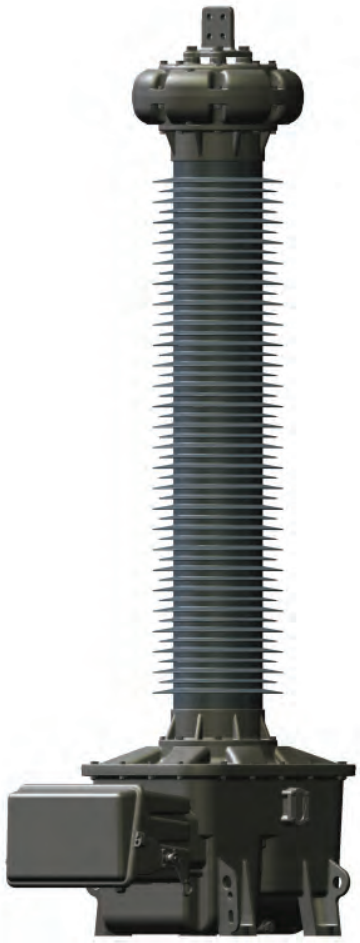
Type CVO Capacitor Voltage Transformer
72.5kV to 550kV



General
Ritz type CVO is a Coupling Capacitor Voltage Transformer (CCVT) used in high voltage and extra-high voltage systems to provide voltage outputs to meters, protective relays, and other instruments. Additionally, the unit can be equipped with carrier accessories which allow the CCVT to be used for coupling power line carrier (PLC) signals to the transmission line for communication applications.

CCVTs become increasingly more cost-effective as the system voltage increases when compared to inductive VTs. CCVTs are also lighter in weight than VTs and can be shipped with the upper capacitor sections disassembled for easier shipping and handling.

This brochure details the features and ratings of the Ritz CCVT type CVO.

Applications
CCVTs provide voltage outputs for revenue meters, protective relays, and other voltage monitoring instruments.

CCVTs equipped with carrier accessories can couple high frequency PLC signals to the transmissions line.

CCVTs, with the addition of an optional harmonic measuring device, can be used as a direct input to power quality instruments.

The capacitance of the Ritz CCVT can be used to reduce the transient recovery voltage (TRV) of a high voltage circuit breaker, particularly for short-line faults.

Standards
Ritz can design to meet all national and international standards including ANSI/IEEE, CSA, IEC, AS, and to any customer requirements.

Construction
Ritz CCVTs consist of two basic assemblies: the high voltage capacitor divider consisting of one of more capacitor sections and the electromagnetic unit housed in the base tank.

Capacitor Section(s)
The capacitor section contains the capacitor voltage divider that steps down the voltage applied at the primary terminal to a reduced voltage at the intermediate voltage tap.

The external insulation is provided by a polymer hollow-core insulator consisting of a fiberglass-reinforced resin tube with molded-on silicone rubber sheds and marine-grade aluminum flanges. Polymer insulators provide a strong resistance to pollution and maintain long lasting high levels of hydrophobicity. In addition, polymer insulators reduce weight, increase seismic withstand performance, and offer a higher level of safety. As an option, porcelain insulators can be provided.

The capacitor elements are manufactured using a mixed dielectric design, with the dielectric materials being kraft paper and polypropylene film. Using both paper and film dielectric material ensures a stable capacitance over a wide operating temperature range.

The capacitor section consists of multiple series-connected capacitor elements that are connected using low inductance tinned copper tabs. The capacitor elements are mechanically compressed and bound in sub-sections using fiberglass reinforced epoxy tape. The division of the capacitor divider into smaller sub-sections ensures a consistent spacing factor to allow for proper oil flow and a stable capacitance over the life of the unit.

After assembly into the insulator, the capacitor sections are dried in an oven under vacuum. After drying, the capacitor sections are filled and impregnated with synthetic capacitor oil. The synthetic oil is chosen based on excellent gas absorption properties which contribute to exceptional partial discharge performance.

Each capacitor section is hermetically sealed and is fitted with a stainless steel expansion bellow to compensate for oil volume changes over the operating temperature range of the unit.

The top of the upper capacitor section is fitted with a cast marine-grade aluminum cover and primary terminal. The terminal is removable to expose threaded holes for line trap mounting. For CCVTs with multiple capacitor sections, the mechanical connection of the sections also serves as the electrical connection between sections.

Electromagnetic Unit (EMU)
The EMU steps down the intermediate tap voltage to a voltage suitable for connecting to meters, relays, and other instruments.

The intermediate voltage transformer is wound using double-enamel magnet wire and utilizes kraft paper as insulation between winding layers. A ground shield is provided between the primary and secondary windings. The neutral end of the primary winding has multiple taps to facilitate factory ratio accuracy calibration. Multiple secondary windings are provided based on the customer specification.

A compensating reactor is connected in series with the intermediate voltage transformer to cancel phase shifts induced in the capacitor voltage divider. The compensating reactor has multiple taps used in factory phase-angle accuracy calibration.

A passive ferroresonance suppression device (FSD) is connected across one of the secondary windings and is provided to suppress ferroresonance between the capacitance of the voltage divider and the inductance of the EMU transformer and compensating reactor. The FSD is comprised of a saturable reactor controlled damping resistance and a stabilizing resistance. The FSD design does not adversely impact the transient response performance.

When required by the standard or customer specification, the EMU is fitted with a potential ground switch (PGS) on the side of the base tank. This switch can be used to ground the intermediate voltage tap.

The EMU is housed in a hermetically sealed cast marine-grade aluminum base tank which is filled with mineral oil. An oil-level sight glass and oil drain plug is provided on the base tank.

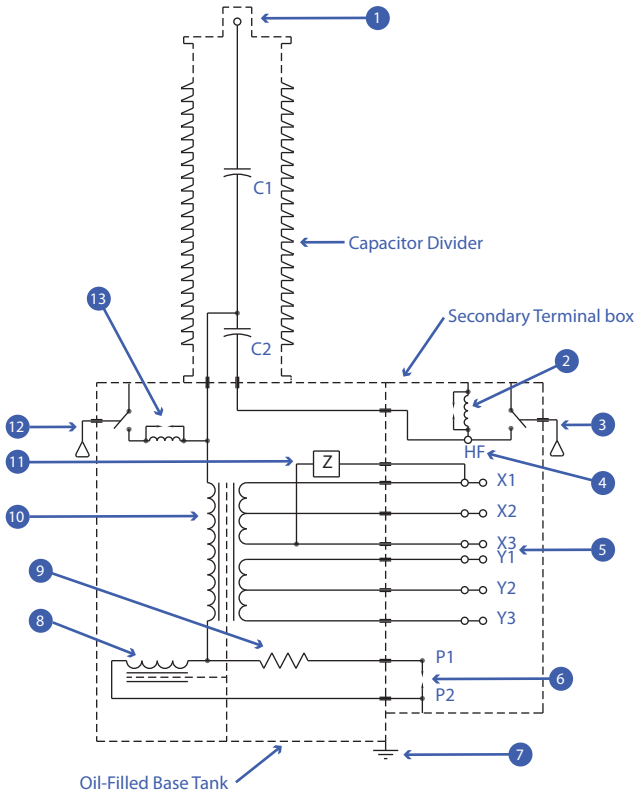
Carrier Accessories
As an option, the CCVT can be equipped with carrier accessories, which include a carrier ground-switch, drain coil with protective gap, and a carrier entrance bushing.

Secondary Terminal Box
Customer connections are housed in a cast marine-grade aluminum secondary terminal box on the front of the unit with a large lockable door. An aluminum field-drillable gland plate is provided for customer conduit hubs.

Corona Suppression
The CCVT is designed to reduce corona discharge. 245kV class units and above are supplied with an aluminum electrode to ensure proper insulation performance.

Seismic Performance
Seismic performance is considered in all aspects of the CCVT design. Designs can be supplied to comply with international seismic standards.

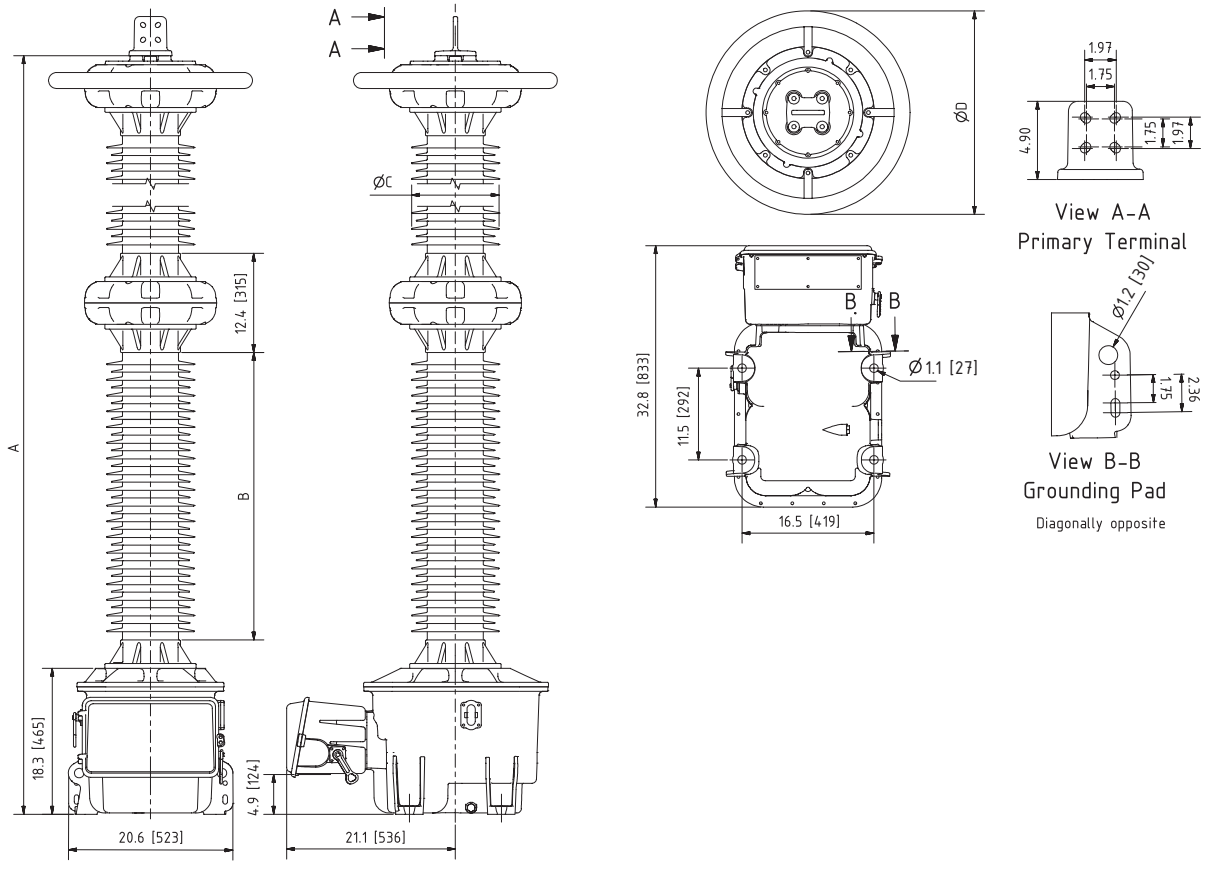
Typical Ritz Type CVO Schematic



1. HV Terminal
2. Drain Coil and Protective Gap
3. Carrier Ground Switch (CGS)
4. Carrier (HF) Terminal
5. Secondary Terminals
6. Reactor Protective Device
7. Ground Terminal
8. Compensating Reactor
9. Damping Resistor
10. Intermediate Voltage Transformer
11. Ferroresonance Suppression Device (FSD)
12. Potential Ground Switch (PGS)
13. Choke Coil and Protective Device

Type	CVO...IR	CVO...II	CVO...IM	CVO...ER	CVO...EI	CVO...EM
Capacitance	Intermediate	Intermediate	Intermediate	Extra High	Extra High	Extra High
Accuracy Class (ANSI C93.1)						
2 Main Secondary Windings			0.15Z			0.15Z
		0.3Z	0.3ZZ		0.3Z	0.3ZZ
	0.6Z	0.6ZZ		0.6Z	0.6ZZ	
Auxillary Third Winding	1.2Y - special ratings upon request					
Transient Response After 1 Cycle	<9% @ ZT	<9% @ ZT/ZZT	<9% @ ZT/ZZT	<6% @ ZT	<5% @ ZT	<5% @ ZZT
Ferroresonance Suppression	Less than 10% after 10 cycles at 150% rated voltage - special ratings upon request					
Thermal Burden	1000 VA	1000 VA	1200 VA	1000 VA	1000 VA	1500 VA

Unit Type	Maximum System Voltage (kV)	Nominal Capacitance (pF)	Number of Sections	A (in [mm])	B (in [mm])	ϕC (in [mm])	ϕD (in [mm])	Minimum Creepage Distance (in [mm])
CVO72I_	72.5	17000	1	54.7 [1389]	22.8 [579]	10.9 [277]	n/a	88.4 [2245]
CVO123I_	123	10700		67.9 [1724]	36 [91]			150.1 [3812]
CVO145I_	145	8800		75.7 [1922]	43 [1092]			176.9 [4493]
CVO170I_	170	7300		84.6 [2148]	52.7 [1338]			207.4 [5267]
CVO245I_	245	5300	2	116.3 [2954]	36 [914]		25.5 [648]	299 [7594]
CVO362I_	362	3600		149.8 [3804]	52.7 [1338]		34 [864]	441.8 [11221]
CVO550I_	550	2400	3	215.0 [5461]	52.7 [1338]			671.2 [17048]
CVO72E_	72.5	37600	1	54.7 [1389]	22.8 [579]	12.5 [318]	n/a	88.4 [2245]
CVO123E_	123	22700		67.9 [1724]	36 [914]			150.1 [3812]
CVO145E_	145	18700		75.7 [1922]	43 [1092]			176.9 [4493]
CVO170E_	170	15500		84.6 [2148]	52.7 [1338]			207.4 [5267]
CVO245E_	245	11300	2	116.3 [2954]	36 [914]		25.5 [648]	299 [7594]
CVO362E_	362	7700		149.8 [3804]	52.7 [1338]		34 [864]	441.8 [11221]
CVO550E_	550	5100	3	215.0 [5461]	52.7 [1338]			671.2 [17048]



Ritz Instrument Transformers, Inc.
25 Hamburg Avenue
Lavonia, GA USA 30553
TEL: 706-356-7180
FAX: 866-772-5245
sales@ritzusa.com

Other ratings available upon request.
Ratings listed in this brochure are subject to change without notice.