

**TRADITION** - MANUFACTURING INSTRUMENT TRANSFORMERS SINCE 1947

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

**EXTENSIVE EXPERIENCE** - MORE THAN 40 YEARS OF SERVICE EXPERIENCE IN VPU TYPE OF VOLTAGE TRANSFORMERS, WITH MORE THAN 15.000 UNITS INSTALLED WORLDWIDE

**FLEXIBLE DESIGN** - READINESS AND WILLINGNESS TO COMPLY WITH CUSTOMER REQUIREMENTS

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

**VPU**  
INDUCTIVE VOLTAGE  
TRANSFORMERS  
72,5 to 550 kV



**KONČAR**

Končar - Instrument Transformers Inc.



## Application

Voltage transformers are used to step-down high voltage to defined values, and thus provide standardized, useable levels of voltage in a variety of power system protection, monitoring and measurement applications while insulating the measurement and protection equipment from high system voltage.

## Main Features & Performance

- Um: from 72,5 kV up to 550 kV
- Up to 6 secondary windings
- High-precision measurement accuracy and protection classes
- Unique design with an open magnetic core - ensuring ferroresonance immunity
- Explosion safe design
- Maintaining of designated accuracy class during entire transformer lifetime
- High quality paper-oil main insulation
- High thermal burden - up to 2500 VA in standard design, higher ratings possible
- Stainless steel bellows oil expansion system
- Sealing for life - every single transformer is vacuum tested with helium
- Nitrogen free
- Standard ambient temperatures from -35 to +40 °C (extreme temperature ranges upon request)
- High quality porcelain or composite (silicone shed) insulator
- Extensive experience in seismically active regions
- Minimum oil design and PCB free - environment friendly
- Non-corrosive hardware
- Maintenance free
- Partial discharge free on power-frequency withstand voltage

## Accessories

- Terminal for measuring dielectric dissipation factor ( $\text{tg}\delta$ )
- Oil level indicator
- Fuses or Micro circuit breakers (MCB) for secondary windings protection (optional)
- Revenue metering secondary terminals can be separately sealed
- Transport shock indicators (standard for  $U_m \geq 362$  kV, optional for all voltage levels)
- Internal overpressure indicator as online monitoring system (optional)

## Quality Assurance

Končar inductive voltage transformers are designed in compliance with IEC, ANSI/IEEE, GOST, AS, IS, CAN/CSA, or any other relevant standard.

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 standards are met.

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



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## DUCTIVE VOLTAGE INDUCTIVE VO

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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.

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 VPU transformers.

Sectioned primary winding additionally ensures excellent cooling properties, which makes this transformer have high thermal output ability.

### 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.

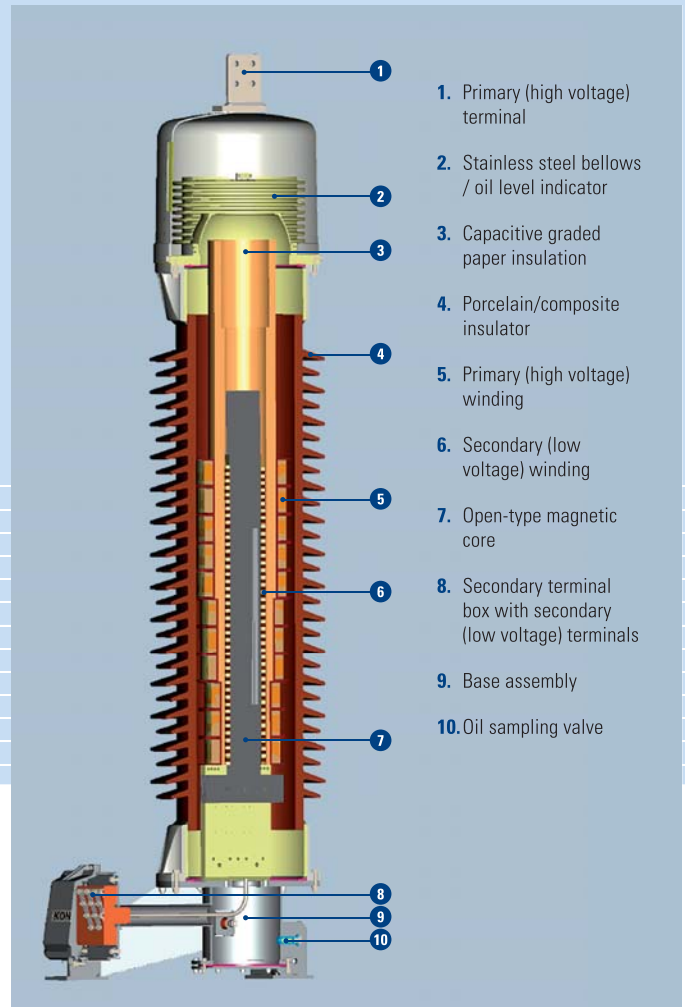
### Magnetic Core and Secondary Windings

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 enamelled copper wire directly onto the core, ensuring uniform flux density along the core height as well as phase displacement compensation. Furthermore, the large winding cross-section makes it capable of withstanding a secondary short circuit, thus contributing to transformer safety.

The active part is designed to accommodate up to 6 secondary windings having any accuracy class for metering or protection purposes. Dual transformation ratio can be achieved by taps on secondary windings.

### Cross-section Drawing



## 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 glass-fibre reinforced resin tube and silicone rubber sheds.

The insulator creepage distance is based on the ambient air pollution and is chosen to suite customer requirements.

The VPU inductive voltage transformer has been seismically tested and meets all of the IEEE Standard 693-2005 requirements.

## 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, ensuring perfect hermetical sealing of the enclosure.

The transformer base is made of either aluminium alloy or 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 plate, oil sampling and filling valve, lifting lugs, earthing terminals and an optional oil overpressure indicator.

Earthing terminal size and type are to be defined in the inquiry. The standard connection is screw type (M12 x 35) or a stranded copper conductor clamp.



## Terminals

The 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.

Standard secondary terminals are M8 in size and are of the threaded bolt type. They are made of stainless steel. Other terminal types, materials and dimensions are available on request.

The secondary terminals, along with optional protective devices and tariff terminal sealing, reside in the secondary terminal box. Cable glands or plates provide entry to the box and are designed in accordance with customers needs.

## Standard Dimensions

Type	Maximum System Voltage	Total Height	Total Weight	Oil Weight	Base mounting	Minimal Creepage Distance
	kV	mm	kg	kg	mm	mm
VPU-72,5	72,5	1900	305	50	330x330	1815
VPU-123	123	2170	350	60	330x330	3075
VPU-145	145	2170	370	65	330x330	3625
VPU-170	170	2400	480	95	330x330	4675
VPU-245	245	3460	700	130	410x410	6740
VPU-362	362	4550	1250	290	470x470	9050
VPU-420	420	4550	1300	290	470x470	10500
VPU-525	550	5050	1760	460	510x510	13750

The given indicative values refer to our standard porcelain versions and vary depending on electrical, mechanical and environmental parameters specified in the customers' inquiry.

The values are susceptible to change in the course of technical developments.

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