

arteche

HIGH VOLTAGE.  
INSTRUMENT  
TRANSFORMERS.



This document may be subject to changes.  
Contact ARTECHE to confirm the characteristics and  
availability of the products described here.



Moving together

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- › Dry insulation

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# 1. CURRENT TRANSFORMERS

Oil-paper insulation

Gas insulation

Dry insulation



› 420 kV Current transformers, model CA. CFE, Chicoasén (Mexico).

## 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 LB up to 362 kV.

Gas insulation:  
model CG up to 550 kV.

Dry insulation:  
model CX up to 72.5 kV.



> Model CA



> Model LB



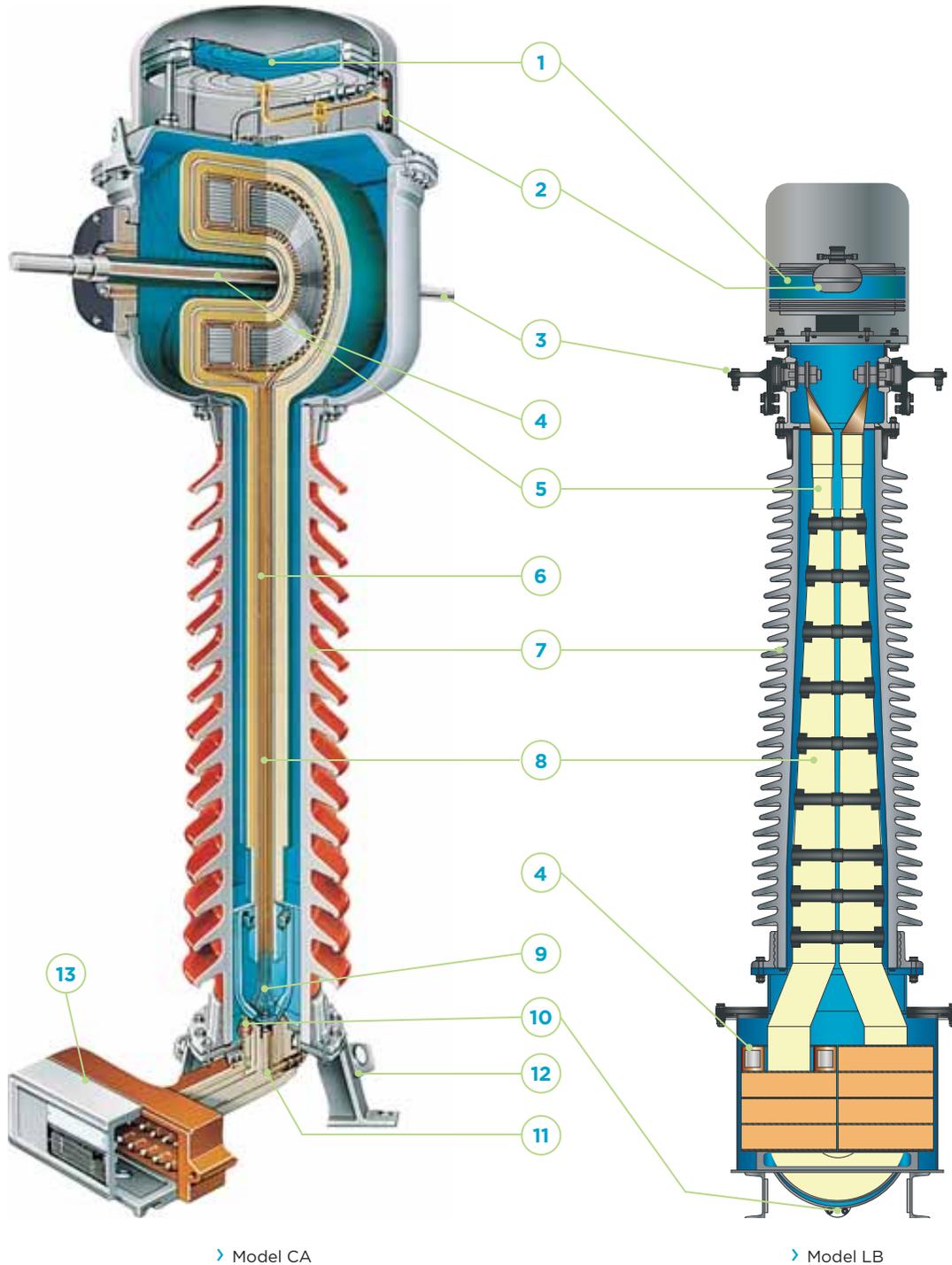
> Model CG



> Model CX

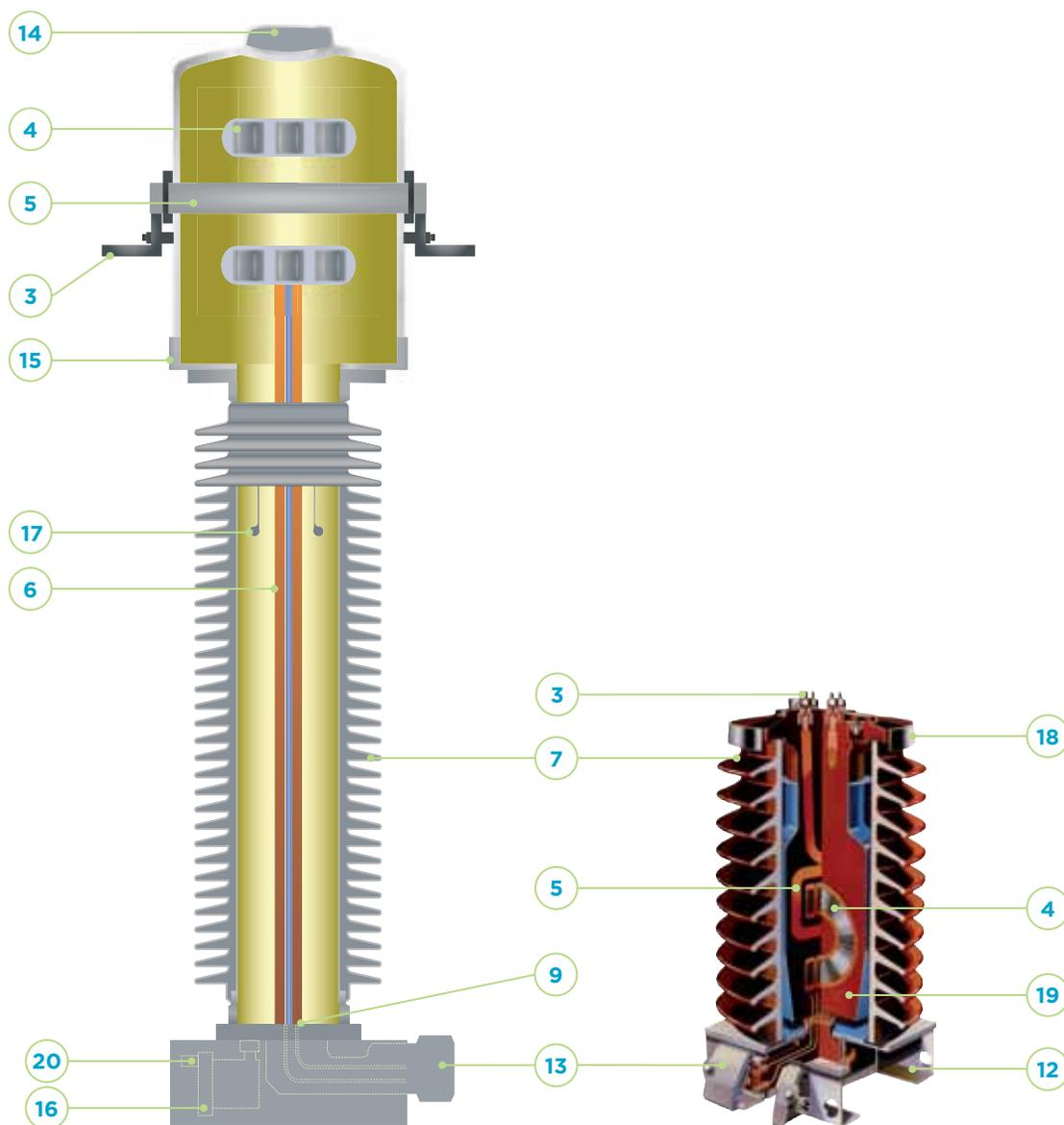
## SECTIONS

- |                                   |                                             |
|-----------------------------------|---------------------------------------------|
| 1. Oil volume compensating system | 6. Secondary conductors                     |
| 2. Oil level indicator            | 7. Insulator (porcelain or silicone rubber) |
| 3. Primary terminal               | 8. Capacitive bushing                       |
| 4. Cores and secondary windings   | 9. Reinforced ground connection             |
| 5. Primary winding                | 10. Oil sampling valve                      |



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

- |                            |                        |
|----------------------------|------------------------|
| 11. Tangent delta tap      | 16. Manometer          |
| 12. Grounding terminal     | 17. HV electrode       |
| 13. Secondary terminal box | 18. Equipotential ring |
| 14. Pressure relief device | 19. Resin insulation   |
| 15. Head                   | 20. Gas filling valve  |



> Model CG

> Model CX

## APPLICATIONS

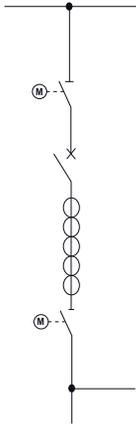
Ideal for installation at metering points due to its very high accuracy.

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

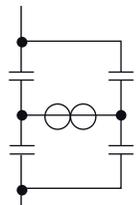
Suitable for installation in AC and DC filters in converter substations for HVDC projects.

### Examples of applications:

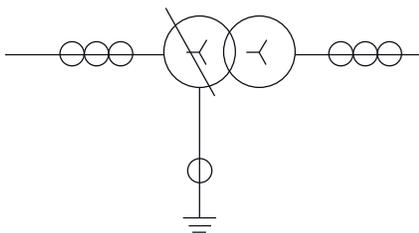
1. Protection for high voltage lines and substations.



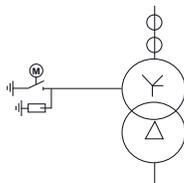
2. Protection for capacitor banks.



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).



3. 420 kV Current transformers. National Grid (UK).



4. 420 kV Current transformers. Rede Eléctrica Nacional (Portugal).

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

# DESIGN AND MANUFACTURE

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 section of the CT inside a hermetically sealed 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.

### LB RANGE:

The active parts are located in the bottom section. 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 section, inside a hermetically sealed metal box that acts as a low-voltage shield surrounded by SF<sub>6</sub> 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. High voltage electrode uniformly surrounds this metal tube allowing the electrical field to be 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.



> Detail of a rupture disc in a CG head.

> Metallic bellows in a CA.

## 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 and designed to withstand all the type tests included in the standards.
- > Compliance to any international standards: IEC, IEEE, UNE, BS, VDE, SS, CAN/CSA, AS, NBR, JIS, GOST, NF...
- > Officially homologated in-house testing facilities.
- > May be transported and stored horizontally or vertically.
- > Measurements Canada approval available as required, please consult factory for specific requirements.

> 800 kV Current Transformers.  
Reliance (India).



## 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.
- › 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 overvoltage 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), LB (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:

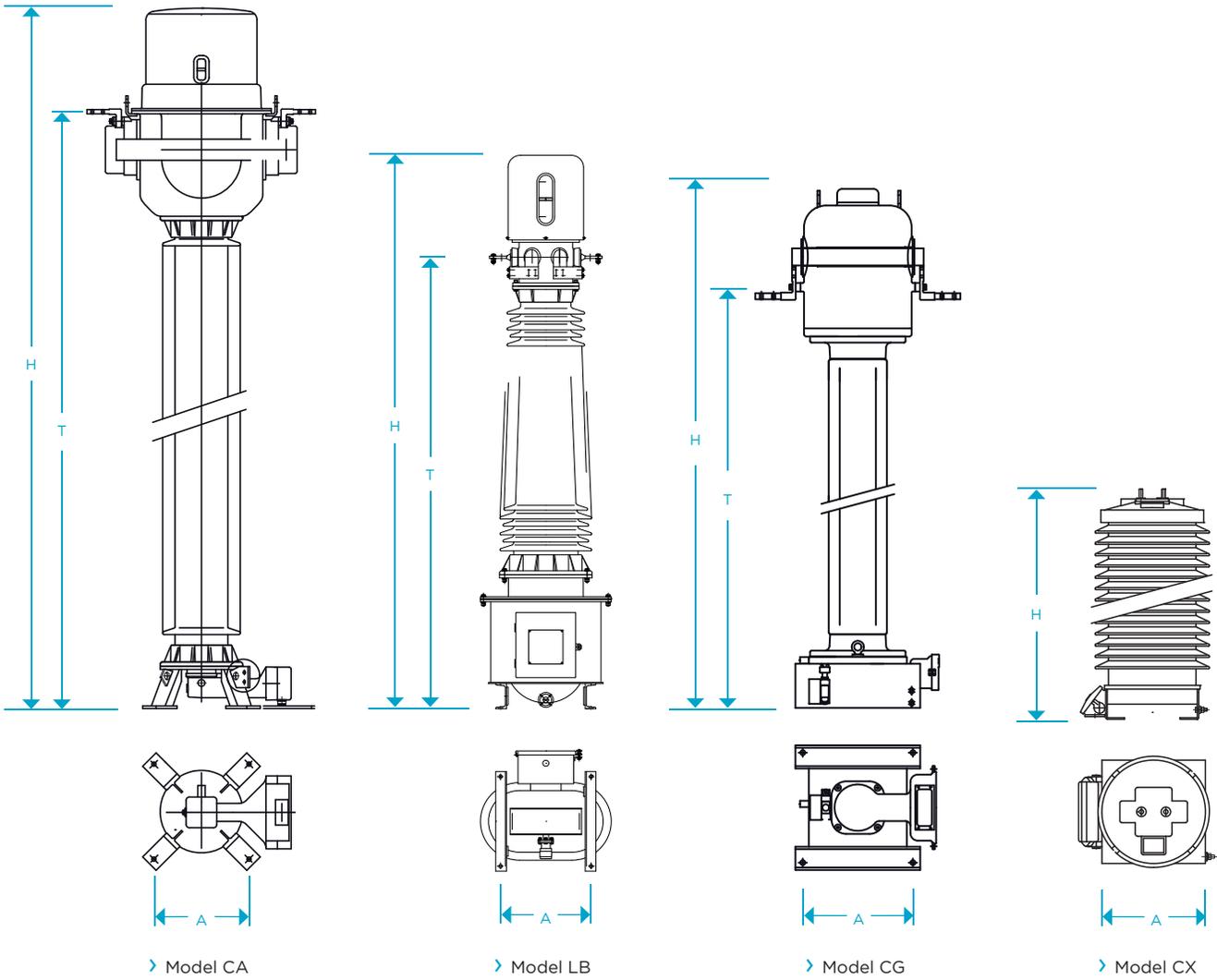
- > Protection: all possible types, including linear cores, low induction, etc.
- > Metering: accuracy classes for any metering/billing need (including high accuracy class 0.1 / 0.15 with extended range in current).

Number of secondary windings: as per customer needs, up to 10 secondary windings (or more) are possible in a single device.



- > 420 kV Current transformers. Tennet (The Netherlands).
- > 245 kV Current transformers. SECO (Sudan).

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



> Type test performed on a CG 245 kV.  
 > 36 kV Current transformers. Fingrid, Kimy (Finland).

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

### Oil-paper insulation > Model CA

Model	Highest voltage (kV)	Rated insulation level			Standard creepage distance (mm)	Dimensions			Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)		A (mm)	T (mm)	H (mm)	
CA-36	36	70	170	-	900	350	1185	1625	250
CA-52	52	95	250	-	1300	350	1185	1625	260
CA-72	72.5	140	325	-	1825	350	1335	1775	280
CA-100	100	185	450	-	2500	350	1335	1775	290
CA-123	123	230	550	-	3075	350	1665	2095	300
CA-145	145	275	650	-	3625	350	1665	2095	310
CA-170	170	325	750	-	4250	350	1895	2335	330
CA-245	245	460	1050	-	6125	450	2755	3055	560
		395	950						
CA-300	300	460	1050	850	7500	450	3170	3580	650
CA-362	362	510	1175	950	9050	600	3875	4355	870
CA-420	420	630	1425	1050	10500	600	3875	4355	920
		575	1300						
CA-525	(525) 550	680	1550	1175	13125	600	4530	5365	1200
CA-550	(525) 550	800	1800	1175	13750	600	5205	5960	1700
CA-765	(765) 800	880	1950	1425	15300	600	5770	6590	2050
		975	2100	1550					

Approximate dimensions and weights For special requirements, please consult

Primary currents: from 1 A to 5000 A. Short circuit currents: up to 120 kA/1 s.

### Oil-paper insulation > Model LB

Model	Highest voltage (kV)	Rated insulation level			Standard creepage distance (mm)	Dimensions			Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)		A (mm)	T (mm)	H (mm)	
LB-36	36	70	170	-	1260	660x490	1405	1710	173
LB-72,5	72.5	140	325	-	2250	775x650	1360	1810	470
LB-145	123	230	550	-	3906	775x550	2380	2825	670
	145	275	650	-	4495	775x550	2450	2895	690
LB-245	245	460	1050	-	7810	790x605	3440	3890	1150
LB-362	362	510	1175	950	11260	910x750	3550	4100	1380

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

Primary currents: from 1 A to 4000 A. Short circuit currents: up to 50 kA/1 s.

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

### Gas insulation > Model CG

Model	Highest voltage (kV)	Rated insulation level			Standard creepage distance (mm)	Dimensions			Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching Impulse (kVp)		A (mm)	T (mm)	H (mm)	
CG-145	123	230	550	-	3625	450x450	1895	2330	205
CG-145	145	275	650	-	3625	450x450	1895	2330	205
CG-170	170	325	750	-	4250	450x450	2070	2505	235
CG-245	245	395	950	-	6125	450x450	2795	3370	400
		460	1050	-					
CG-300	300	460	1050	850	7500	450x450	3180	3755	430
CG-362	362	510	1175	950	11222	600x600	4400	5080	1650
CG-420	420	630	1425	1050	13020	800x800	4900	5580	1700
CG-550	550	680	1550	1175	17050	800x800	5900	6580	1800

Approximate dimensions and weights For special requirements, please consult  
 Primary currents: up to 5000 A. Short circuit currents: up to 120 kA/1 s.

### Dry insulation > Model CX

Model	Highest voltage (kV)	Rated insulation level		Standard creepage distance (mm)	Dimensions		Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)		A (mm)	H (mm)	
CXD-24	24	50	125	744	210	462	43
CXE-24	24	50	125	744	250	480	72
CXE-36	36	70	170	900	250	532	80
CXG-36	36	70	170	900	250	670	150
CXE-52	52	95	250	1440	250	712	111
CXG-52	52	95	250	1560	250	798	186
CXH-52	52	95	250	1560	330	800	263
CXG-72	72.5	140	325	1860	250	918	190
CXH-72	72.5	140	325	1860	330	920	305

Approximate dimensions and weights For special requirements, please consult  
 Primary currents: from 1 A to 2400 A. Short circuit currents: up to 120 kA/1 s.



Over 2300 professionals  
committed to a common  
project.

## 2. INDUCTIVE VOLTAGE TRANSFORMERS

Oil-paper insulation  
Gas insulation



› 123 kV Inductive voltage transformers. Fingrid (Finland).

## 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.



> Model UTF



> Model UTE



> Model UTD



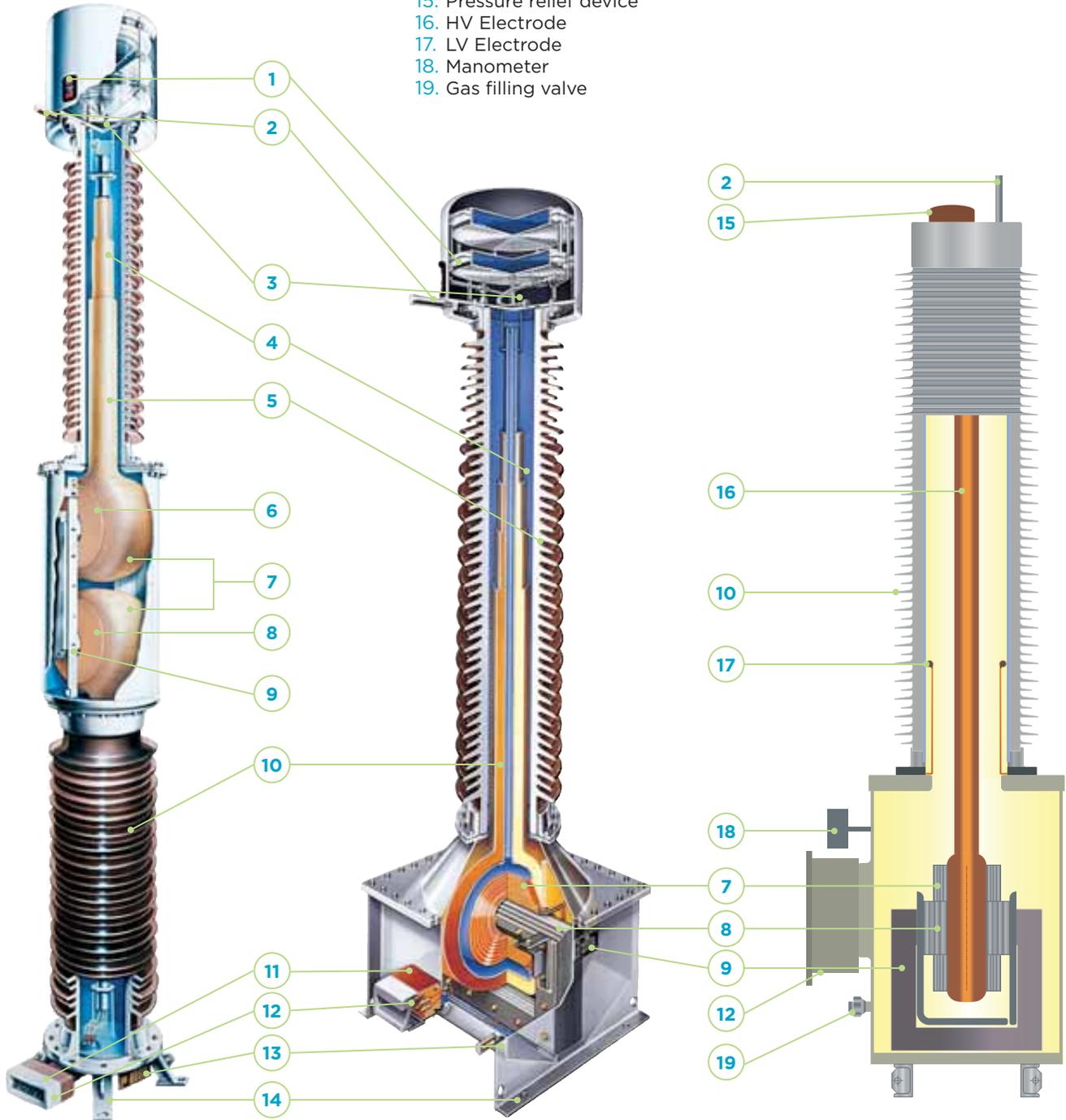
> Model UG

Model UT up to 550 kV.

Model UG up to 550 kV.

## SECTIONS

- |                                   |                                              |
|-----------------------------------|----------------------------------------------|
| 1. Oil level indicator            | 8. Secondary windings                        |
| 2. Primary terminal               | 9. Core                                      |
| 3. Oil volume compensating system | 10. Insulator (porcelain or silicone rubber) |
| 4. Capacitive bushing             | 11. Tangent delta measuring tap              |
| 5. Oil-paper insulation           | 12. Secondary terminal box                   |
| 6. Compensation windings          | 13. Oil sampling valve                       |
| 7. Primary windings               | 14. Grounding terminal                       |
|                                   | 15. Pressure relief device                   |
|                                   | 16. HV Electrode                             |
|                                   | 17. LV Electrode                             |
|                                   | 18. Manometer                                |
|                                   | 19. Gas filling valve                        |



> Model UT. From 362 kV

> Model UT. Up to 300 kV

> Model UG. Up to 550 kV

## 2. INDUCTIVE VOLTAGE TRANSFORMERS > Oil-paper and gas insulation

### APPLICATIONS

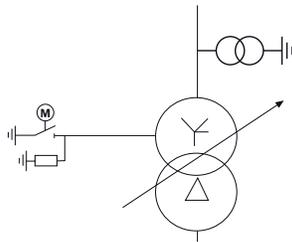
Ideal for installation at metering points due to its very high accuracy class.

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

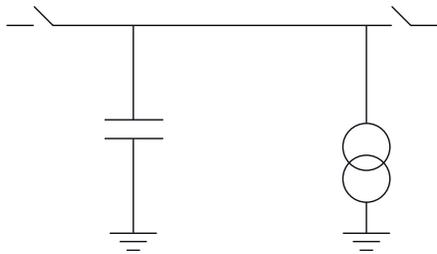
Excellent frequency response; ideal for monitoring power quality and measuring harmonics.

#### Examples of applications:

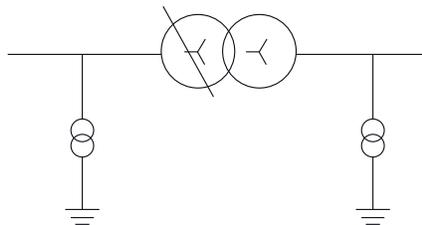
1. Revenue metering.



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. 420 kV Inductive voltage transformer. R.E.E. (Spain).

## 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.

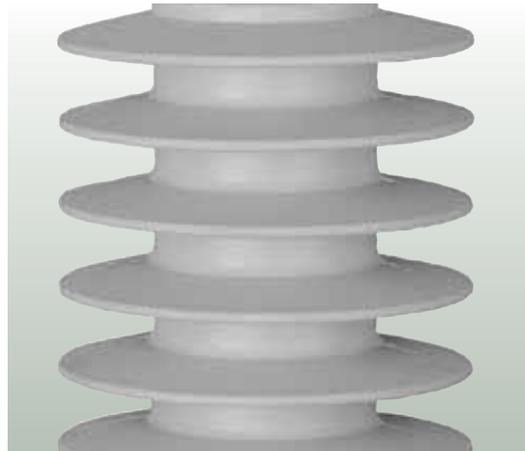
### ADVANTAGES

- › Very high and invariable accuracy (up to 0.1%) steady for the operational 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.
- › Hermetically sealed to guarantee complete water tightness with the minimum volume of oil or gas (Each unit is tested individually).
- › Maintenance-free throughout their lifespan.
- › Excellent response under extreme weather conditions, 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 and designed to withstand all the type tests included in the standards.
- › Compliance to any international standards: IEC, IEEE, UNE, BS, VDE, SS, CAN/CSA, AS, NBR, JIS, GOST, NF.
- › Officially homologated in-house testing facilities.
- › May be transported and stored horizontally or vertically.
- › Measurements Canada approval available as required, please consult factory for specific requirements.

### OPTIONS:

- › Wide range of primary and secondary terminals.
- › Sealable secondary terminals.
- › Secondary terminal protection devices inside the terminal box.

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



- › Oil level indicator.
- › Various types of insulators available (silicone, gray porcelain, coloured porcelain...).

## 2. INDUCTIVE VOLTAGE TRANSFORMERS > Oil-paper and gas insulation

### OIL-PAPER INSULATION:

- > Oil level compensating system that effectively regulates changes in oil volume mainly caused by temperature.
- > Oil sampling valve for periodic analysis.
- > Environmental-friendly design through the use of high quality insulating oils free of PCB. The materials used are recyclable and resistant to the elements.

### OPTIONS:

- > Silicone rubber insulator.
- > Oil compensation system with metallic bellows. Option for rubber diaphragm up to 170 kV.
- > Current through connection to the HV: line.

### 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 transformer.
- > Designed to minimize gas volume, pressure and leaks, with a leakage rate <0.5%/year (lower values available upon request), thus reducing its environmental impact.
- > Online monitoring of the insulation status with a manometer alarm.
- > Tanks and insulators are designed, manufactured and tested according to international pressure vessel standards.
- > Designed to withstand rated voltage with internal atmospheric gas pressure.

- > 420 kV Inductive voltage transformers. R.E.E. (Spain).



## 2. INDUCTIVE VOLTAGE TRANSFORMERS > Oil-paper and gas insulation

### RANGE

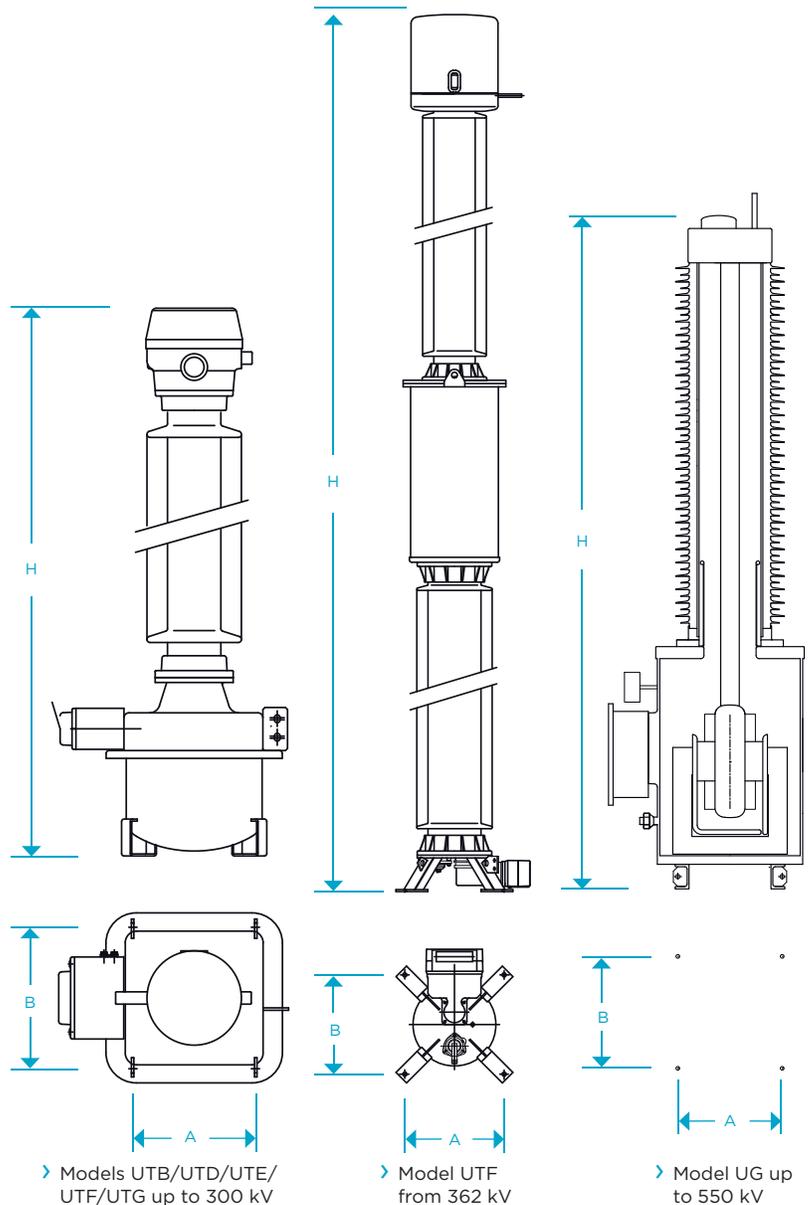
ARTECHE inductive voltage transformers are named with the letters (UT oil-paper or UG gas) followed by 1 additional letter (oil paper only), and 2 or 3 numbers indicating the maximum voltage of the network for which they are designed.

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 inductive voltage transformers to comply with any domestic or international standard.

#### Standard accuracy classes and burdens:

- > According to CSA/CAN and 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.



- > 123 kV Inductive voltage transformers. Electronet Services (New Zealand).
- > 420 kV Inductive voltage transformers. Elia (Belgium).

## 2. INDUCTIVE VOLTAGE TRANSFORMERS > Oil-paper and gas insulation

### Oil-paper insulation > Model UT

Model	Highest voltage (kV)	Rated insulation level			Thermal burden (VA)	Standard creepage distance (mm)	Dimensions		Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)			A x B (mm)	H (mm)	
UTB-52	52	95	250	-	1500	1300	300x300	1335	95
UTD-52	52	95	250	-	2000	1300	330x300	1395	150
UTB-72	72.5	140	325	-	1500	1825	300x300	1335	108
UTD-72	72.5	140	325	-	2000	1825	330x300	1395	150
UTE-72	72.5	140	325	-	2500	1825	400x430	1645	285
UTD-100	100	185	450	-	2000	2500	330x300	1690	165
UTD-123	123	230	550	-	3000	3075	350x475	2120	292
UTE-123	123	230	550	-	3500	3075	350x475	2120	355
UTE-145	145	275	650	-	3500	3625	350x475	2105	335
UTE-170	170	325	750	-	3500	4250	350x475	2235	350
UTF-245	245	460	1050	-	3500	6125	450x590	3210	650
		395	950						
UTG-245	245	460	1050	-	3500	6125	500x640	3260	800
		395	950						
UTG-300	300	460	1050	850	3500	7500	500x640	3660	910
UTF-420	420	630	1425	1050	3500	10500	600x600	5210	1315
		575	1300	950					
UTF-525	550 (525)	680	1550	1175	3500	13125	600x600	6070	1700

Approximate dimensions and weights For special requirements, please consult

### Gas insulation > Model UG

Model	Highest voltage (kV)	Rated insulation level			Thermal burden (VA)	Standard creepage distance (mm)	Dimensions		Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)			A x B (mm)	H (mm)	
UG-123	123	230	550	-	1000	3813	315 x 315	2400	450
UG-145	145	275	650	-	1000	4495	315 x 315	2400	450
UG-170	170	325	750	-	1000	5270	315 x 315	2600	470
UG-245	245	460	1050	-	1000	7595	450 x 450	3200	650
UG-300	300	460	1050	850	1000	9300	450 x 450	3550	700
UG-362	362	510	1175	950	1000	11222	600 x 600	3900	1100
UG-420	420	630	1425	1050	1000	13020	600 x 600	4600	1200
UG-550	550	680	1550	1175	1000	17050	600 x 600	5100	1300

Approximate dimensions and weights For special requirements, please consult

# 3. COMBINED TRANSFORMERS

## Oil-paper insulation



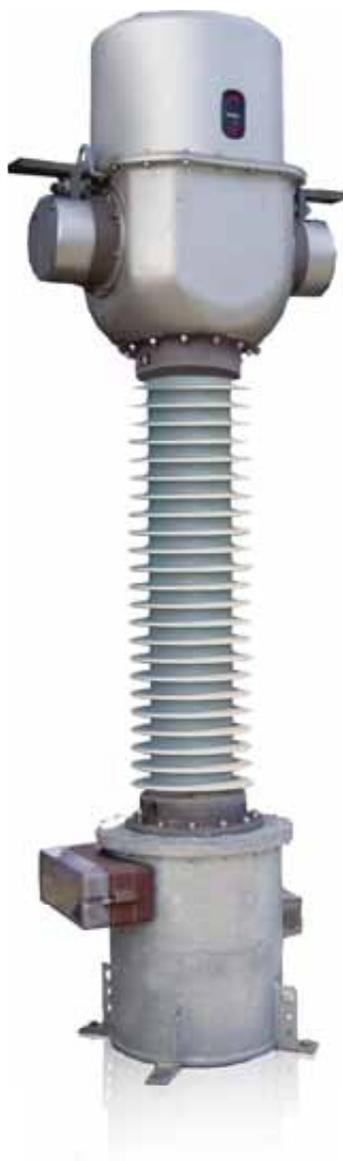
› 123 kV Combined transformers.

### 3. COMBINED TRANSFORMERS > Oil-paper insulation

## INTRODUCTION

Combined instrument transformers contain a current transformer and an inductive voltage transformer within the same body.

Thus they are used in the same applications as their respective independent transformers; 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.

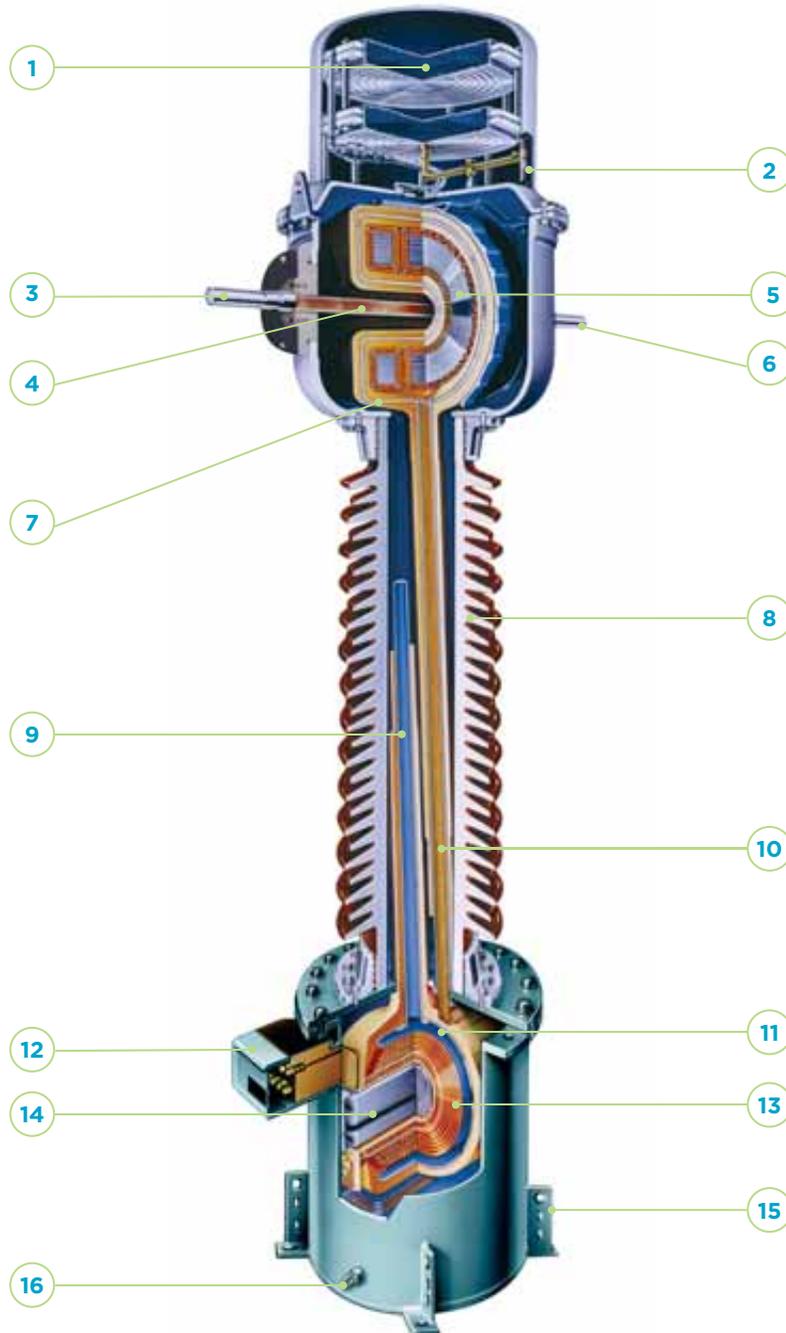


Model KA up to 245 kV.

> Model KA

## SECTIONS

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

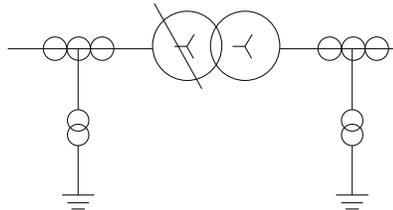
Ideal for installation at metering points due to their very high accuracy class, both in current and voltage.

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

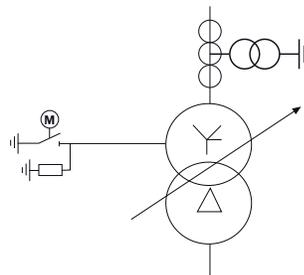
Excellent frequency response; ideal for monitoring power quality and measuring harmonics.

#### 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).



## DESIGN AND MANUFACTURE

Combined transformers mirror 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.



- › Wide variety of primary terminals.
- › Can be transported horizontally.

### 3. COMBINED TRANSFORMERS > Oil-paper insulation

#### ADVANTAGES

- › Less space needed in the substation, and during 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 that are both 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 and designed to withstand all the type tests included in the standards.
- › Compliance to any international standards: IEC, IEEE, UNE, BS, VDE, SS, CAN/CSA, AS, NBR, JIS, GOST, NF...
- › Officially homologated in-house testing facilities.
- › May be transported and stored horizontally or vertically.
- › Measurements Canada approval available as required, Please consult factory for specific requirements.

#### OPTIONS:

- › Silicone rubber insulation.
- › Tangent delta measurement tap and capacitive tap.
- › Wide range of primary and secondary terminals.
- › Different cable glands and accessories available.

› 123 kV Combined Transformers.  
ESB (Ireland).



## RANGE

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:

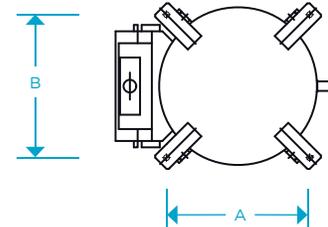
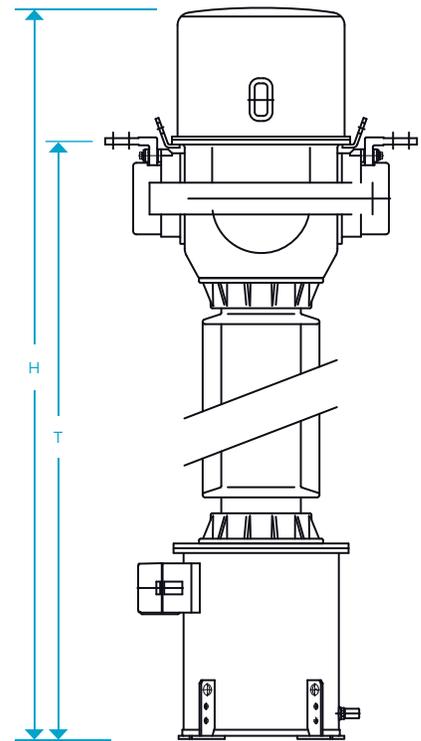
- › Protection: all possible types, including linear cores, low induction, etc.
- › Metering: accuracy classes for any metering/billing need (including high accuracy class 0.1 / 0.15 with extended range in current).

Number of secondary windings: as per customer needs.

**Standard accuracy classes and burdens for voltage transformer:**

- › According to CAN/CSA and 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 KA



- › 170 kV Combined transformers. Pechiney (The Netherlands).
- › 69 kV Combined transformers. Greenville Light & Power Systems (USA).

### 3. COMBINED TRANSFORMERS > Oil-paper insulation

#### Oil-paper insulation > Model KA

Model	Highest voltage (kV)	Rated insulation level			Standard creepage distance (mm)	No. secondaries*	Dimensions			Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)			AXB (mm)	T (mm)	H (mm)	
KA-72	72,5	140	325	-	1.825	TI 6	400x430	1.770	2.235	360
						TT 4				
KA-123	123	230	550	-	3.625	TI 6	450x450	2.285	2.785	580
						TT 4				
KA-145	145	275	650	-	3.625	TI 6	450x450	2.285	2.785	580
						TT 4				
KA-170	170	325	750	-	4.250	TI 6	450x450	2.445	2.945	755
						TT 4				
KA-245	245	395	950	-	6.125	TI 6	450x450	3.185	3.820	1.050
	300	460	1.050	-		TT 4				
		460	1.050	850	7.500		600x600	4.340	5.050	1.520

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

\*TI: Current transformer

\*TT: Voltage transformer

# 4. CAPACITIVE VOLTAGE TRANSFORMERS AND COUPLING CAPACITORS

## Oil-paper insulation



› 420 kV Capacitive voltage transformers. Fingrid, Visulahti (Finland).

## 4. CAPACITIVE VOLTAGE TRANSFORMERS AND COUPLING CAPACITORS > Oil-paper insulation

### INTRODUCTION

Capacitive voltage transformers isolate the measuring instruments, meters, 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, making them equivalent to the capacitive part of a CVT.



> Model DFK

> Model DDN

> Model DDB

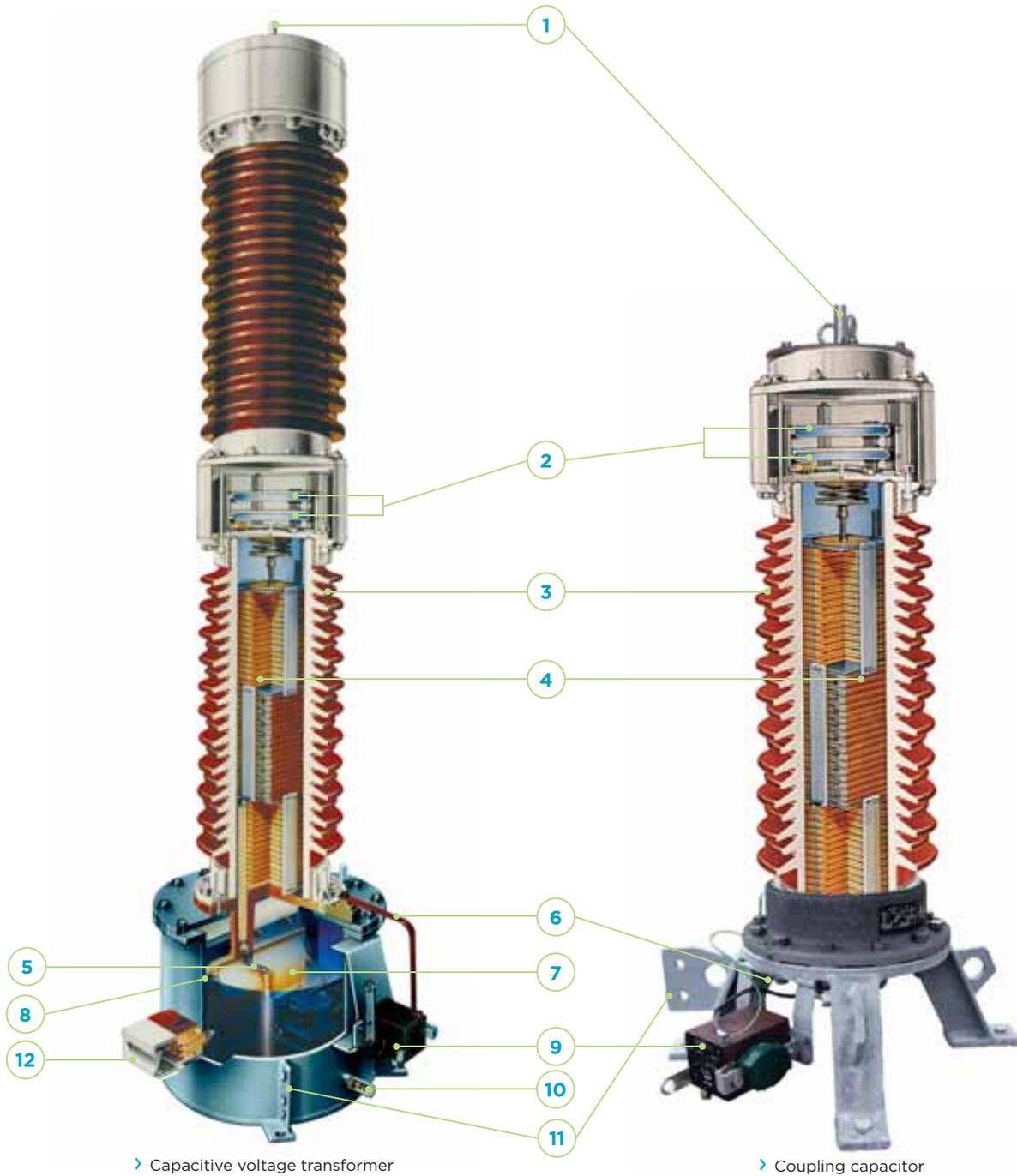
Capacitive voltage transformer:  
model DFK up to 800 kV,  
model DDB up to 170 kV.

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

4. CAPACITIVE VOLTAGE TRANSFORMERS AND COUPLING CAPACITORS >  
Oil-paper insulation

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. Grounding terminal
- 12. Secondary terminal box



## 4. CAPACITIVE VOLTAGE TRANSFORMERS AND COUPLING CAPACITORS > Oil-paper insulation

### APPLICATIONS

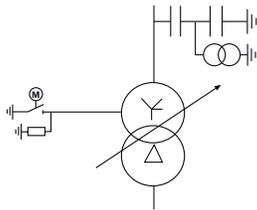
Ideal for installation at metering points due to its very high accuracy class and extremely steady capacitance.

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

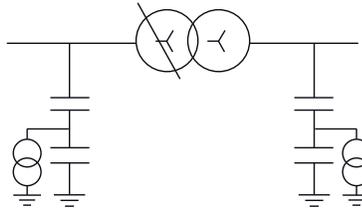
Helps to reduce voltage peaks in the line.

#### Examples of applications:

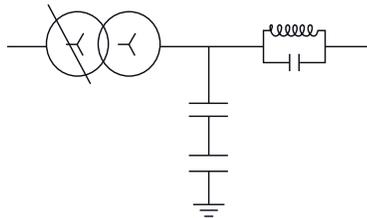
1. Revenue metering.



2. Protection for high voltage lines and substations.



3. Transmission of high frequency signals.



> 400 kV Capacitive voltage transformers. R.E.E. (Spain).



## 4. CAPACITIVE VOLTAGE TRANSFORMERS AND COUPLING CAPACITORS > Oil-paper insulation

# DESIGN AND MANUFACTURE

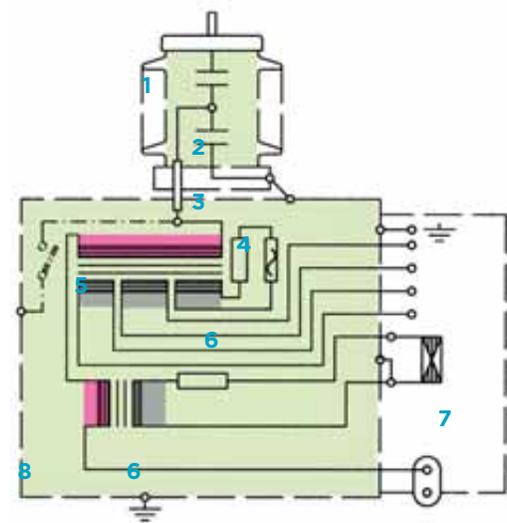
Capacitive voltage transformers consist of a series of capacitors connected in series on top of a tank in which the electromagnetic unit (inductive transformer (5), series reactor (8) and auxiliary elements) is housed. These capacitors form a voltage divider (2, 3) between the high voltage terminal (1) 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 the secondary terminal box (7) enabling connection; sufficient space is available to install protection elements such as fuses or circuit breakers.



1. Primary terminal
2. Capacitors
3. Capacitors
4. High frequency terminal
5. Inductive voltage transformer
6. Ferroresonance suppression circuit
7. Secondary terminal box
8. Compensating reactor



- > Grounding switch for safety handling during operation.
- > Protection devices for the secondaries may be installed inside the terminal block.

## 4. CAPACITIVE VOLTAGE TRANSFORMERS AND COUPLING CAPACITORS > Oil-paper insulation

### 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 that 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.
- › 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 and designed to withstand all the type tests included in the standards.
- › Compliance to any international standards: IEC, IEEE, UNE, BS, VDE, SS, CAN/CSA, AS, NBR, JIS, GOST, NF...
- › Officially homologated in-house testing facilities.
- › Measurements Canada approval available as required, please consult factory for specific requirements.

### OPTIONS:

- › Silicone rubber insulation.
- › Carrier accessories.
- › Ground switch for the inductive part.
- › Wide range of primary and secondary terminals.
- › Sealable secondary terminals.
- › Line traps can be mounted on top of the CVT.
- › 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.

## 4. CAPACITIVE VOLTAGE TRANSFORMERS AND COUPLING CAPACITORS > Oil-paper insulation

### RANGE

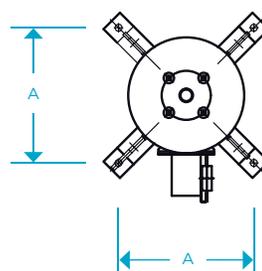
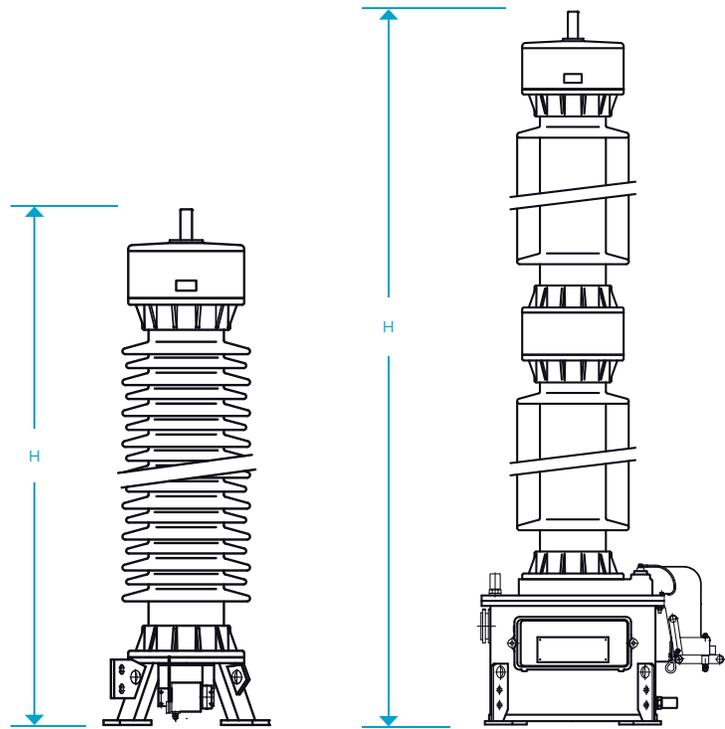
ARTECHE capacitive voltage transformers and coupling capacitors are named with different letters (DDB or DFK for transformers; DDN or DFN for capacitors) followed by 2 or 3 numbers indicating the maximum voltage of the network for which they are designed.

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.

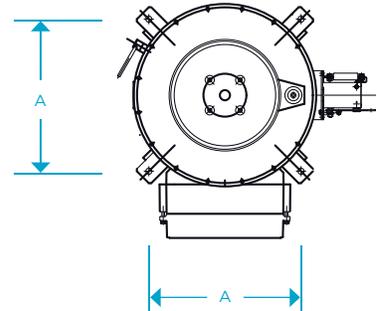
#### Standard accuracy classes and powers:

- > According to CAN/CSA and 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.



> Coupling capacitor



> Capacitive voltage transformer



- > 245 kV Capacitive voltage transformers. NEPCO (Jordan).
- > 525 kV Capacitive voltage transformers. UTE (Uruguay).

## 4. CAPACITIVE VOLTAGE TRANSFORMERS AND COUPLING CAPACITORS > Oil-paper insulation

Capacitive voltage transformers										
Model	Highest Voltage (kV)	Rated insulation level			Standard capacitance (pF)	High capacitance (pF)	Standard creepage distance (mm)	Dimensions		Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)				A (mm)	H (mm)	
DDB-72	72.5	140	325	-	10.300	25500	1825	450	1510	245
DDB-100	100	185	450	-	5700	14300	2500	450	1600	255
DDB-123	123	230	550	-	5600	14000	3075	450	1830	300
DDB-145	145	275	650	-	3900	19500	3625	450	1920	310
DDB-170	170	325	750	-	7500	16500	4250	450	2065	330
DFK-245	245	460	1050	-	5800	11000	6125	450	2885	450
		395	950							
DFK-300	300	460	1050	850	6000	12500	7500	450	3205	480
DFK-362	362	510	1175	950	4500	10100	9050	450	3675	520
DFK-420	420	630	1425	1050	3500	7700	10500	450	4595	670
		575	1300	950						
DFK-525	(525) 550	680	1550	1175	3000	6200	13125	450	5560	1065
		800	1800	1175						
DFK-765	(765) 800	880	1950	1425	3000	4500	15300	450	7010	1270
		975	2100	1550						

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

Coupling capacitors										
Model	Highest Voltage (kV)	Rated insulation level			Standard capacitance (pF)	High capacitance (pF)	Standard creepage distance (mm)	Dimensions		Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)				A (mm)	H (mm)	
DDN-72	72.5	140	325	-	10300	25500	1825	450	1235	115
DDN-100	100	185	450	-	5700	14300	2500	450	1325	120
DDN-123	123	230	550	-	5600	14000	3075	450	1585	145
DDN-145	145	275	650	-	3900	19500	3625	450	1675	150
DDN-170	170	325	750	-	7500	16500	4250	450	1805	170
DFN-245	245	460	1050	-	5800	11000	6125	450	2625	255
DFN-300	300	460	1050	850	6000	12500	7500	450	2945	305
DFN-362	362	510	1175	950	4500	10100	9050	450	3415	345
DFN-420	420	630	1425	1050	3500	7700	10500	450	4335	495
		575	1300	950						
DFN-525	(525) 550	680	1550	1175	3000	6200	13125	450	5300	890
		800	1800	1173						
DFN-765	(765) 800	880	1950	1425	3000	4500	15300	450	6760	1095
		975	2100	1550						

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

# 5. POWER VOLTAGE TRANSFORMERS

Oil-paper insulation  
Gas insulation



› 245 kV Transformer  
for substation auxiliary  
services, model UTP.  
Coyote Switch (USA).

## 5. POWER VOLTAGE TRANSFORMERS > Oil-paper and gas insulation

### 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 UG up to 550 kV and 100 kVA.



> Model UTP



> Model UT



> Model UG

## 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.
5. **Voltage elevator** for High Voltage electrical test laboratories, wind and solar farms.

› UTP-245 Voltage transformer for rural electrification. Chihuahua State (Mexico).



## 5. POWER VOLTAGE TRANSFORMERS > Oil-paper and gas insulation

# DESIGN AND MANUFACTURE

Power voltage transformers have a direct phase to ground connection with galvanic insulation between primary and secondary windings, which are coiled over the same magnetic core with independent insulation.

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 SF<sub>6</sub> and the plastic layer form the electrical insulation. An input valve for SF<sub>6</sub> gas is provided on a side of tank together with a manometer for monitoring leakages and gas pressure.



- > Oil-paper insulated power voltage transformers.
- > 72.5 kV Gas Power voltage transformer. R.E.E. (Spain).

## ADVANTAGES

The conventional solutions used for applications mentioned on page 44 usually are a dedicated medium voltage line, diesel generators or the power transformer tertiary winding. ARTECHE'S power voltage transformer has the following advantages:

- › Highly reliable power source within the sub-station.
- › Independent power supply, more flexible as the user does not have to depend on third parties.
- › Cost effective.
- › Maintenance-free throughout their lifespan.
- › Quick and flexible solution
- › Release of the power transformer tertiary winding.
- › Social benefits. Electrification of isolated rural areas, emergency power after natural disasters...

In addition to the several advantages of this solution, there are also the common ones to ARTECHE instrument transformers range:

- › Wide range of designs meeting customer needs.
- › 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, high altitudes, seismic hazard areas, violent winds, etc.
- › Officially homologated in-house testing facilities.
- › Each transformer is routine tested for partial discharges, tangent delta (DDF), insulation and accuracy and designed to withstand all the type tests included in the standards.
- › Environmental-friendly design. The materials used are recyclable and resistant to the elements.
- › May be transported and stored horizontally or vertically.

### OPTIONS:

- › Additional secondaries for measuring and/or protection.
- › Inner temperature monitoring sensor.

### OIL-PAPER:

- › Oil compensating system that effectively regulates changes in oil volume mainly caused by temperature.
- › Oil sampling valve for periodic analysis.

### OPTIONS:

- › Porcelain or silicone rubber insulator.
- › Over-pressure relief valve with connection capability to SCADA system.
- › Terminal for main insulation monitoring (tangent  $\delta$  measurement).
- › Taps for voltage regulation.
- › Winding for secondary current measuring and protection.
- › Single-phase/three-phase voltages in the secondary from a single HV phase.

### GAS:

- › The silicone rubber insulator guarantees safety during transportation and service.
- › Online monitoring of the insulation status with a manometer alarm.
- › Pressure relief device (rupture disc) in the top part of the transformer.

ARTECHE has developed 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 power voltage transformers, helping to reduce their isolation. This project has been awarded with the "Tomorrow's Energy Prize" in the 2013 World Energy Congress (WEC).

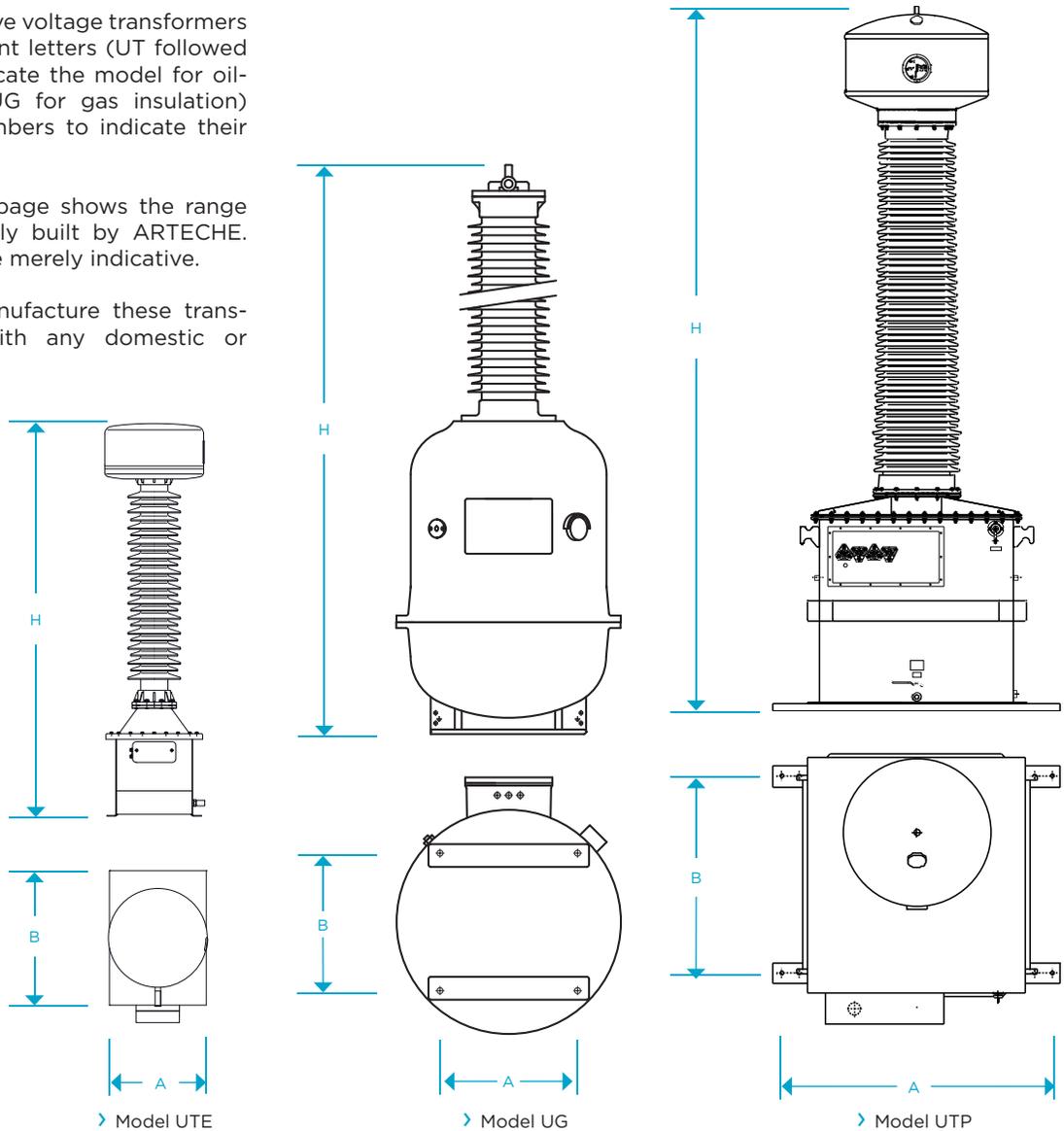


## RANGE

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 UG 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 Power voltage transformers. Transener (Argentina).
- > 420 kV UG Power voltage transformer. Routine tested in ARTECHE's laboratory.

## 5. POWER VOLTAGE TRANSFORMERS > Oil-paper and gas insulation

### Oil-paper insulation > Model UT

Model	Highest Voltage (kV)	Rated insulation level			Burden (kVA)	Standard creepage distance (mm)	Dimensions		Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)			AxB (mm)	H (mm)	
UTE-72	72.5	140	325	-	up to 10	1825	400x430	1645	285
UTE-145	145	275	650	-	up to 10	3625	400x400	2105	400
UTG-245	245	460	1050	-	up to 10	6125	500x640	3260	800

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

### Oil-paper insulation > Model UTP

Model	Highest Voltage (kV)	Rated insulation level			Burden (kVA)	Standard creepage distance (mm)	Dimensions		Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)			AxB (mm)	H (mm)	
UTP-123	123	230	550	-	50/100	4525	1100x776	3100	2950
UTP-145	145	275	650	-	50/100	4525	1101x776	3100	2950
UTP-170	170	325	750	-	50/100	5285	1102x776	3400	3200
UTP-245	245	395	900	-	50/100/167/333	6125	1450x1220	4590	4500
		460	1050				1451x1220		
UTP-362	362	510	1175	950	50/100/167/333	9050	1452x1220	5270	5135
		575	1300				1453x1220		

Approximate dimensions and weights For special requirements, please consult

### Gas insulation > Model UG

Model	Highest voltage (kV)	Rated insulation level			Burden (kVA)	Standard creepage distance (mm)	Dimensions		Weight (kg)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching Impulse (kVp)			Base (mm)	Height (mm)	
UG-72	72.5	140	325	-	50	2248	600x600/1200x1200	2250	< 3500
UG-145	123	230	550	-	100	3813	600x600/1200x1200	3100	< 3500
	145	275	650	-	100	4495	600x600/1200x1200	3100	< 3500
UG-245	170	325	750	-	100	5270	600x600/1200x1200	3300	< 3500
	245	460	1050	-	100	7595	600x600/1200x1200	3800	< 3500
	300	460	1050	850	100	9300	600x600/1200x1200	4200	< 3500
UG-420	362	510	1175	950	100	11222	900x900/1200x1200	4600	< 3500
	420	630	1425	1050	100	13020	900x900/1200x1200	5300	< 3500
UG-550	550	680	1550	1175	100	17050	900x900/1200x1200	5800	< 3500

Approximate dimensions and weights For special requirements, please consult

## 6. OTHER TECHNOLOGIES

Medium voltage outdoor

Voltage transformers for GIS

Optical current transformer

Line traps



› Optical current transformer SDO OCT.

## 6. OTHER TECHNOLOGIES

# 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.



› Outdoor medium voltage transformers.

› Voltage transformer for GIS.

› Optical current transformer.

› Line traps.

## 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).

For more information, refer to the catalog: **Medium Voltage Outdoor Instrument Transformers.**

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.

› 36 kV CR Current transformers. Electronet Services (New Zealand).



## 6. OTHER TECHNOLOGIES

# VOLTAGE TRANSFORMER FOR GAS INSULATED SWITCHGEAR (GIS)

These are voltage transformers insulated with SF<sub>6</sub> for gas insulated switchgears (GIS).

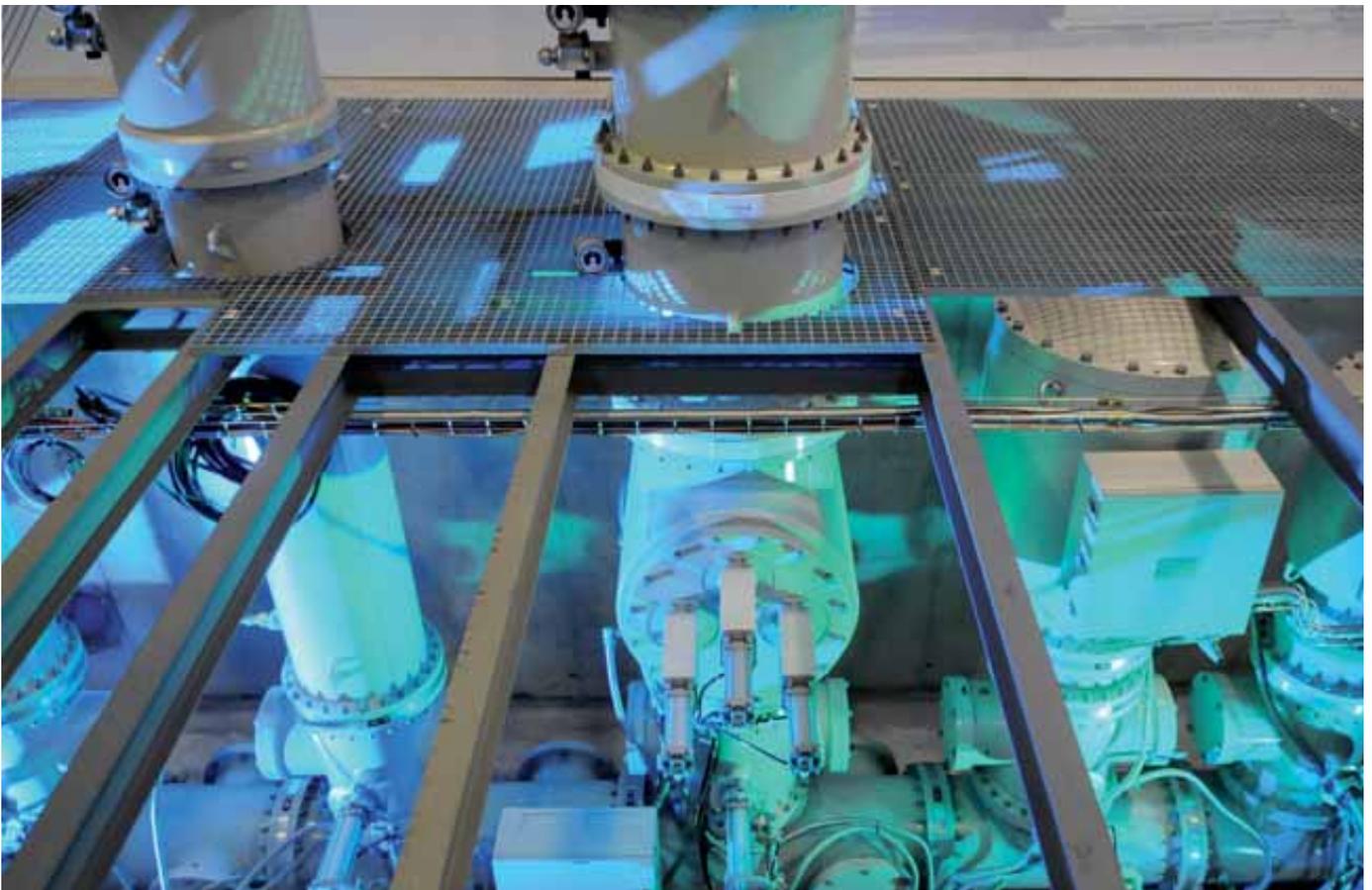
Gas insulated voltage transformers for GIS can be single-phase or three-phase. Both types of VTs are connected to the GIS through insulators.

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

Model SVR up to 800 kV.

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

› Routine test substation for voltage transformers for GIS.



## OPTICAL CURRENT TRANSFORMER SDO OCT

The SDO OCT is a highly accurate optical current transformer for high voltage systems, based on a fully passive optical transducer (The SDO ICT). The SDO OCT provides a digital measurement solution for metering and protection applications in the next generation of high voltage digital substations.

The operation of the SDO ICT is based on the Faraday Effect. The polarization state of a linearly polarized optical signal is rotated as it travels through a magnetic field. For an optical signal which travels along a closed path, the angle of rotation is proportional to the current enclosed by the path.

The rotation of the polarization state of the light is measured interferometrically as the phase difference between circularly polarized optical signals which travel in opposite directions around a coil of fibre that encloses the primary.

ARTECHE SDO uses the most advanced fiber sensing technology based on a patented technique that allows construction of passive interferometric transducers.

The SDO OCT is composed of three elements:

- › SDO ICT sensor head.
- › Post-type solid and dry polymer insulator with an embedded fiber optic.
- › SDO MU merging unit.

SDO OCT is ideally suited for:

- › Digital measurement for metering & protection based on the IEC 61850 process bus protocol.
- › Custom, LEA output. Can also be provided for other applications, such as:
  - HVDC.
  - FACTS.

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

Model SDO OCT up to 1200 kV.

- › SDO OCT Optical current transformers. Copel (Brazil).



## 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. ESB (Ireland).



## 7. QUALITY & ENVIRONMENT

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 environmental-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.
- › ISO 14001:2004.
- › ISO 9001:2008.
- › OHSAS 18001:2007.

ARTECHE demonstrates its commitment in all core subjects of Corporate Social Responsibility integrating its practices in their management systems and following the guidelines of ISO 26000. ARTECHE is a signatory of the United Nations agreement “The Global Compact”, a voluntary initiative for Social Responsibility, which is supporting the ten principles based on human rights, labor rights, environment protection and anti-corruption fight.



- › ARTECHE new Ultra High Voltage laboratory up to 1200 kV.

## 8. SERVICE

With production plants on **four continents** (Spain, Mexico, Argentina, China and Australia) and over 100 customer service technical offices to ensure optimal service.



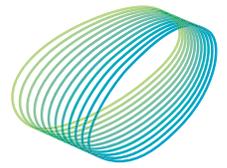
## SERVICE

- › 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 on four continents (North America, South America, Europe, Asia and Australia) and more than 100 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.



- › The solutions ARTECHE has developed and expanded upon have made it a major participant in the most important electrical events and organizations.



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Moving together



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