



PEL DISTRIBUTION TRANSFORMER



/ Change your life

INTRODUCTION - PEL DISTRIBUTION TRANSFORMER FACTORY

PEL is manufacturing distribution transformers since its inception in 1956. However, in 2009, PEL established an independent factory to cater the ever increasing demand of distribution transformers within the country and abroad by maintaining high quality standards. This state of the art factory, covering an overall area of about 612,000 sq. ft., was inaugurated by Mr. Yousaf Raza Gilani, the then Prime Minister of Pakistan.

In order to meet the international standards, PEL joined hands with Pauwels, Belgium for a technical collaboration. PEL offers a wide range of products from 5kVA to 10MVA and up to 36kV voltage class. The overall monthly capacity of the plant is 350MVA. PEL Group, as Pakistan's leading transformer manufacturer, aims to maintain its position as pacesetter. PEL operates a nationwide network of sales offices and also provides installation, commissioning and after-sales-services for distribution transformers.

PRODUCT RANGE

1. Three Phase Distribution Transformer
 - a. Small Distribution Transformer
 - b. Medium Distribution Transformer
 - c. Large Distribution Transformer
2. Pad Mounted Transformer
3. Auto Transformer
4. Dry Type Transformer
5. Aluminum Winding Transformer
6. Smart Transformer
7. Single Phase Transformer
8. Low Voltage Transformer
9. Isolation Transformer
10. Furnace Transformer

Research, Development and Design

PEL believes in introduction of new technologies and continuous improvement in existing products through critical analysis, research, development and best utilization of available resources. PEL R&D and design team is focused to find new materials and value added accessories that not only improve the quality but enhance the features of the product as well.

Special engineering tools, software and applications are deployed for real time 3-D modeling and analysis to meet certain parameters and safety measures. The highly qualified team ensures the product complying with the customer's required specifications and qualifies the stringent standards of quality control. On demand, the engineering team also provides numerous technical supports to clients to achieve the best suited product in order. Each transformer order from our valuable client is considered to be an advancement towards excellence.

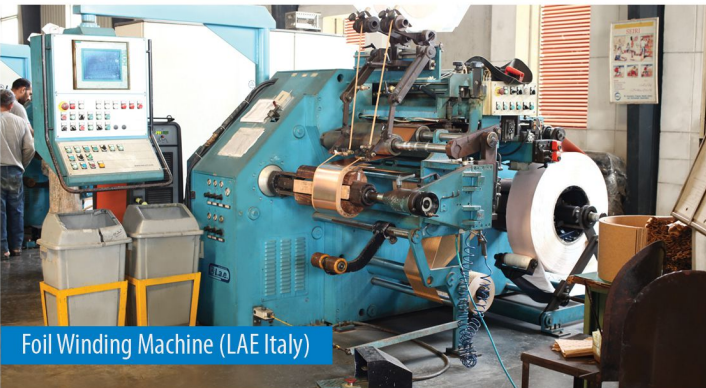


MANUFACTURING

Core

The cut of the core sheets and the material of ferromagnetic core are optimized, shaped and clamped to produce a core with minimum losses and dimensions. This methodology optimizes the consumption of both material and energy, bringing benefits to the user, environment and manufacturer. This is achieved by the use of high grade silicon steel sheets, characterized by low hysteresis losses. PEL imports this high tech core material from the world's leading electrical steel manufacturers.

The core consists of a series of laminations made from very thin insulated sheets. At PEL these sheets are slit and cut by computer numerical controlled machines of high precision. The sheets are stacked in an overlap pattern of either single or multiple, such patterns promise additional benefits in terms of optimized no-load losses, noise level and strength. Special LASER cut jigs and fixtures are used to ensure low core losses.



Winding

LV Winding is usually made of copper sheet conductor (foil). This reduces the axial stresses produced by short circuit to a minimum level against conventional windings thus enabling axial support structure greatly simplified. HV winding is drawn from copper rod either with insulating enamel coating or wrapped in insulation paper. Selection of copper wire, strip or foil and the type of insulation is made in accordance with the specifications required. DDP (Diamond Dotted Paper) is used as interlayer insulation and also between LV & HV windings. The high voltage winding is wound directly on the low voltage winding in order to maintain a sufficient clearance with respect to voltage level.

Assembly

Assembly of core and windings builds the active part of transformer. Tap-Changer and Bushings are mounted on top plate which is installed above the assembled active part. Bushings and windings are connected by the means of durable junctions of copper components. The unit is then sent to furnace for a specific time and temperature (48 hours at 100°C to 120°C) to remove moisture from insulating materials.

Once the active part is dried, it is given a comprehensive quality inspection and placed in tank. The top plate is bolted with tank by placing a leak-proof packing. Oil filling is done under vacuum to impregnate the active part completely in oil hence ensuring the electrical properties remain unaffected. High quality mineral/silicon oil is filled in transformer for its thermal and insulating properties. This oil fully complies with IEC 60296/60836 specifications.



Tank Manufacturing and Painting:

PEL has the capability to produce the following types of transformer tanks:

- Fixed Corrugated Fin Type
- Detachable Radiators with Radiator Shut-off Valves

Tanks may also be hermetically sealed or of expansion/conservator type. In-house production of corrugated cooling-fins of high grade CR sheet is done on computer numerical control (CNC) machines and welded by highly skilled workers. The bottom, top frame and fin panels are then welded together on specially designed rotating welding tables. The skill and craftsmanship of highly experienced welders and leakage test during production ensures leak-free finished tanks.

Prepared tanks are sand-blast or shot-blast and chemically processed to remove any surface impurities for longer life against corrosion and leaving a clean surface ready for paint coating. After the pretreatment process, the tanks are powder coated in powder coating plant and then baked at controlled temperature in oven.



Powder Coating Plant

QUALITY CONTROL

The finished product undergoes rigorous testing at PEL test field to ensure longer life of the transformer. All routine tests as per IEC 60076-1 are performed on the product. Any special requirement by the client, described before the order, is also verified at the test field. PEL has its own facility for performing the type tests i.e. Impulse Test and Temperature Rise Test.



Impulse Generator



Control Panel for Testing

PEPCO (WAPDA) RATING TRANSFORMERS

The general technical parameters and specifications of the approved designs are as follows:

Voltage Ratio:	11/0.415 kV
Temperature Rise:	40/50°C
Vector Group:	Dyn-11
Tank Type:	Pole and Pad Mounted (Hermetically Sealed or Conservator Type)
Specs./Standards:	DDS-84:2007 (amended to date) IEC-60076

Pad Mounted Transformers (100, 200, 400 & 630 kVA) featuring same losses and parameters are also manufactured. All Pole and Pad Mounted Transformers undergo annual type testing and are approved by PEPCO.

Losses (Watts) - WAPDA Ratings

Rating (kVA)	Iron	Copper
10	52	256
15	68	348
25	98	512
50	140	936
100	248	1616
200	396	2728
400	740	4480
630	1080	6520

K-ELECTRIC RATING TRANSFORMERS

The general technical parameters and specifications of the approved designs are as follows:

Voltage Ratio:	11/0.420 kV
Temperature Rise:	35/45°C
Vector Group:	Dyn-11
Tank Type:	Pole and Pad Mounted (Hermetically Sealed or Conservator Type)
Specs./Standards:	K/R&D/DT/28 (amended to date) IEC-60076

PEL is also manufacturing Pad mounted transformer 500 kVA with RMU unit, featuring same losses and parameters as approved by K-Electric.

Losses (Watts) - K-Electric Ratings

Rating (kVA)	Iron	Copper
150	380	2000
250	600	3500
500	935	5715
750	1250	7250
1000	1500	10000
1500	2250	14500

WAPDA (A-4) Ratings approved by K-Electric:

Voltage Ratio: 11/0.415 kV

Losses (Watts) – WAPDA (A-4) Ratings

Rating (kVA)	Iron	Copper
15	85	435
25	123	640
50	175	1170
100	310	2020
200	495	3410
400	925	5600



Conservator type Pole Mounted Transformer



Hermetically seal type Pole Mounted Transformer



Pad Mounted Transformer

PRIVATE RATING TRANSFORMERS

PEL manufactures transformers for the private customers against client requirement and specifications.

- Small Distribution Transformers (<250 kVA up to 36 kV)
- Medium Distribution Transformers (250 kVA – 2000 kVA up to 36 kV)
- Large Distribution Transformers (>2000 kVA up to 36 kV)

General specifications of Standard Rating transformers are as follows:

Voltage Ratio: 11/0.415 kV

Vector Group: Dyn-11

Specs./Standards: IEC-60076



Rating	Voltage Ratio	Losses Iron Copper		Percentage Impedence	Voltage Regulation	Transformer Efficiency	Distance b/w Roller Wheels
kVA	kV	kW		%	%	%	mm
750	11/0.415	1.30	10.0	5.0	4.00	98.12	780
1000	11/0.415	1.60	13.0	5.0	4.00	98.16	820
1250	11/0.415	1.80	15.5	5.0	3.97	98.27	820
1500	11/0.415	2.20	20.0	6.0	4.62	98.25	1020
2000	11/0.415	2.50	24.0	6.0	4.55	98.39	1020
2500	11/0.415	2.90	29.0	6.0	4.54	98.41	1020
3000	11/0.415	3.20	36.5	7.0	5.23	98.33	1020
4000	11/0.415	4.60	52.0	7.0	5.28	98.24	1500
5000	11/0.415	5.40	67.0	7.0	5.30	98.20	1500
6000	11/6.000	5.80	55.0	7.0	5.02	98.74	1500
7500	11/6.000	7.00	65.0	8.0	5.28	98.77	1500
10000	11/6.000	13.0	80.0	8.0	6.42	98.84	1740

■ DRY TYPE TRANSFORMERS

PEL also offers dry-type transformers with range up to 3 MVA, and 11 kV voltage class. To minimize environmental contamination and fire hazards, customers are specifying dry-type transformers more frequently. These transformers meet strict parameters with respect to electrical system demands and functioning in areas with extreme climatic conditions.

Why PEL?

- First ever company approved by PEPCO for producing dry type transformers.
- Special Nomex® insulation is used to boost the thermal heat bearing capacity of the transformers.
- Transformers are manufactured in accordance with industrial and international standards (IEC 60076-11).



Some applications of dry-type transformers are as follows:

- Virtually maintenance free.
- Suitable for installations that require a high degree of safety.
- For in-door application.

■ SINGLE PHASE TRANSFORMERS

Single-Phase, oil immersed small distribution transformer is an economical option for certain networks. PEL design team is proud to provide optimum efficiency, better mechanical, thermal and electrical performance as required by client specifications.

Range: 100 VA to 10MVA with voltage class up to 36 kV.



SMART TRANSFORMERS

PEL outstanding manufacturing and design skills have resulted in Pakistan's first SMART transformers. With the use of Nomex® insulation and Silicon Oil, PEL has managed to achieve the same output which was not possible in conventional designs. This results smaller dimensions in terms of length, width, height and weight than the conventional transformer against same rating and specs.

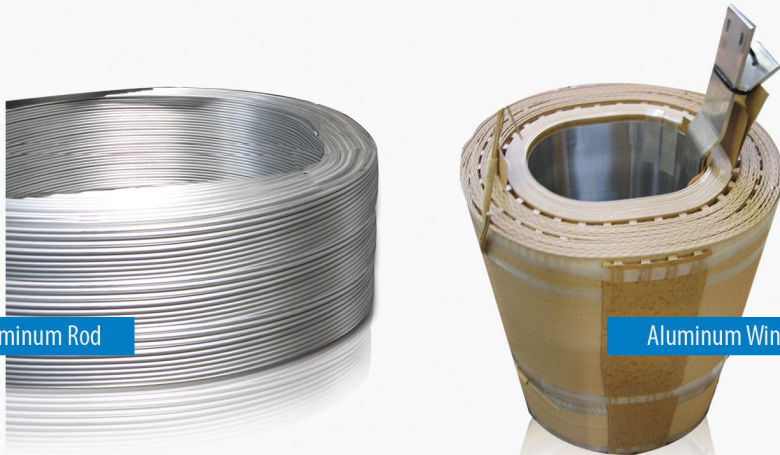
Uses and Application:

- Fire safety
- Limited space requirement
- Capable to withstand overload conditions for longer duration



ALUMINUM WINDING TRANSFORMER

Committed to new developments, PEL has introduced cost effective Aluminum Winding Transformer to its product family against the same performance parameters as that of conventional copper winding transformer. This transformer may either be Hybrid (Copper HV, Aluminum LV or vice versa) or complete Aluminum Winding transformer.



Aluminum Rod

Aluminum Winding

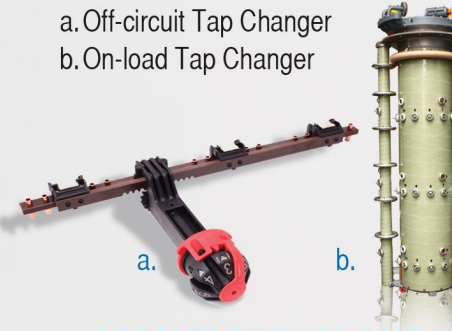
First time ever in the history of Pakistan, PEL's 1500 KVA Aluminum Winding Transformer has successfully qualified Short Circuit Test at HV & SC Lab, Islamabad.

ACCESSORIES

Distribution transformer comes with a variety of accessories for various protection purposes against faults. Following is a list of significant imported accessories offered by PEL:

TAP CHANGER

- Off-circuit Tap Changer
- On-load Tap Changer



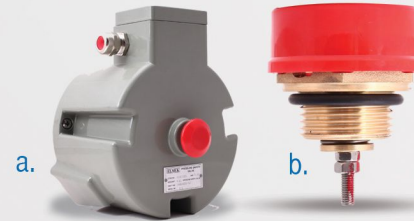
BUCHHOLZ RELAY

- Single Float
- Double Float



PRESSURE RELIEF DEVICE

- With Contacts
- Without Contacts



OIL LEVEL INDICATOR

- With/without Contacts
- Vertical Type



THERMOMETER (OIL/WINDING)

- With Contacts
- Without Contacts



BUSHING

- Porcelain Bushing
- Resin Casted Bushing
- Plug In Bushing





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