying process has been completed the unit will be tanked and filled with degassed oil under vacuum within a minimum period of time.
Fabrication

The Sealed type Transformer tanks are made of high quality pre formed corrugated fin walls made out of cold rolled steel. It is ensured that finished tanks meet over pressure requirements & permanent deformation limits specified by international standards.

Vertical bending machine helps to form the corrugated tanks only with one welded seam, which is a specialty in our products.

In conservator type design, high quality steel sheets are used for tank fabrication. For cooling pre fabricated detachable radiator panels are used.

All welds are tested, ensuring 100% leak proof seams and mechanical strength.

Most of the fabricated tanks are Galvanized in our own hot dip galvanizing plant, according to international standards and then powder painted. Other non galvanized tanks are shot blasted in order to remove all traces of grease, rust welding slag and other impurities. Immediately after shot blasting the tanks are painted with primer and finishing coats. All the items are powder painted to provide a smooth attractive final finish.

Various other painting methods are used to meet specified customer requirements.
All transformers are subjected to the full range of specified tests as per international standards such as IEC, BS and ANSI.

Following routine tests are carried out on each transformer before it is released for dispatch,
- Preliminary Insulation Resistance
- Vector Group
- Voltage Ratio
- Winding Resistance
- Oil Dielectric Strength
- Separate Source Voltage Withstand
- Induced Over - Voltage
- No Load
- Full Load
- Impedance Measurements
- Tank’s pressure withstand ability

Following type/special tests are carried out either at the customer’s request or as part of a verification of a new design. All tests are performed within the factory except for dynamic short circuit tests and impulse tests which are done at internationally accredited third party laboratories such as KEMA, Netherlands.

The type/special tests are,
- Short Circuit
- Lightning Impulse Voltage
- Sound Level
- Temperature Rise
However much a manufacturer of a product talks high about his products, and his manufacturing processes, unless the products are tested and certified by internationally reputed independent third party laboratories or testing agencies, they will not be accepted by modern markets. The products of LTL have the world’s best third party certification.

Type-test certification for quality of LTL distribution transformers are received from KEMA High Power & High Voltage Laboratories in the Netherlands.
LTL Transformers (Pvt) Ltd. is committed to deliver state of the art and reliable products to its customers. To achieve this, the overseas trained engineers and technicians of the production facility strictly follow Quality Assurance procedures incorporated in the integrated management system at every stage of the production process. The Company is stringently conforming to ISO standards ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007 with regard to these aspects which are certified by the International Agency Det Norske Veritas (DNV) of the Netherlands. Regular internal and external quality audits ensure the full and continuous conformity with these international standards. The company’s materials and components suppliers are also required to satisfy these quality standards.

Transformers manufactured at LTL are strictly in compliance with the relevant international standards (IEC, BS, ANSI). This together with the Quality Assurance procedures result in the highest quality of the products manufactured.
Quality Products Delivered on Time

The quality of each product is guaranteed before its release for dispatch.

We have experience in securely delivering transformers to over 25 countries throughout the world during the past ten years.

Transportation options and customer requirements are carefully evaluated and determined by our well experienced staff in the field, and the products are appropriately packed and delivered to the final destination.

Installation of the transformers or substations can either be done by the customer or by the experienced LTL field service crew.
LTL considers its human resource as its main asset and over the years has assembled a well educated, well trained, and well contented engineers, technicians and other staff. Their innovation and creativity is well encouraged throughout the organization and appropriately rewarded as novel ideas could arise from various backgrounds. With this shared vision, the company has maximized its organizational capacity, which reflects in the quality and quantity of its production.

Manufacture of such a range of diversified products that adhered to international standards would not have been possible if not for this committed human resource team.
Support Services of LTL Transformers (Pvt) Ltd.

The company offers a range of support services associated with power installations inclusive of transformers which consist of:

- Transportation, Installation, Commissioning and Testing of Power Transformers up to 220 kVA/150 MVA at Power Plants, Grid Substations, etc, together with associated protection and fire fighting systems.

- Oil filtration and oil testing in transformers up to 150 MVA.

- Maintenance of Power Installations in Industrial and Commercial Buildings, Power Utilities, Hospital Complexes and other such institutions under Annual Maintenance Contract or other terms as required by customers.

- Repairs of Distribution Transformers.

- Hiring of transformers for emergency short term requirements as substitutes.

- Branch offices or agents of company located in several countries will readily respond to customers’ enquiries with regard to such services.
## Technical Data of Three Phase Transformers

<table>
<thead>
<tr>
<th>Capacity (kVA)</th>
<th>Eff. P.F. = 0.8, Full Load (%)</th>
<th>Voltage regulation</th>
<th>No load loss (W)</th>
<th>Load loss (W)</th>
<th>Total losses (W)</th>
<th>Impedance (%)</th>
<th>Noise level (dB)</th>
<th>Dimensions (mm)</th>
<th>Oil qty (Litres)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>97.05</td>
<td>4.10</td>
<td>355</td>
<td>2125</td>
<td>2490</td>
<td>4.5</td>
<td>50</td>
<td>Length 1095</td>
<td>240</td>
<td>850</td>
</tr>
<tr>
<td>160</td>
<td>97.65</td>
<td>3.72</td>
<td>500</td>
<td>2575</td>
<td>3075</td>
<td>4.5</td>
<td>51</td>
<td>Width 900</td>
<td>300</td>
<td>1050</td>
</tr>
<tr>
<td>250</td>
<td>98.06</td>
<td>3.72</td>
<td>670</td>
<td>3295</td>
<td>3965</td>
<td>4.5</td>
<td>52</td>
<td>Height 1165</td>
<td>380</td>
<td>1400</td>
</tr>
<tr>
<td>400</td>
<td>98.41</td>
<td>3.51</td>
<td>965</td>
<td>4205</td>
<td>5170</td>
<td>4.5</td>
<td>54</td>
<td>935</td>
<td>495</td>
<td>840</td>
</tr>
<tr>
<td>630</td>
<td>98.45</td>
<td>3.84</td>
<td>1295</td>
<td>6150</td>
<td>7445</td>
<td>5.0</td>
<td>55</td>
<td>955</td>
<td>695</td>
<td>980</td>
</tr>
<tr>
<td>800</td>
<td>98.54</td>
<td>4.08</td>
<td>1400</td>
<td>8675</td>
<td>10075</td>
<td>5.5</td>
<td>55</td>
<td>1010</td>
<td>785</td>
<td>1100</td>
</tr>
<tr>
<td>1000</td>
<td>98.59</td>
<td>4.31</td>
<td>1550</td>
<td>10275</td>
<td>11825</td>
<td>6.5</td>
<td>55</td>
<td>1065</td>
<td>890</td>
<td>1200</td>
</tr>
<tr>
<td>1250</td>
<td>98.72</td>
<td>4.75</td>
<td>1825</td>
<td>12430</td>
<td>14255</td>
<td>7.0</td>
<td>55</td>
<td>1145</td>
<td>1355</td>
<td>1325</td>
</tr>
<tr>
<td>1500</td>
<td>98.87</td>
<td>4.44</td>
<td>2160</td>
<td>13340</td>
<td>15500</td>
<td>7.0</td>
<td>55</td>
<td>1270</td>
<td>1470</td>
<td>1470</td>
</tr>
<tr>
<td>1750</td>
<td>98.78</td>
<td>5.00</td>
<td>2290</td>
<td>16520</td>
<td>18810</td>
<td>7.0</td>
<td>56</td>
<td>1325</td>
<td>1510</td>
<td>1635</td>
</tr>
<tr>
<td>2000</td>
<td>98.79</td>
<td>4.86</td>
<td>2620</td>
<td>17040</td>
<td>19660</td>
<td>7.0</td>
<td>56</td>
<td>1365</td>
<td>1675</td>
<td>1700</td>
</tr>
<tr>
<td>2500</td>
<td>98.88</td>
<td>5.27</td>
<td>2830</td>
<td>23450</td>
<td>26280</td>
<td>7.0</td>
<td>57</td>
<td>1470</td>
<td>1875</td>
<td>1900</td>
</tr>
<tr>
<td>3000</td>
<td>5.30</td>
<td>5.53</td>
<td>5195</td>
<td>25470</td>
<td>30665</td>
<td>7.0</td>
<td>58</td>
<td>1515</td>
<td>2375</td>
<td>2350</td>
</tr>
<tr>
<td>5000</td>
<td>5.30</td>
<td>5.53</td>
<td>5275</td>
<td>40130</td>
<td>45405</td>
<td>7.0</td>
<td>59</td>
<td>1565</td>
<td>2445</td>
<td>3525</td>
</tr>
</tbody>
</table>

### Rated Primary Voltage: 11 kV

<table>
<thead>
<tr>
<th>Capacity (kVA)</th>
<th>Eff. P.F. = 0.8, Full Load (%)</th>
<th>Voltage regulation</th>
<th>No load loss (W)</th>
<th>Load loss (W)</th>
<th>Total losses (W)</th>
<th>Impedance (%)</th>
<th>Noise level (dB)</th>
<th>Dimensions (mm)</th>
<th>Oil qty (Litres)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>97.00</td>
<td>3.84</td>
<td>270</td>
<td>2250</td>
<td>2520</td>
<td>4.0</td>
<td>48</td>
<td>Length 955</td>
<td>165</td>
<td>650</td>
</tr>
<tr>
<td>160</td>
<td>97.80</td>
<td>3.52</td>
<td>375</td>
<td>2510</td>
<td>2885</td>
<td>4.0</td>
<td>49</td>
<td>Width 840</td>
<td>200</td>
<td>850</td>
</tr>
<tr>
<td>250</td>
<td>98.01</td>
<td>3.39</td>
<td>515</td>
<td>3550</td>
<td>4085</td>
<td>4.0</td>
<td>50</td>
<td>Height 1015</td>
<td>250</td>
<td>1100</td>
</tr>
<tr>
<td>400</td>
<td>98.27</td>
<td>3.44</td>
<td>720</td>
<td>4925</td>
<td>5645</td>
<td>4.0</td>
<td>52</td>
<td>1130</td>
<td>350</td>
<td>1400</td>
</tr>
<tr>
<td>630</td>
<td>98.45</td>
<td>3.61</td>
<td>990</td>
<td>6950</td>
<td>7940</td>
<td>4.5</td>
<td>53</td>
<td>1245</td>
<td>540</td>
<td>1700</td>
</tr>
<tr>
<td>800</td>
<td>98.47</td>
<td>4.09</td>
<td>1205</td>
<td>8740</td>
<td>9945</td>
<td>5.0</td>
<td>54</td>
<td>1490</td>
<td>805</td>
<td>2000</td>
</tr>
<tr>
<td>1000</td>
<td>98.48</td>
<td>3.74</td>
<td>1325</td>
<td>11010</td>
<td>12335</td>
<td>5.5</td>
<td>55</td>
<td>1690</td>
<td>920</td>
<td>2500</td>
</tr>
<tr>
<td>1250</td>
<td>98.62</td>
<td>4.32</td>
<td>1635</td>
<td>12375</td>
<td>14010</td>
<td>6.0</td>
<td>56</td>
<td>1800</td>
<td>1370</td>
<td>3000</td>
</tr>
<tr>
<td>1500</td>
<td>98.70</td>
<td>4.34</td>
<td>1940</td>
<td>13480</td>
<td>15420</td>
<td>6.0</td>
<td>57</td>
<td>2025</td>
<td>1485</td>
<td>3500</td>
</tr>
<tr>
<td>1750</td>
<td>98.72</td>
<td>4.32</td>
<td>2460</td>
<td>15740</td>
<td>18220</td>
<td>7.0</td>
<td>57</td>
<td>2340</td>
<td>2135</td>
<td>4000</td>
</tr>
<tr>
<td>2000</td>
<td>98.79</td>
<td>5.07</td>
<td>2500</td>
<td>18885</td>
<td>21200</td>
<td>7.0</td>
<td>58</td>
<td>2340</td>
<td>2340</td>
<td>4500</td>
</tr>
<tr>
<td>2500</td>
<td>98.86</td>
<td>4.85</td>
<td>2550</td>
<td>24710</td>
<td>27260</td>
<td>7.0</td>
<td>59</td>
<td>2425</td>
<td>2425</td>
<td>5000</td>
</tr>
</tbody>
</table>

Note: Tolerances are applicable as per the Standard IEC 60076

<table>
<thead>
<tr>
<th>Vector Group</th>
<th>Temp. Rise (°C)</th>
<th>Windings</th>
<th>Top Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyn11</td>
<td>60</td>
<td>55</td>
<td>55</td>
</tr>
</tbody>
</table>
LTL HOLDINGS (Pvt) Ltd.
67, Park Street, Colombo 02 | Tel: +94 (0) 112 695 007 | Fax: +94 (0) 112 684 900
Email: info@ltl.lk | Web: www.ltl.lk

LTL TRANSFORMERS (Pvt) Ltd.
154/11, Railway Station Road, Angulana, Moratuwa
Tel: +94 (0) 112 605 101-3 Fax: +94 (0) 112 607 312 Email: transformer@ltl.lk

LTL Transformers (Pvt) Ltd.
A Subsidiary of LTL Holdings (Pvt) Ltd.