APPLICATION

A combined instrument transformer essentially consists of two measuring units: an inductive voltage transformer and a current transformer.
Combined instrument transformers are used to step-down current and voltage to the specified values and provide standardized current and voltage levels in a variety of power monitoring, measurement and protection applications, while insulating the measurement and protection equipment from high system voltage.

PERFORMANCE

- Um: 72,5 to 550 kV
- In: up to 6000 A
- Short circuit: up to 100 kA (Idyn: 250 kA peak)
- Secondary cores: up to 10
- Secondary windings: up to 6
- All measuring, protection and transient performance accuracy classes available

WHY USE A COMBINED UNIT INSTEAD OF TWO SEPARATE UNITS?

- All metering and protection functions integrated into a single unit
- Small footprint for additional space and cost savings
- Easier transport and installation
- Smaller oil volume

MAIN FEATURES

- High-quality paper-oil insulation
- Partial discharge free on power-frequency withstand voltage
- Hermetically sealed with a stainless-steel bellows oil expansion system
- Standard ambient temperatures from -35°C to +40°C (extreme temperature ranges upon request)
- High-quality porcelain or composite (silicone shed) insulator depending on customer preference
- High level of seismic performance according to the latest revision of the IEEE 693 standard. Conformance to any national or regional standard also possible
- Minimum oil design and PCB free – environment friendly
- Advanced corrosion protection for maritime, industrial or other demanding installation locations
- Maintenance free

CURRENT TRANSFORMER

- Top-core design
- Primary and/or secondary transformation ratio selection. Single, Dual or Multi ratio options available
- Low leakage reactance and minimal primary winding losses
- Internal arc protection

VOLTAGE TRANSFORMER

- Unique design with an open magnetic core – ensuring ferroresonance immunity
- Explosion-safe design that limits the energy under internal fault conditions
- Standard thermal burden up to 2500 VA, higher values available on request

Included Accessories:

- Terminal for dielectric dissipation factor (tgδ) measurement
- Oil level indicator
- Transport shock indicators (standard for Um≥362 kV, optional for other voltage levels)
- Bolt or connector for transformer earthing
- Oil sampling valve
- Provisions for lifting

Optional Accessories:

- Surge arresters on primary or secondary windings
- Revenue metering secondary terminals can be sealed separately
- Fuses or Micro Circuit Breakers (MCB) for secondary winding protection
- Internal overpressure indicator
- Terminal box heaters

Quality assurance

Končar combined transformers are designed in compliance with IEC, ANSI/IEEE, GOST, AS, IS, CAN/CSA, JIS 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 ISO 45001 certified, ensuring compliance with environmental and occupational health standards.
Our testing facilities are accredited according to the ISO/IEC 17020 and 17025 standards, with results traceable to any ILAC signatory worldwide.

STANDARD CHARACTERISTICS AND DIMENSIONS

Our units are custom made according to customer specification and preference. The table below contains indicative values referring to our standard units with porcelain insulators. Any dimension or characteristic listed can vary, depending on electrical, mechanical and environmental parameters specified in the customers' inquiry. The values are susceptible to change in the course of technical development.

TYPE	HIGHEST VOLTAGE FOR EQUIPMENT [kV]	RATED POWER-FREQUENCY WITHSTAND VOLTAGE [kV]	RATED LIGHTNING IMPULSE WITHSTAND VOLTAGE [kV]	DIMENSIONS [mm]				WEIGHT [kg]	OIL VOLUME [l]
				TRANSFORMER HEIGHT	HEIGHT OF THE PRIMARY TERMINAL	BASE MOUNTING	CREEPAGE DISTANCE		
VAU-72,5	72,5	140	325	2500	1900	□ 520	1815	490	95
VAU-123	123	230	550	2550	2100	□ 520	3075	520	95
VAU-145	145	275	650	2700	2200	□ 520	3625	550	115
VAU-170	170	325	750	2950	2400	□ 520	4250	610	160
VAU-245	245	460	1050	3720	3120	□ 520	6125	900	210
VAU-300	300	460	1050	3900	3300	□ 520	7500	1100	275
VAU-362	362	510	1175	4870	4070	□ 650	9050	1500	440
VAU-420	420	630	1425	5330	4550	□ 650	10500	1950	485
VAU-525	550	680	1550	6590	5620	□ 750	13750	2390	730

TRANSFORM EVERYDAY

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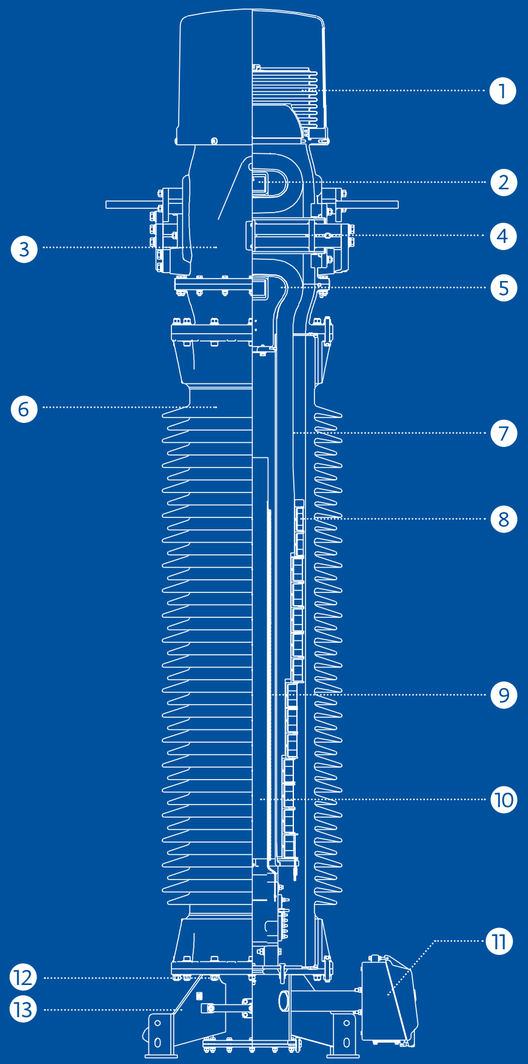
TAILOR – MADE DESIGN

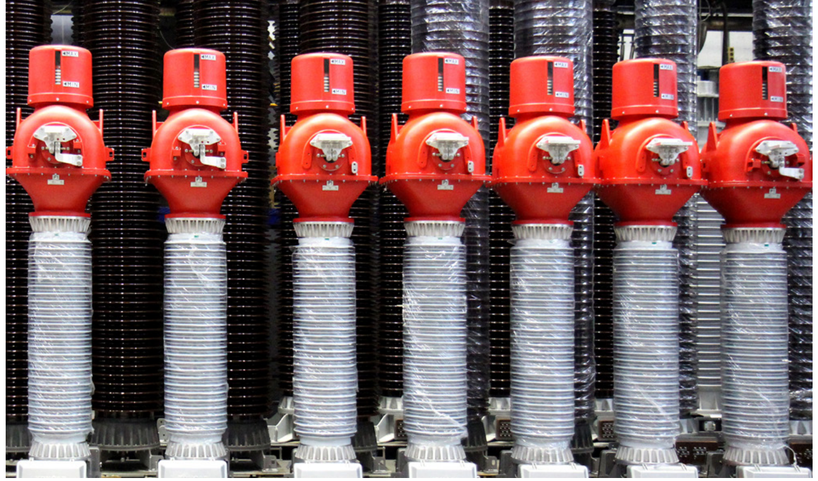
VAU

COMBINED INSTRUMENT TRANSFORMERS
72,5 to 550 kV

KONČAR
Končar - Instrument transformers, Inc.



1. STAINLESS STEEL BELLOWS / OIL LEVEL INDICATOR
2. CT CORES WITH SECONDARY WINDINGS
3. TRANSFORMER HEAD
4. CT PRIMARY WINDING
5. CT CORE ENCLOSURE
6. INSULATOR
7. MAIN INSULATION
8. VT SECTIONED PRIMARY WINDING
9. VT SECONDARY WINDING
10. OPEN CORE
11. SECONDARY TERMINAL BOX
12. BASE ASSEMBLY
13. OIL SAMPLING VALVE



DESIGN

CURRENT TRANSFORMER

The active part of the top-core current transformer comprises wound toroidal cores and an aluminium or copper primary winding, with paper insulation in between.

The advantage of the top-core design lies in having the primary winding uniformly and symmetrically spread around the cores. Therefore, local saturation is avoided, and minimal leakage reactance is ensured. Additionally, the top-core design results in minimal primary winding losses.

Variable transformation ratios are achieved through reconnection on either the primary (HV) and/or secondary (LV) side.

The transformer can accommodate up to 10 cores of various sizes and material types. Depending on the required accuracy class, the cores can be made of cold-rolled grain-oriented magnetic steel, soft magnetic materials and nanocrystalline alloys. An adequate material selection also allows the transformer accuracy to be maintained over an extended current range, even exceeding the requirements specified in current international standards.

High-grade enamelled wire is uniformly wound around the core to achieve minimum leakage reactance, which in turn enables accurate software computation of CT response in transient network conditions.

The cores and the secondary winding reside inside an aluminium cast enclosure, which is designed to safely lead the fault current to the ground without the danger of an arc occurring within the external insulator.

VOLTAGE TRANSFORMER

The magnetic core is made of stacked silicone steel sheets. The open core (single limb) ensures a linearized transformer magnetizing characteristic, which eliminates the 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 enables it to withstand a secondary short circuit, thus ensuring a safe operation in fault conditions.

One of the significant advantages of the open-core design is the primary winding, which is composed of multiple independent and insulated sections uniformly stacked vertically along the transformer height. This ensures a controlled distribution of dielectric stress on internal and external insulation and excellent cooling properties, which allow for a high thermal output.

In an unlikely case of a failure between turns or between layers within the primary winding, the fault remains localized to only one section and cannot spread to the entire primary winding. This feature limits the fault current and ensures inherent explosion safety of the VAU combined transformers. This feature is independent of the insulator type.

Paper-Oil Insulation

The high-voltage primary side is insulated from the low-voltage secondary side with oil-impregnated paper of high dielectric strength. The open-core concept allows for a design in which the current and voltage active parts both use the same paper-oil insulation.

Conductive capacitive screens are inserted between layers of paper insulation to adequately distribute the high-frequency overvoltages. The paper insulation is dried in high vacuum and impregnated with high-grade inhibited or uninhibited, degassed and dried (moisture content of no more than 2 ppm) mineral transformer oil.

The paper-oil insulation is closed in and hermetically sealed from ambient air with stainless steel bellows, which also compensate for thermal oil expansion and serve as both an expansion mechanism and an oil level indicator.

All these features ensure excellent and long-lasting dielectric properties of the transformer's main insulation system.

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

Insulator

As per request, external insulation can be either porcelain or composite. 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 insulator creepage distance is based on the ambient air pollution and is to be quoted in the inquiry.

Enclosure

The transformer enclosure consists of the base assembly, insulator, head, bellows and bellows cover.
The active part of the current transformer is located inside the aluminium cast head, which is designed to achieve minimal oil volume. The current transformer active part extends into the voltage transformer active part, located inside the insulator. This concept is similar to that of a power transformer bushing and is designed to achieve minimal oil volume.
The transformer base is made of either cast aluminium or high-quality steel, which is hot dip galvanized and additionally painted for long-lasting corrosion resistance. It contains the secondary terminal box, oil sampling and filling valve, lifting lugs, earthing terminals and an optional oil overpressure indicator. Several levels of corrosion protection can be specified, depending on environmental conditions at the installation site.
The size and type of the earthing terminals are to be defined in the inquiry. The standard connection is bolt type (M12 x 35) or a stranded copper conductor clamp.
Every transformer is subjected to a rigorous vacuum sealing test to ensure a perfect hermetical sealing of the entire enclosure.
The VAU combined transformers have been seismically tested and they meet all the requirements of the latest version of the IEEE 693 Standard or equivalent seismic standards.

Terminals

The high-voltage primary terminal can be made of aluminium or galvanic corrosion-protected electrolytic copper. Standard secondary terminals are stainless-steel threaded bolts (size M8).

Other terminal types, materials and dimensions are available on request.

Secondary terminals, along with protective devices and other additional accessories, reside in the secondary terminal box. Cable glands or plates provide entry to the box and are designed according to customer specification and preference.

KEY VALUES

EXPERIENCE
More than 70 years of experience in the design, manufacture, testing and delivery of instrument transformers

PRESENCE
Over 100 countries across all continents

EXPERTISE
We are not only manufacturers, but also engineers and researchers. Turn to us for advice, recommendations and guidance

TAILOR-MADE DESIGN
We cater to any customer requirement
Your units are being built just for you

LONGEVITY
Our insulation system design philosophy, rigorous internal testing criteria and advanced quality control allow us to declare a 50-year service life of our units

SERVICE
Continuous after-sales services are always available for any questions or doubts you may have, both technical and commercial