HIGH VOLTAGE.
INSTRUMENT
TRANSFORMERS.
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   › Dry insulation

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1. CURRENT TRANSFORMERS

Oil-paper insulation
Gas insulation
Dry insulation

420 kV Current transformers with gray silicone rubber insulator. Statnett (Norway).
1. CURRENT TRANSFORMERS > Oil-paper, gas and dry insulation

INTRODUCTION

Current transformers are designed to provide a scaled down replica of the current in the HV line and isolate the measuring instruments, meters, relays, etc., from the high voltage power circuit.

Oil-paper insulation: model CA up to 800 kV, model CH up to 145 kV.

Gas insulation: model CG up to 300 kV.

Dry insulation: model CX up to 72.5 kV.
1. CURRENT TRANSFORMERS > Oil-paper, gas and dry insulation

SECTIONS

1. Oil volume compensating system
2. Oil level indicator
3. Primary terminal
4. Cores and secondary windings
5. Primary winding
6. Secondary conductors
7. Insulator (porcelain or silicone rubber)
8. Capacitive bushing
9. Reinforced earth connection
10. Oil sampling valve
11. Tangent delta tap
12. Earthing terminal
13. Secondary terminal box
14. Pressure relief device
15. Head

16. Manometer
17. HV electrode
18. Equipotential ring
19. Resin insulator

1. CURRENT TRANSFORMERS > Oil-paper, gas and dry insulation
APPLICATIONS

Ideal for installation at metering points due to its very high accuracy.

Excellent frequency response; ideal for monitoring power quality and measuring harmonics.

Suitable for installation in AC and DC filters in converter substations for HVDC projects.

Examples of applications:

1. Protection for high voltage lines and substations.

2. Protection for capacitor banks.

3. Protection for power transformers.

4. Revenue metering.

1. 765 kV Current transformer. RAO-FSK (Russia).

2. 245 kV Current transformer protecting capacitor bank (India).


4. 420 kV Current transformers. Rede Elétrica Nacional (Portugal).
The current transformer consists of one or several cores with their corresponding secondary windings (active parts).

**CA RANGE:**
The active parts are located in the top part inside a metal box that acts as a low-voltage shield; the main oil-paper insulation is wrapped around, ending up with a high-voltage shield. The primary conductor can be a pass-through bar (with or without external reclosings) or a winding, depending on the case. The secondary cables run through an oil-paper insulated capacitive bushing with several shields for proper electrical field distribution.

**CH RANGE:**
The active parts are located in the bottom part. The primary conductor is hairpin shaped and the main oil-paper insulation is wrapped around it, including several intermediate capacitive shields so that the electrical field is properly distributed.

**CG RANGE:**
The active parts are located in the top part, inside a metal box that acts as a low-voltage shield surrounded by SF6 gas insulation. The primary conductor can be a pass-through bar with or without external reclosings. The secondary conductors run through a low voltage tube to the secondary terminal block. Around this metal tube, there is a high voltage electrode so that the electrical field is properly distributed.

**CX RANGE:**
The active parts are located approximately in the center of the resin body, vacuum cast with epoxy resin, which fixes and isolates the active parts, creating a rigid body with high mechanical resistance, excellent thermal performance and dielectric withstand capability.

This resin body is inside a hollow porcelain or silicone rubber insulator. The chamber between the resin body and the insulator is hermetically sealed with nitrile rubber gaskets; this space is filled with oil for insulation levels above 36 kV.

With more than 65 years of experience, ARTECHE guarantees the performance of its transformers under challenging operating conditions such as extreme temperature, salty or polluted environment, seismic hazard areas, violent winds or high altitude.
1. CURRENT TRANSFORMERS > Oil-paper, gas and dry insulation

ADVANTAGES

› Variety of designs and technologies of insulation for greater adaptation to client needs.
› Robust mechanical strength and reduced size due to a compact design that is easy to transport, store and install, and which reduces visual impact.
› Hermetically sealed to guarantee complete water tightness with the minimum volume of oil or gas (Each unit is tested individually).
› Excellent response under extreme weather conditions (Oil-paper insulation from -55°C; up to +55°C; gas insulation from -45°C up to +55°C), altitudes over 1.000 m.a.s.l., seismic hazard areas, violent winds, etc.
› Maintenance-free throughout their lifespan.
› Very high and invariable accuracy (up to 0,1%).
› Protection for the secondary windings in the terminal block.
› Wide range of primary and secondary terminals.
› Different cable glands and accessories available.
› Each transformer is routine tested for partial discharges, tangent delta (DDF), insulation and accuracy. Designed to withstand all the type test included in the standards.
› Compliance to any international standards: IEC, IEEE, UNE, BS, VDE, SS, CAN, AS, BS, NBR, JIS, GOST, NF...
› Officially homologated in-house testing facilities.
› May be transported and stored horizontally or vertically.
1. CURRENT TRANSFORMERS > Oil-paper, gas and dry insulation

**OIL-PAPER INSULATION:**

Wide range of primary currents: from 1 to 5,000 A.

Oil level compensating system that effectively regulates changes in oil volume mainly caused by temperature.

Oil sampling valve for periodic analysis.

The materials used for construction are recyclable and resistant to the elements. Its advanced design adheres to environmental regulations through the use of high quality insulating oils, free of PCB.

**Top-core Type:**

- All types of measurement and protection cores: multi-ratio, linear...
- Very high rated currents and short-circuit currents.
- Reinforced safety design, resistant to internal arc.
- Metallic oil bellows and tangent delta measurement tap.

**Hairpin Type:**

- Excellent seismic performance.
- Good heat dissipation in the primary conductor.
- Reduced size makes it extremely easy to handle.
- Option for metallic oil bellows and tangent delta measurement tap.

**OPTIONS:**

- Silicone rubber insulator.
- Capacitive voltage tap.

**GAS INSULATION:**

- Total safety in case of internal arc: overpressure is relieved by the pressure relief device (rupture disc) in the top part of the head.
- The silicone rubber insulator guarantees safety during transportation and service.
- Online monitoring of the insulation status with a manometer alarm.
- Compact and very light design.
- Designed to minimize gas volume, pressure and leaks, thus reducing its environmental impact.

**DRY INSULATION:**

- Cast in high dielectric strength resin.
- Primary winding with spark gap for over-voltage protection.
- Compact design for easy handling.
- May be transported, stored and installed vertically or horizontally.
- Porcelain or silicone rubber insulators.

Innovations in transformers in recent years have made them more efficient with compact designs, making them easy to transport, store and install; minimizing visual impact.
ARTECHE transformers are installed in over 150 countries.
1. CURRENT TRANSFORMERS > Oil-paper, gas and dry insulation

RANGE

ARTECHE current transformers are named with the letters CA (top-core type, oil-paper) CH (hairpin type, oil-paper), CG (gas type) or CX (dry type) followed by 2 or 3 numbers indicating the maximum service voltage for which they have been designed.

The table on the next page shows the range manufactured by ARTECHE. These characteristics are merely indicative; ARTECHE can manufacture transformers to comply with any domestic or international standard.

Winding ratios: all types of combinations possible in a single device.

Secondary windings for:

› Protection: all possible types, including linear cores, low induction, etc.

› Metering: accuracy classes for any metering/billing need (including high accuracy class 0.1 / 0.15 with extended range in current).

Number of secondary windings: as per customer needs, up to 10 secondary windings (or more) are possible in a single device.
1. CURRENT TRANSFORMERS > Oil-paper, gas and dry insulation

> Routine test performed on a CG 145 kV.
> 36 kV Current transformers, Fingrid, Kimy (Finland).
## Instrument transformers | High voltage

### 1. CURRENT TRANSFORMERS > Oil-paper, gas and dry insulation

#### Oil-paper insulation > Model CA

<table>
<thead>
<tr>
<th>Model</th>
<th>Highest voltage (kV)</th>
<th>Rated insulation level</th>
<th>Standard creepage distance (mm)</th>
<th>Dimensions</th>
<th>Weight (kg)</th>
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<td>3.625</td>
<td>330 2.250 2.565</td>
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</table>

Approximate dimensions and weights. For special requirements, please consult.

Primary currents: from 1 A to 5,000 A. Short circuit currents: up to 120 kA.

### Oil-paper insulation > Model CH

<table>
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<tr>
<th>Model</th>
<th>Highest voltage (kV)</th>
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<th>Standard creepage distance (mm)</th>
<th>Dimensions</th>
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<td>275 650</td>
<td>3.625</td>
<td>330 2.250 2.565</td>
<td>430</td>
</tr>
</tbody>
</table>

Approximate dimensions and weights. For special requirements, please consult.

Primary currents: from 1 A to 2,000 A. Short circuit currents: up to 48 kA.
## Gas insulation > Model CG

<table>
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<tr>
<th>Model</th>
<th>Highest voltage (kV)</th>
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<td>Power frequency (kV)</td>
<td>Lightning impulse (BIL) (kVp)</td>
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<td>T (mm)</td>
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</table>

Approximate dimensions and weights. For special requirements, please consult.

Primary currents: up to 5,000 A. Short circuit currents: up to 120 kA/1 s.

## Dry insulation > Model CX

<table>
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<tr>
<th>Model</th>
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<td>140</td>
<td>325</td>
<td>1860</td>
<td>330</td>
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</tbody>
</table>

Approximate dimensions and weights. For special requirements, please consult.

Primary currents: from 1 A to 2,400 A. Short circuit currents: up to 120 kA/1 s.
Over 2,100 professionals committed to a common project.
2. INDUCTIVE VOLTAGE TRANSFORMERS
Oil-paper insulation
INTRODUCTION

Inductive voltage transformers are designed to provide a scaled down replica of the voltage in the HV line and isolate the measuring instruments, meters, relays, etc., from the high voltage power circuit.
2. INDUCTIVE VOLTAGE TRANSFORMERS > Oil-paper insulation

SECTIONS

1. Oil level indicator
2. Primary terminal
3. Oil volume compensating system
4. Capacitive bushing
5. Oil-paper insulation
6. Compensation windings
7. Primary windings
8. Secondary windings
9. Core
10. Insulator (porcelain or silicone rubber)
11. Tangent delta measuring tap
12. Secondary terminal box
13. Oil sampling valve
14. Earthing terminal
2. INDUCTIVE VOLTAGE TRANSFORMERS > Oil-paper insulation

APPLICATIONS

Ideal for installation at metering points due to its very high accuracy class.

Suitable for the discharge of high-voltage lines and capacitor banks.

Excellent frequency response; ideal for monitoring power quality and measuring harmonics.

Examples of applications:

1. Revenue metering.

2. Discharge of capacitor lines and banks.

3. Protection for high voltage lines and substations.

4. Supply for auxiliary services.

1. 123 kV Inductive voltage transformers (Bosnia).

2. 123 kV Inductive voltage transformers. Transpower (New Zealand).

3. 420 kV Inductive voltage transformers. Rede Eléctrica Nacional (Portugal).

4. 245 kV Inductive voltage transformer. Coyote Switch (USA).
DESIGN AND MANUFACTURE

Voltage transformers can have several secondary windings for metering and/or protection. The primary winding and all the secondary windings are wound around the same core, which is loaded with the total burden.

The core and the windings are located inside a metallic tank. The windings have an anti-resonant design, which makes the transformer work properly both at power frequency and during temporary high frequency transients.

ADVANTAGES

- Very high and invariable accuracy (up to 0.1%) steady for the operation life of the equipment, with maximum reliability.
- Anti-resonant winding design.
- Safe design in case of internal fault thanks to:
  - Active parts located inside metallic tank, separated from the insulator.
  - Pressure relief devices.
  - Electrical connections resistant to short circuit.
- Robust mechanical strength and reduced size due to a compact design that is easy to transport, store and install, and which reduces visual impact.
- Oil level compensating system that effectively regulates changes in oil volume mainly caused by temperature.
- Hermetically sealed to guarantee complete water tightness with the minimum volume of oil or gas. (Each unit is tested individually).
- Oil sampling valve for periodic analysis.
- Maintenance-free throughout their lifespan.

High and steady accuracy, combined with safe design and maximum reliability.

› Oil level indicator.
› Various types of insulators available (silicone, gray porcelain, colored porcelain ...).
2. INDUCTIVE VOLTAGE TRANSFORMERS > Oil-paper insulation

› Environmental-friendly design through the use of high quality insulating oils free of PCB. The materials used are recyclable and resistant to the elements.
› Excellent response under extreme weather conditions (from -55°C; up to +55°C), altitudes over 1000 m.a.s.l., seismic hazard areas, violent winds, etc.
› Each transformer is routine tested for partial discharges, tangent delta (DDF), insulation and accuracy. Designed to withstand all the type test included in the standards.
› Compliance to any international standards: IEC, IEEE, UNE, BS, VDE, SS, CAN, AS, NBR, JIS, GOST, NF.
› Officially homologated in-house testing facilities.
› May be transported and stored horizontally or vertically.

OPTIONS:
› Wide range of primary and secondary terminals.
› Silicone rubber insulator.
› Sealable secondary terminals.
› Secondary terminal protection devices inside the terminal box.
› Oil compensation system with metallic bellows. Option for rubber diaphragm up to 170 kV.
› Current through connection to the HV line.
› Vertical primary terminal.

› 420 kV Inductive voltage transformers. R.E.E. (Spain).
ARTECHE inductive voltage transformers are named with the letters (UT) followed by 1 additional letter and 2 or 3 numbers indicating the maximum voltage of the network for which they are designed.

The table on the next page shows the range of both types of transformers currently manufactured by ARTECHE. These characteristics are merely indicative; ARTECHE can manufacture them to comply with any domestic or international standard.

**Standard accuracy classes and burdens:**

- According to IEC standards
  - 100 VA Class 0,2 / 3P
  - 250 VA Class 0,5 / 3P
- According to IEEE standards
  - 0.3 WXYZ
  - 1.2 WXYZ, ZZ

Higher accuracy classes and burdens available.

- Model UTB/UTD/UTE/UTF/UTG up to 300 kV
- Model UTF from 362 kV
- 123 kV Inductive voltage transformers. Electronet Services (New Zealand).
- 420 kV Inductive voltage transformers. Elia (Belgium).
2. INDUCTIVE VOLTAGE TRANSFORMERS > Oil-paper insulation

<table>
<thead>
<tr>
<th>Model</th>
<th>Highest voltage (kV)</th>
<th>Power frequency (kV)</th>
<th>Lightning impulse (BIL) (kVp)</th>
<th>Switching impulse (kVp)</th>
<th>Thermal burden (VA)</th>
<th>Standard creepage distance (mm)</th>
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</tbody>
</table>

Approximate dimensions and weights. For special requirements, please consult.
3. COMBINED TRANSFORMERS
Oil-paper insulation

› 123 kV Combined transformers.
INTRODUCTION

Combined Instrument Transformers contain a current transformer and an inductive voltage transformer within the same body.

They are therefore used in the same applications as the independent transformers in them; they separate meters, counters, relays, etc., from the high voltage circuit, and provide a scaled replica of the current and voltage in the HV line.
3. COMBINED TRANSFORMERS > Oil-paper insulation

SECTIONS

1. Oil volume compensating system
2. Oil level indicator
3. Primary terminal (P1)
4. CT primary winding
5. CT secondary winding
6. Primary terminal (P2)
7. CT cores
8. Insulator (Porcelain or silicone rubber)
9. VT capacitive bushing
10. CT capacitive bushing
11. VT primary winding
12. Secondary terminal box
13. VT secondary winding
14. VT core
15. Earthing terminal
16. Oil sampling valve

> Up to 245 kV
3. COMBINED TRANSFORMERS > Oil-paper insulation

APPLICATIONS

Combined transformers are suitable for use in substations where space or installation costs make using independent transformers difficult.

Ideal for installation at metering points due to their very high accuracy class, both in current and voltage.

Suitable for the discharge of high-voltage lines and capacitor banks.

Excellent frequency response; ideal for monitoring power quality and measuring harmonics.

Examples of applications:

1. Protection for high voltage lines and substations.

2. Revenue metering.

› 72.5 kV Combined transformers in substation incoming line. L’ONE (Morocco).
Combined transformers gather the manufacturing characteristics of current transformers (CA type) and inductive voltage transformers (UT type).

The CT active parts are located in the top part inside a metal box that acts as a low-voltage shield; the main oil-paper insulation is wrapped around it, ending up with a high-voltage shield. The primary conductor can be a pass-through bar (with or without external reclosings) or a winding, depending on the case. The secondary cables run through an oil-paper insulated capacitive bushing with several shields for proper electrical field distribution.

Voltage transformers can have several secondary windings for metering and/or protection. The primary winding and all the secondary windings are wound around the same core, which is loaded with all the burden.

The core and the windings are located inside a metallic tank. The windings have an anti-resonant design, which makes the transformer work properly both at power frequency and during temporary high frequency transients.

ARTECHE’S experience with major transmission lines explains why we are a key figure in future power links between countries and continents.
ADVANTAGES

› Less space needed in the substation, transportation and storage.
› Savings:
  - Support structures, connectors and installation time.
  - Inspection and maintenance.
  - Spare parts.
› Excellent response under extreme weather conditions (from -55°C; up to +55°C), altitudes over 1,000 m.a.s.l., seismic hazard areas, violent winds, etc.
› Robust mechanical strength and reduced size due to a compact design that is easy to transport, store and install, and which reduces visual impact.
› Hermetically sealed to guarantee complete water tightness with the minimum volume of oil or gas. (Each unit is tested individually)
› Reinforced safety design, resistant to internal arc.
› Oil level compensating system that effectively regulates changes in oil volume mainly caused by temperature.
› Oil sampling valve for periodic analysis.
› Maintenance-free throughout their lifespan.
› Environmental-friendly design through the use of materials recyclable and resistant to the elements. Its advanced design adheres to environmental regulations through the use of high quality insulating oils, free of PCB.
› Each transformer is routine tested for partial discharges, tangent delta (DDF), insulation and accuracy. Designed to withstand all the type test included in the standards.
› Compliance to any international standards: IEC, IEEE, UNE, BS, VDE, SS, CAN, AS, NBR, JIS, GOST, NF...
› Officially homologated in-house testing facilities.
› May be transported and stored horizontally or vertically.

OPTIONS:

› Silicone rubber insulation.
› Tangent delta measurement tap and capacitive tap.
› Wide range of primary and secondary terminals.
› Different cable glands and accessories available.
ARTECHE combined instrument transformers with oil-paper insulation are named with the letters KA followed by 2 or 3 numbers indicating the maximum service voltage for which they have been designed.

The table on the next page shows the range of combined transformers currently manufactured by ARTECHE. These characteristics are merely indicative; ARTECHE can manufacture these transformers to comply with any domestic or international standard.

Current ratios: all types of combinations possible in a single device.

Secondary windings for:
- Protection: all possible types, including linear cores, low induction, etc.
- Metering: accuracy classes for any metering/billing need (including high accuracy class 0.1 / 0.15 with extended range in current).

Number of secondary windings: as per customer needs.

**Standard accuracy classes and burdens for voltage transformer:**
- According to IEC standards
  - 100 VA Class 0.2 / 3P
  - 250 VA Class 0.5 / 3P
- According to IEEE standards
  - 0.3 WXYZ
  - 1.2 WXYZ, ZZ

Higher accuracy classes and burdens available.

1. COMBINED TRANSFORMERS > Oil-paper insulation

**RANGE**

> 170 kV Combined transformers. Pechinney (The Netherlands).
### Oil-paper insulation > Model KA

<table>
<thead>
<tr>
<th>Model</th>
<th>Highest voltage (kV)</th>
<th>Rated insulation level</th>
<th>Power frequency (kV)</th>
<th>Lightning impulse (BIL) (kVp)</th>
<th>Standard creepage distance (mm)</th>
<th>No. secondaries*</th>
<th>Dimensions (mm)</th>
<th>Weight (kg)</th>
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<td></td>
<td></td>
<td></td>
<td>395</td>
<td></td>
<td>TI 3</td>
<td></td>
<td>450x590</td>
<td>3.315</td>
</tr>
</tbody>
</table>

*TI: Current transformer  **TT: Voltage transformer

Approximate dimensions and weights. For special requirements, please consult.
4. CAPACITIVE VOLTAGE TRANSFORMERS AND COUPLING CAPACITORS

Oil-paper insulation

420 kV Capacitive voltage transformers. Fingrid, Visulahti (Finland).
Capacitive voltage transformers isolate the measuring instruments, meter, relays, protections, etc., from the high voltage power circuit and provide a scaled replica of the voltage in the HV line.

They enable transmission of high frequency signals through the high voltage HV lines.

Coupling Capacitors are only used for coupling high frequency communication signals and they are equivalent to the capacitive part of a CVT.

Capacitive voltage transformer
model DFK up to 800 kV,
model DDB up to 170 kV.

Coupling capacitor:
model DFN up to 800 kV,
model DDN up to 170 kV.
SECTIONS

1. Primary terminal
2. Oil volume compensating system
3. Insulator (porcelain or silicone rubber)
4. Capacitors
5. Intermediate voltage tap
6. High frequency terminal
7. Inductive voltage transformer
8. Oil level indicator
9. Carrier accessories
10. Oil sampling valve
11. Earthing terminal
12. Secondary terminal box

> Capacitive voltage transformer
> Coupling capacitor
APPLICATIONS

Ideal for installation at metering points due to its very high accuracy class and extremely steady capacitance.

Transmission of high-frequency signals through the high voltage lines (PLC).

Helps to reduce voltage peaks in the line.

Examples of applications:

1. Revenue metering.
2. Protection for high voltage lines and substations.
3. Transmission of high frequency signals.

400 kV Capacitive voltage transformers. R.E.E. (Spain).
DESIGN AND MANUFACTURE

Capacitive voltage transformers consist of a series of capacitors connected in series on top of a tank in which the electromagnetic unit (inductive transformer (5), series reactor (8) and auxiliary elements) is housed. These capacitors form a voltage divider (2, 3) between the high voltage terminal (1) and the high frequency terminal (4).

The capacitors, impregnated with high grade dielectric oil, are housed in one or more insulators. Each of them forms an hermetically sealed independent unit, with a very stable capacitance over time.

The high frequency terminal (4) for the PLC signal comes out of one side through a piece of resin that separates the capacitive unit from the inductive voltage transformer.

The medium voltage inductive voltage transformer is immersed in mineral oil and housed inside an hermetically sealed metallic tank.

The secondary terminals are located inside a box (7) enabling connections and has space with protection elements such as fuses or circuit breakers.

 › Earthing switch for safety handling during operation.
 › Protection devices for the secondaries may be installed inside the terminal block.
ADVANTAGES

› High stability of capacity, and therefore of accuracy.
› Reliable ferroresonance suppression system that does not affect transient response or accuracy.
› Excellent mechanical resistance to seismic forces.
› Pressure relief device to guarantee maximum safety.
› Robust mechanical strength and reduced size due to a compact design that is easy to transport, store and install, and which reduces visual impact.
› Hermetically sealed to guarantee complete water tightness with the minimum volume of oil or gas (Each unit is tested individually).
› Oil level compensating system that effectively regulates changes in oil volume.
› Maintenance-free throughout their lifespan.
› Environmental-friendly design through the use of materials recyclable and resistant to the elements. Its advanced design adheres to environmental regulations through the use of high quality insulating oils, free of PCB.
› Excellent response under extreme weather conditions (from -55°C; up to +55°C), altitudes over 1,000 m.a.s.l., seismic hazard areas, violent winds, etc.
› Each transformer is routine tested for partial discharges, tangent delta (DDF), insulation and accuracy. Designed to withstand all the type test included in the standards.
› Compliance to any international standards: IEC, IEEE, UNE, BS, VDE, SS, CAN, AS, NBR, JIS, GOST, NF...
› Officially homologated in-house testing facilities.

OPTIONS:

› Silicone rubber insulation.
› Carrier accessories.
› Earthing switch for the inductive part.
› Wide range of primary and secondary terminals.
› Sealable secondary terminals.
› Line traps can be installed on the top.
› Different cable glands and accessories available.
› Wide range of capacitances.
› Secondary terminal protection devices inside the terminal box.

Maximum safety and reliability within a custom-made design.
RANGE

ARTECHE capacitive voltage transformers and coupling capacitors are named with different letters (DDB or DFK for transformers; DDN or DFN for capacitors) followed by 2 or 3 numbers indicating the maximum voltage of the network for which they are designed.

The tables show the ranges of both types of devices currently built by ARTECHE. These characteristics are merely indicative; they can be manufactured to comply with any domestic or international standard.

Standard accuracy classes and powers:

› According to IEC standards
  100 VA Class 0,2 / 3P
  250 VA Class 0,5 / 3P

› According to IEEE standards
  0,3 WXYZ
  1,2 WXYZ, ZZ

Higher accuracy classes and burdens available.

> 245 kV Capacitive voltage transformers, NEPCO (Jordan).
> 525 kV Capacitive voltage transformers, UTE (Uruguay).
## Capacitive Voltage Transformers and Coupling Capacitors

### Capacitive Voltage Transformers

<table>
<thead>
<tr>
<th>Model</th>
<th>Highest Voltage (kV)</th>
<th>Rated Insulation Level</th>
<th>Standard Capacitance (pF)</th>
<th>High Capacitance (pF)</th>
<th>Standard Creepage Distance (mm)</th>
<th>Dimensions</th>
<th>Weight (kg)</th>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>A (mm)</td>
<td>H (mm)</td>
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Approximate dimensions and weights. For special requirements, please consult. Higher capacities available upon request.

### Coupling Capacitors

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<th>Highest Voltage (kV)</th>
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<th>Standard Capacitance (pF)</th>
<th>High Capacitance (pF)</th>
<th>Standard Creepage Distance (mm)</th>
<th>Dimensions</th>
<th>Weight (kg)</th>
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<td></td>
<td></td>
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<td>H (mm)</td>
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<td>15.300</td>
<td>450</td>
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</tbody>
</table>

Approximate dimensions and weights. For special requirements, please consult. Higher capacities available upon request.
5. AUXILIARY SERVICES

VOLTAGE TRANSFORMERS

Oil-paper insulation

Gas insulation

245 kV Transformer for substation auxiliary services, model UTE Coyote Switch (USA).
INTRODUCTION

This type of voltage transformer can supply several kVA low voltage power directly from a high voltage transmission line.

It offers all the benefits of a potential transformer with the applications of a distribution transformer.

Oil-paper insulation: model UT up to 245 kV and 10 kVA; model UTP up to 362 kV and 333 kVA.

Gas insulation: model SVR up to 550 kV and 50 kVA.
APPLICATIONS

1. **Substations auxiliary services power supply:**
   Power supply in conventional substations where low voltage power is needed as a primary or back-up supply; or in remote areas where building distribution lines is unsafe and with unreliable supply that requires frequent maintenance and high costs.

   It can also be used as a primary power source in switching substations without power transformers to supply the substation and SCADA control systems.

2. **Power supply for telecommunication and monitoring systems:**
   High quality electrical supply for booster antennas in remote locations using a voltage transformer connected to a nearby transmission line.

3. **Rural electrification of isolated populations:**
   As a power source for supplying reliable power to rural populations in isolated areas where there are no distribution lines nearby, but there are transmission lines. This particular application supplies low voltage power directly from HV line in an economical and practical way.

4. **Temporary power supply** when building substations, wind farms, etc., and emergency supply during natural disasters.

› UTP-245 Voltage transformer for rural electrification. Chihuahua State (Mexico).
5. AUXILIARY SERVICES VOLTAGE TRANSFORMERS > Oil-paper and gas insulation

DESIGN AND MANUFACTURE

Voltage transformers for auxiliary services with oil-paper insulation are made with a magnetic core inside a metallic tank with its primary and secondary windings around it. The primary conductor is enclosed by a capacitive bushing consisting of shields and layers of insulating paper impregnated in oil. In order to control oil level changes, they are fitted with metallic bellows.

Voltage transformers for auxiliary services with gas insulation are made with a magnetic core inside a metallic tank with its primary and secondary windings around it. These windings are made of heat-resisting electric wires coated in synthetic resin and a layer of plastic with a high dielectric resistance and excellent thermal and mechanical performance.

The SF6 and the plastic layer form the electrical insulation. An input valve for SF6 gas is provided on a side of tank together with a manometer for monitoring leakages and gas pressure.
5. AUXILIARY SERVICES VOLTAGE TRANSFORMERS > Oil-paper and gas insulation

ADVANTAGES

The conventional solution used for the previously mentioned applications is a dedicated medium voltage line. ARTECHE’S voltage transformer for auxiliary services has the following advantages:

› Wide range of designs meeting customer needs.
› Social benefits. Electrification of isolated rural areas, emergency power after natural disasters...
› Independent power supply, more flexible as the user does not have to depend on third parties.
› Cost effective.
› Quick and flexible solution compared to building new lines, since there is no need to apply for licence, conduct environmental studies, use eminent domain, etc.).
› Highly reliable power source within the substation.
› Safety for the most critical equipment in the substation (power transformer). Low voltage and auxiliary services are the most unreliable uses. With this solution there is no need for a tertiary winding that could put the power transformer in risk.
› Dual function, it can be used as a power source and as an instrument transformer in a single unit, since it can also be used for metering and/or protection.
› Hermetically sealed to guarantee complete water tightness with the minimum volume of oil or gas (Each unit is tested individually).
› May be transported and stored horizontally or vertically.
› Maintenance-free throughout their lifespan.
› Environmental-friendly design through the use of high quality insulating oils, free of PBC. The materials used are recyclable and resistant to the elements.
› Excellent response under extreme weather conditions, high altitudes, seismic hazard areas, violent winds, etc.
› Each transformer is routine tested for partial discharges, tangent delta (DDF), insulation and accuracy. Designed to withstand all the type test included in the standards.
› Officially homologated in-house testing facilities.

Oil-paper:

› Oil compensating system that effectively regulates changes in oil volume mainly caused by temperature.
› Oil sampling valve for periodic analysis.
› Porcelain or silicone rubber insulator.

Gas:

› The silicone rubber insulator guarantees safety during transportation and service.
› Online monitoring of the insulation status with a manometer alarm.

ARTECHE developed in 2010 a pioneering pilot project in the State of Chihuahua (Mexico) in collaboration with the local government and C.F.E. to extend electrical service to the region’s rural population, using auxiliary service voltage transformers, helping to reduce their isolation.
RANGE

Auxiliary service inductive voltage transformers are named using different letters (UT followed by a third letter to indicate the model for oil-paper insulation and SVR for gas insulation) followed by 2 or 3 numbers to indicate their service voltages.

The table on the next page shows the range of transformers currently built by ARTECHE. These characteristics are merely indicative.

ARTECHE can also manufacture these transformers to comply with any domestic or international standards.

› 145 kV UTE Inductive voltage transformers. Transener (Argentina).
› 420 kV SVR inductive voltage transformer. Routine tested in ARTECHE’s laboratory.
### Oil-paper insulation > Model UT

<table>
<thead>
<tr>
<th>Model</th>
<th>Highest Voltage (kV)</th>
<th>Rated insulation level</th>
<th>Burden (kVA)</th>
<th>Standard creepage distance (mm)</th>
<th>Dimensions</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Power frequency (kV)</td>
<td>Lightning impulse (BIL) (kVP)</td>
<td>Switching impulse (kVP)</td>
<td>AxB (mm)</td>
<td>H (mm)</td>
</tr>
<tr>
<td>UTE-72</td>
<td>72.5</td>
<td>140</td>
<td>325</td>
<td>-</td>
<td>1.825</td>
<td>400x430</td>
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<tr>
<td>UTE-145</td>
<td>145</td>
<td>275</td>
<td>650</td>
<td>-</td>
<td>3.625</td>
<td>400x400</td>
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<tr>
<td>UTG-245</td>
<td>245</td>
<td>460</td>
<td>1.050</td>
<td>-</td>
<td>6.125</td>
<td>500x640</td>
</tr>
</tbody>
</table>

Approximate dimensions and weights. For special requirements, please consult.

### Oil-paper insulation > Model UTP

<table>
<thead>
<tr>
<th>Model</th>
<th>Highest Voltage (kV)</th>
<th>Rated insulation level</th>
<th>Burden (kVA)</th>
<th>Standard creepage distance (mm)</th>
<th>Dimensions</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Power frequency (kV)</td>
<td>Lightning impulse (BIL) (kVP)</td>
<td>Switching impulse (kVP)</td>
<td>AxB (mm)</td>
<td>H (mm)</td>
</tr>
<tr>
<td>UTP-145</td>
<td>145</td>
<td>275</td>
<td>650</td>
<td>-</td>
<td>3.625</td>
<td>1.450x1.220</td>
</tr>
<tr>
<td>UTP-245</td>
<td>245</td>
<td>395</td>
<td>950</td>
<td>-</td>
<td>6.125</td>
<td>1.450x1.220</td>
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<tr>
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<td>1.1175</td>
<td>950</td>
<td>9.050</td>
<td>1.450x1.220</td>
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</tbody>
</table>

Approximate dimensions and weights. For special requirements, please consult.

### Gas insulation > Model SVR

<table>
<thead>
<tr>
<th>Model</th>
<th>Highest Voltage (kV)</th>
<th>Rated insulation level</th>
<th>Burden (kVA)</th>
<th>Standard creepage distance (mm)</th>
<th>Dimensions</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Power frequency (kV)</td>
<td>Lightning impulse (BIL) (kVP)</td>
<td>Switching impulse (kVP)</td>
<td>AxB (mm)</td>
<td>H (mm)</td>
</tr>
<tr>
<td>SVR-6</td>
<td>72.5</td>
<td>140</td>
<td>325/350</td>
<td>-</td>
<td>1.825</td>
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<td>275</td>
<td>650</td>
<td>-</td>
<td>3.625</td>
<td>500x390</td>
</tr>
<tr>
<td>SVR-20</td>
<td>245</td>
<td>395</td>
<td>950</td>
<td>-</td>
<td>6.125</td>
<td>500x390</td>
</tr>
<tr>
<td>SVR-38</td>
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<td>1.300</td>
<td>950</td>
<td>10.500</td>
<td>520x490</td>
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<td>SVR-50</td>
<td>(525) 550</td>
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<td>1.550</td>
<td>1.750</td>
<td>13.125</td>
<td>600x560</td>
</tr>
</tbody>
</table>

Approximate dimensions and weights. For special requirements, please consult.
6. OTHER TECHNOLOGIES
Medium voltage outdoor
Voltage transformers for GIS
Optical current transformer
Line traps
INTRODUCTION

ARTECHE feels that innovation is a strategic priority and a competitive advantage.

Over the last few years ARTECHE has developed new lines of business that complement traditional products, such as Voltage transformers for gas insulated switchgears and optical current transformers.

High voltage instrument transformers also converge with other complementary technologies such as line traps and medium voltage outdoor instrument transformers.

Medium voltage outdoor instrument transformers.

Voltage transformers for GIS.

Optical current transformer.

Digital measurement.

Line traps.
6. OTHER TECHNOLOGIES

MEDIUM VOLTAGE OUTDOOR INSTRUMENT TRANSFORMERS

They can be used in metering and protection; ensuring maximum accuracy and reliability in different designs.

CURRENT TRANSFORMERS

Dry transformers with external cycloaliphatic resin insulation (CR, CE, CPE), or with external porcelain insulation (CX).

INDUCTIVE VOLTAGE TRANSFORMERS

Dry transformers with external cycloaliphatic resin insulation (UR, VR), or with external silicone rubber insulation (UJ, VJ).

Oil-paper transformers with external porcelain or silicon rubber insulator (UZK, VZK).

COMBINED TRANSFORMERS

A current transformer and a voltage transformer in the same resin body surrounded by cycloaliphatic resin (KM).

Current transformers: models CX/CR/CE up to 72.5 kV; model CPE up to 36 kV.

Inductive voltage transformers: models UR/UT up to 72.5 kV; model VR up to 52 kV; models UJ/ VJ/UZK/VZK up to 36 kV.

Combined transformer: model KM up to 36 kV.

For more information, refer to the catalog: Medium voltage outdoor instrument transformers.
6. OTHER TECHNOLOGIES

VOLTAGE TRANSFORMER FOR GAS INSULATED SWITCHGEARS (GIS)

These are voltage transformers insulated with SF6 for gas insulated switchgears (GIS).

Gas insulated voltage transformers for GIS can be single-phase or three-phase. Both types of VTs are connected to the GIS though insulators.

They can be connected to the GIS either in horizontal, vertical or upside down positions.

For more information, refer to the Arteche Nissin catalog: Voltage Transformers for Gas Insulated Switchgear (GIS). Up to 800 kV.

Model SVR up to 800 kV.
6. OTHER TECHNOLOGIES

smART DO OPTICAL CURRENT TRANSFORMER

The optical current transformer was introduced as an alternative to the conventional current transformers. Together with the Merging Unit, it offers an advanced digital measurement solution ready for process bus, for both metering and protection applications. It is based on a patented Faraday optical effect technology.

The main applications for optical current transformers are measuring and protection in HVAC, HVDC and HCDC.

Some of the main characteristics of the optical current transformer are:

- Passive optical current sensor based on fiber optics.
- Extensive bandwidth capable of measuring AC and DC currents up to 100 harmonic and above.
- IEC 60044-8 accuracy measurement, up to class 0.2S.
- Unlimited dynamic range. Does not become saturated.
- The Merging Unit sports a digital output interface compatible with Process Bus Protocol IEC 61850-9-2 LE.
- Light and compact design.
- Maintenance free and longer service life.
- Avoids electrical failures leading to explosions and other risks like open secondaries.
- Environmental-friendly. Solid, dry insulation with no need for oil or SF6 gas.
- No voltage limit. The optical sensor can withstand any voltage level; it is only limited by the type of insulator used.

For more information, refer to the catalog: smART DO Optical Current Transformer.

Model smART DO up to 1.200 kV.

smART DO Optical transformers. Powerlink (Australia).
6. OTHER TECHNOLOGIES

LINE TRAPS

Line traps direct the high-frequency telecommunication signal to the appropriate lines, blocking the transmission to the others, and avoiding losses and interferences.

They are installed in series with the line in order to keep the high frequency signal within required line sections.

FEATURES

› Provides the most reliable communication channel for substation control and protection systems.
› Reliable tuning system.
› Excellent mechanical resistance to short circuits.
› Maintenance free.
› Wide range of tuning devices: narrow band, broadband, or adjustable band.

With high impedance for telecommunication frequencies (40-500 kHz), preventing the signal from being lost. At the same time, the impedance at power frequency should be quite low not to interfere with the power transmission.

Installation possibilities:
› Suspended installation.
› Pedestal installation:
  - On coupling capacitor or capacitive voltage transformer.
  - Isolated pedestal.
  - Multiple pedestals.

For more information, refer to catalog: Line Traps.

› Line Traps mounted as pedestals. Picón, Ciudad Real (Spain).
Exceeding environmental regulations, ARTECHE has been able to minimize the use of hazardous materials, energy consumption and waste generation.
QUALITY & ENVIRONMENT

Everyone in the ARTECHE Group works under the criteria set out in our environmental and quality policy.

A sum of regulated procedures based on communication, teamwork, prevention analysis and continuous improvement, common to the whole organization.

› Advanced sustainability criteria in production and in the creation and development of new products.
› Compact designs, manufactured with minimal energy consumption and environmentally-friendly materials.
› Internal and external skill motivation programs.
› Advanced development of knowledge management.
› Quality agreements with utilities.
› Physico-chemical and electrical laboratories for testing under any international standard.
› Type test reports issued by KEMA, CESI, LAPEM, RENARDIÈRES, etc.
› Final testing according to specific customer requirements.
› Approvals in more than 100 electricity companies.

ARTECHE’S financial and technological independence gives a privileged position ahead of the challenges in the sector.
With production plants in four continents (Spain, Mexico, Argentina, China and Australia) and over 70 customer service technical offices to ensure optimal service.
SERVICE

› ARTECHE’s service is based on a close relationship with the customers, reflected in the integrated post-sale assistance plan and structured client opinion system.

› In addition to ensuring rapid response, ARTECHE developed a continuous service improvement plan, which sustains an extensive training program with courses, publications, conferences, etc.

› ARTECHE’s focus on service, with a broad experience leading us to be an active participant in the electrical organizations such as: IEC, IEEE, CIGRE, CIRED, ASINEL, etc.

› ARTECHE has production facilities in four continents (North America, South America, Europe, Asia and Australia) and more than 70 technical/commercial offices. Thus ARTECHE provides effective responses to the requirements of any customer and situation, based on the global knowledge acquired.

ARTECHE has the technology and capacities of instrument transformers. Thus we provide the best solution available on the market.