

**TRADITION** - MANUFACTURING INSTRUMENT TRANSFORMERS SINCE 1947

**UNIQUE DESIGN** - OPEN-TYPE MAGNETIC CORE

**FLEXIBLE DESIGN** - EVERY UNIT IS DESIGNED TO SATISFY SPECIFIC CUSTOMER REQUIREMENT

**LONGEVITY AND RELIABILITY** - DESIGNED FOR AT LEAST 50 YEARS OF SERVICE LIFE

# LPI

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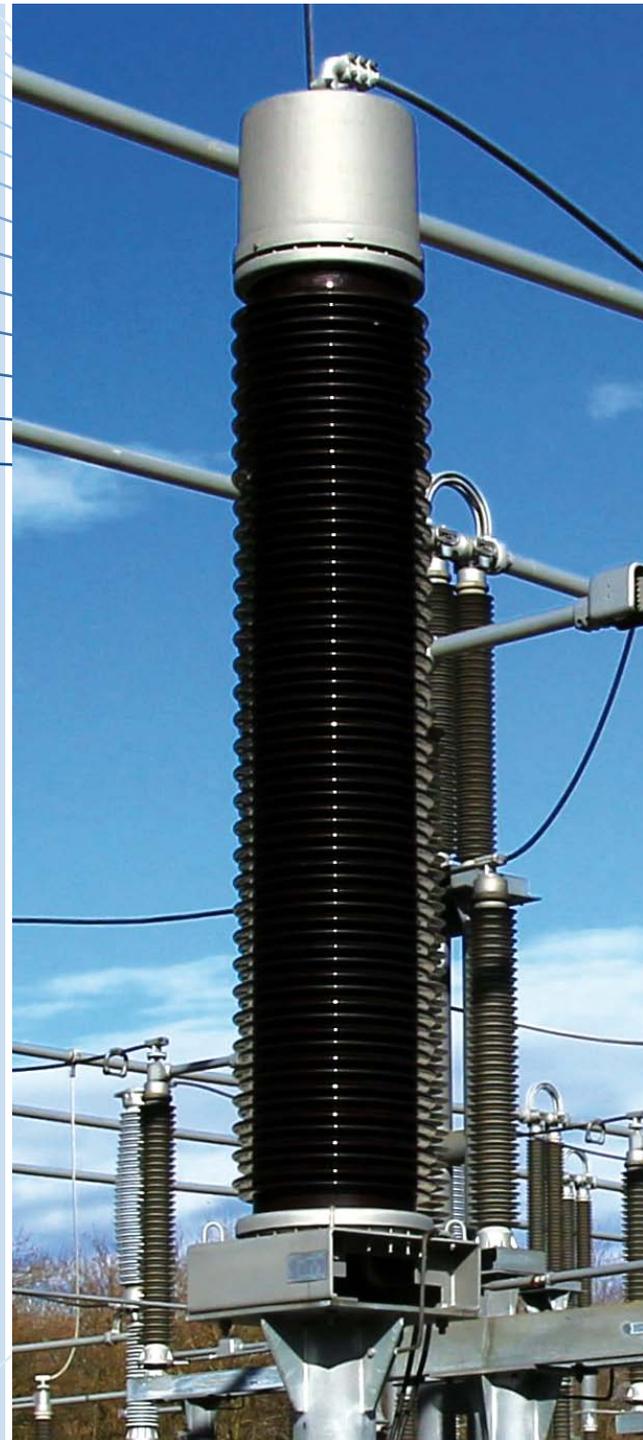
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**VPT**

POWER VOLTAGE  
TRANSFORMER

72,5 to 550 kV



**KONČAR**

Končar - Instrument Transformers Inc.



### Accessories

- Terminal for measuring dielectric dissipation factor ( $\text{tg}\delta$ )
- Oil level indicator
- Off-load tapping on secondary winding (optional)
- Internal overpressure indicator - can be used for transformer monitoring in service

### Quality Assurance

Končar Power Voltage Transformers are designed in compliance with IEC, ANSI/IEEE, GOST, AS, IS, CAN/CSA, or any other relevant standard defining instrument transformers, and satisfying specific power transformer requirements.

Product quality is assured through a certified quality standard, the ISO 9001, covering all aspects of design, production and testing.

Končar - Instrument transformers Inc. is ISO 14001 and OHSAS 18001 certified, ensuring environmental and occupational health and safety standards are met.

And most importantly, our tireless ambition to satisfy our customers has sealed long lasting quality and reliability onto our product.

### Application

Single phase insulated Power Voltage Transformers are intended to be connected to high voltage system and used for supplying low voltage level electrical power to substations or remote consumers, in areas where distribution grid is not accessible.

Based on the well proven design of an open-core Inductive Voltage Transformer type VPU, the Power Voltage Transformer type VPT inherits all features and advantages of a voltage instrument transformer.

### Performance

- Um: from 72,5 kV up to 550 kV
- Rated output: 10 - 100 kVA
- Rated secondary voltage according to customer requirements
- Rated frequency: 50 or 60 Hz

### Main Features

- Unique design with an open magnetic core - ensuring ferroresonance immunity
- Stainless steel bellows oil expansion system
- Sealing for life
- Explosion safe design
- High quality paper-oil main insulation
- Minimum oil design and PCB free - environment friendly
- Maintenance free
- Direct connection to high voltage system and power transformation to low voltage
- Compact size and light-weight design - easy transport and installation
- No transformer protection system necessary
- Standard ambient temperatures from -35 to +40 °C, extreme temperature ranges available upon request
- High quality porcelain or composite (silicone shed) insulator
- Extensive experience in seismically active regions
- Non-corrosive hardware
- Partial discharge free on power-frequency withstand voltage



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## DESIGN

### Primary Winding

The advantage of the open core design lies in having the primary winding composed of multiple sections uniformly stacked vertically along the height of the transformer. This ensures controlled distribution of dielectric stress on internal and external insulation.

Sectioned primary winding additionally ensures excellent cooling properties.

### Paper-Oil Insulation

The high voltage primary side is insulated from the low voltage secondary side by means of oil impregnated paper of high dielectric strength.

A substantial number of semi-conductive capacitive screens are inserted into the layers of paper insulation so as to adequately distribute the high-frequency overvoltages. Another advantage of the open-core design is that it enables the main insulation to be completely machine produced in shape of a cylinder.

The paper insulation is then dried in high vacuum and impregnated with high grade inhibited and degassed (moisture content of no more than 2 ppm) mineral transformer oil.

We guarantee the oil in our transformers not to contain polychlorinated biphenyls and terphenyls (PCB & PCT).

The paper-oil insulation is closed in and hermetically sealed off from ambient air by means of a stainless steel bellows. The stainless steel bellows compensates the thermal oil expansion and thus also serves as an expansion mechanism and an oil level indicator.

All of the points mentioned above ensure excellent and long lasting dielectric properties of the transformers main insulation.

### Magnetic Core and Secondary Windings

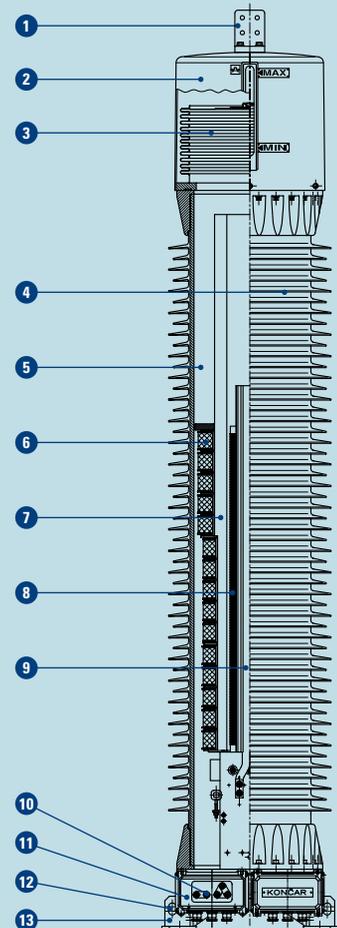
The magnetic core is made of stacked silicone steel sheets. Open core (single limb) design ensures a linearized magnetizing characteristic of the transformer, which eliminates possibility of ferroresonance within the power system.

Secondary windings are wound with high-grade insulated copper conductor directly onto the core, ensuring uniform flux density along the core height. Design and large cross-section makes them capable of withstanding a secondary short circuit, thus contributing to transformer safety.

Off-load tapping can be provided on secondary winding, with taps connections available in secondary terminal box.

### Cross-Section Drawing

1. Primary (high voltage) terminal
2. Bellows cover
3. Metallic bellows
4. Insulator with flanges
5. Mineral oil
6. Primary (high voltage) winding
7. Main insulation
8. Secondary (low voltage) winding
9. Magnetic core
10. Secondary (low voltage) terminals
11. Secondary terminal box
12. Lifting lugs
13. Transformer base



## Insulator

As per request, the external insulation can be either porcelain or composite. The porcelain insulators are made of the highest quality C130 aluminous porcelain, while the composite insulators are composed of a glass-fibre reinforced resin tube and silicone rubber sheds.

The insulators creepage distance is based on the ambient air pollution and is to be quoted in the inquiry.

## Housing

The transformer housing consists of a base, insulator, bellows and bellows cover.

During production, before the oil-filling process, a vacuum sealing test is performed on every transformer produced, ensuring perfect hermetical sealing of the enclosure.

The transformer base is made of high quality steel which is hot dip galvanized and additionally painted for long-lasting corrosion resistance. The transformer base accommodates the secondary terminal box, along with various other accessories, such as name plates, oil sampling and filling valve, lifting lugs, earthing terminals and an oil overpressure indicator.

Earthing terminal size and type are to be defined in the inquiry. The connection can be screw type (M12x35 mm), stranded copper conductor clamp or earthing pad.

## Explosion Safe Design

One of the main advantages inherited from the inductive voltage transformer design is the service safety.

Being composed of independent and insulated sections, the primary winding is explosion safe. In an unlikely case of a between-turns or between-layers failure within primary winding, fault remains localized to only one section and cannot spread to the entire primary winding. This ensures inherent explosion safety of VPT Power Voltage Transformers.

Furthermore, in case of unexpected oil pressure rise, the controlled pressure compensation and release take place through the metallic bellows without oil being spilled, thus preventing damage to the transformer. This also results in mechanical detachment of the bellows cover, and serves as a viable automatic disconnect mechanism from the HV grid.

Finally, our transformers are equipped with oil over-pressure sensors used to signal the operator or control system in case of irregular pressure build-ups and thus operate as an on-line monitoring system.

## Terminals

The Power Voltage Transformer is to be phase to ground connected. The high voltage primary terminal is made of aluminium alloy or, alternatively, of corrosion protected (tin or silver plated) electrolytic copper. The terminal shape and type are both chosen according to applicable standard and customers' requirements and practice.

Secondary windings terminals and optional secondary tap terminals, reside in the secondary terminal box. They are of the threaded bolt type, size M10, and are made of stainless steel. Other terminal types, materials and dimensions are available on request or depending on the ratings.

Cable glands or plates provide entry to the secondary terminal box and are designed in accordance with customers' needs.

## Transformer Dimensions

Power voltage transformers are produced according to specific customer requirements and usually in small series.

Standard dimensions are therefore difficult to define.

The actual transformer dimensions vary depending on rated voltage level, rated power, mechanical and environmental parameters defined in the inquiry.

Transformer dimensions are also susceptible to change in the course of technical developments.

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