

4. CAPACITIVE VOLTAGE TRANSFORMERS AND COUPLING CAPACITORS

Oil-paper insulation



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

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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

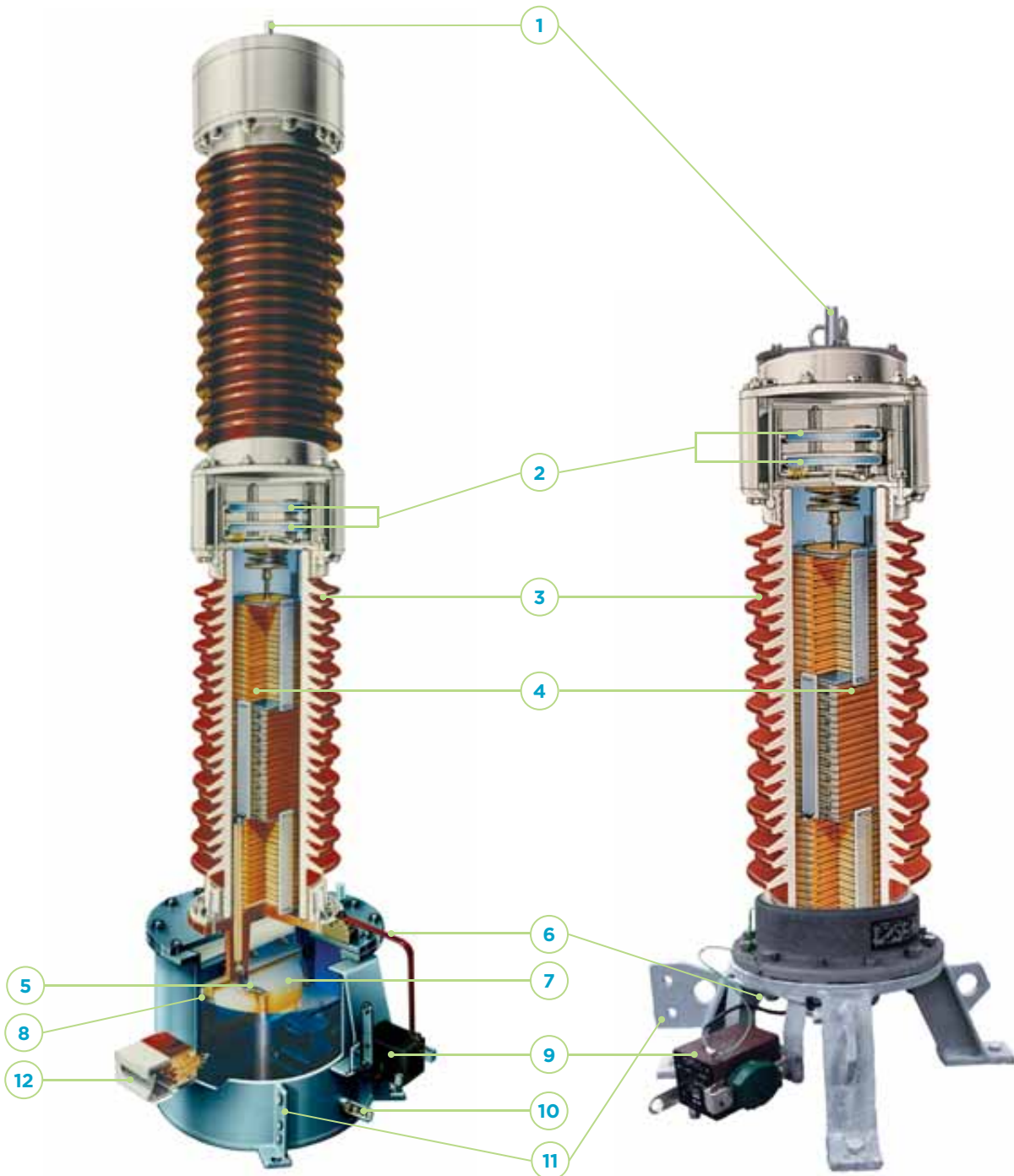
Capacitive voltage transformer:
model DFK up to 800 kV,
model DDB up to 170 kV.

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

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SECTIONS

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



> Capacitive voltage transformer

> Coupling capacitor

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APPLICATIONS

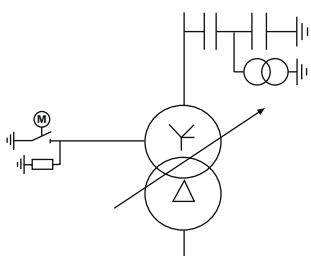
Ideal for installation at metering points due to its very high accuracy class and extremely steady capacitance.

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

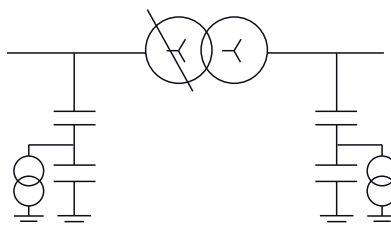
Helps to reduce voltage peaks in the line.

Examples of applications:

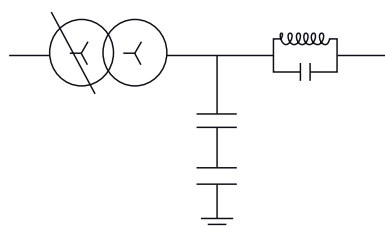
1. Revenue metering.



2. Protection for high voltage lines and substations.



3. Transmission of high frequency signals.



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



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DESIGN AND MANUFACTURE

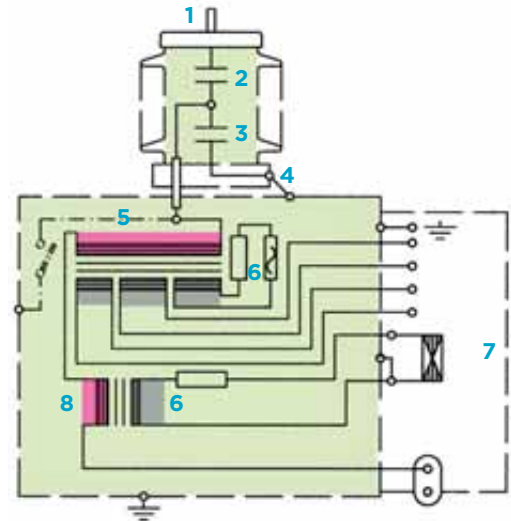
Capacitive voltage transformers consist of a series of capacitors connected in series on top of a tank in which the electromagnetic unit (inductive transformer (5), series reactor (8) and auxiliary elements) is housed. These capacitors form a voltage divider (2, 3) between the high voltage terminal (1)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

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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.

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.

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RANGE

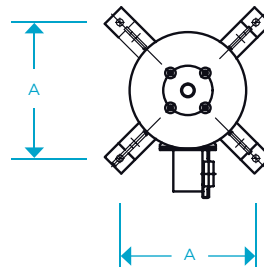
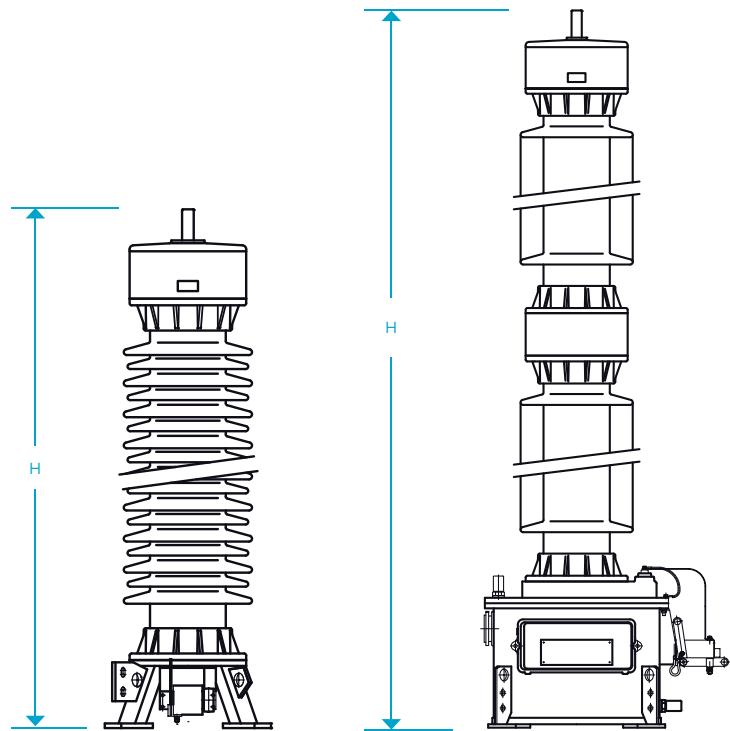
ARTECHE capacitive voltage transformers and coupling capacitors are named with different letters (DDB or DFK for transformers; DDN or DFN for capacitors) followed by 2 or 3 numbers indicating the maximum voltage of the network for which they are designed.

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.

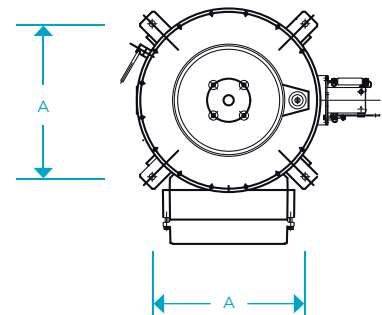
Standard accuracy classes and powers:

- > 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.



> Coupling capacitor



> Capacitive voltage transformer



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

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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	-	10300	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.