OTCF
COUPLING CAPACITOR VOLTAGE TRANSFORMER

OTCF...SR/SI/II/SM/ER/EM/IR/II/IM
(With PGS)
Read this instruction book before installation and Operation of the unit.

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WARNING
DE-ENERGIZED HIGH VOLTAGE EQUIPMENT MAY CONTAIN TRAPPED CHARGES

Read this instruction book before installation and operation of the unit. Never work on high voltage equipment without first having short-circuited and grounded all terminals and metallic housings as the inherent capacitance may have electric charges with voltage at the lethal level. In addition, a ground rod should stay on the line terminal as long as people work on the unit. In the event an electrical test is to be performed, the person supervising the test assumes responsibility of performing the test in a safe manner under the local / federal regulation. After the test, the operator should put the ground rod back to the line terminal until the unit is ready to be in service.

Note: To effectively discharge high voltage equipment do the following:
(a) Put the ground rod onto the line terminal (Such action will short-circuit the entire unit and put the line terminal to the ground potential), and
(b) Use another ground rod to attach to any intermediate metallic housing for duration of 10 –15 seconds to be certain that there is no residual electrical charge within the unit.
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1.0 DESCRIPTION, CIRCUIT DIAGRAM AND NAMEPLATES

1.1 DESIGN

The AREVA T&D/Ritz coupling capacitor voltage transformer (CCVT) comprises a capacitor voltage divider (CVD) and an electromagnetic unit (EMU). Depending on the voltage rating, the CVD can be a multi-capacitor unit stack assembly with the intermediate voltage tap brought out from the bottom capacitor unit. The individual capacitor units contain capacitor elements impregnated with synthetic oil and are hermetically sealed by means of external expansion chambers. The EMU in a base tank filled with mineral oil (See Figure 2) is hermetically sealed by means of an air cushion.

1.2 GENERAL PRINCIPLE OF OPERATION

CCVTs transform voltage of the transmission line, as depicted in the schematic diagram (Figure 1) to values suitable for metering and relaying application. The CVD (CN) comprises a high voltage capacitor (C1) in series with an intermediate voltage capacitor (C2). The EMU, in parallel with C2, comprises the following items:

A. Series Reactance (2)^t tuned, at the rated frequency, to the sum of C1 and C2.

B. Intermediate Transformer (3) with one or more secondary windings.

C. Ferro-resonance Suppression Device, FSD (5).

D. Protective device (8) for the excessive output conditions.

AREVA T&D-Ritz provides a carrier terminal ‘HF’ in the terminal box for carrier coupling, if required. The master (or rating) nameplate on the outside of the terminal box shows the serial number and ratings of the CCVT.

1.3 NORMAL AMBIENT CONDITIONS

All AREVA T&D-Ritz CCVTs are suitable for outdoor operation.

Ambient temperature: -50° to +45° C

Altitude: Up to 3,000 feet above sea level

Wind Velocity: Up to 100 m.p.h

AREVA T&D-Ritz shows the deviations from the above in the customer drawings.

2.0 PACKING, TRANSPORT AND STORAGE

2.1 GENERAL INFORMATION

In general, AREVA T&D-Ritz delivers CCVTs with ratings up to 170 kV in wooden crates containing the base unit assembly (base tank and bottom capacitor unit). For CCVTs above 170 kV, AREVA T&D-Ritz dismantles the upper capacitor units, and crates them in sets with the base unit assembly and all the necessary hardware required to assemble the unit. The users should transport and handle the CCVT as gently as possible. AREVA T&D-Ritz indicates the correct position for transport with the marking “UP” on the packing case.

Note: AREVA T&D-Ritz CCVT’s should always be transported with upper sections disassembled and all components in the vertical upright position.

AREVA T&D-Ritz mounts the bottom capacitor unit on the base tank. A crane should be used to lift the upper capacitor units. The use of rope slings with choker-type hitch arranged to bear on the upper metal flange is an effective way to lift the capacitor units or the base unit assembly (see figure 5). Avoid jarring the load when starting to lift. The user may store crated units outdoors on level ground in a well-drained area. Blocks should be placed underneath the crates to prevent the base of the units from submerging in water during storage. AREVA T&D-Ritz delivers units rated above 170 kV with the upper capacitor unit(s) removed and bolted to the pallet alongside the base unit assembly. AREVA T&D-Ritz protects the top ends of the capacitor units from the weather with temporary covers, which the user should examine when storing the equipment. Covers found to be damaged or loosened should be adjusted or replaced as necessary. AREVA T&D-Ritz recommends additional protection, e.g., a tarpaulin, for extended periods of storage (more than 2 months). Do not stack crates or place heavy objects on top.

2.2 MAXIMUM SHIPPING WEIGHTS

<table>
<thead>
<tr>
<th>Model</th>
<th>Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTCF...SR/SM/IIM</td>
<td>300</td>
</tr>
<tr>
<td>Cap. Unit</td>
<td>300</td>
</tr>
<tr>
<td>Cap. Unit with EMU</td>
<td>750</td>
</tr>
<tr>
<td>OTCF...ER/EM</td>
<td>550</td>
</tr>
<tr>
<td>Cap. Unit</td>
<td>550</td>
</tr>
<tr>
<td>Cap. Unit with EMU</td>
<td>1,050</td>
</tr>
</tbody>
</table>

3 - Try to avoid tilting units by more than 30° from the vertical axis.

4 - The user should use rope with strength twice the lifting weight.

5 - Base unit assembly

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1 - The above is a general description of operating principle. A wiring diagram plate, located on the backside of the door of the terminal box, provides details of the device system.

2 - Bracketed numerals are item numbers in Figure 1.
3.0 ASSEMBLY AND ERECTION

3.1 PRE-ASSEMBLY CHECKS

Clean the packing-material remnants off all components, especially underneath porcelain sheds, flanges, and shielding. Check the oil level indicator on the base tank (See figure 6). Inspect all sealed joints such as fittings, covers, and oil drain valve for traces of oil. Establish and rectify the cause of any leaks before commissioning. Immediately notify AREVA T&D-Ritz of any defects found, quoting the serial number of the unit and providing a description of the defect. In the case of major defects, consult AREVA T&D-Ritz before installing the unit.

3.2 ERECTION OF THE CCVT

Adhere to the transport instructions (see paragraph 2). Uncrate the units carefully and inspect for oil leakage and physical damage.

3.2.1 BASE UNIT ASSEMBLY

Secure the base tank to the foundation or supporting structure with four mounting bolts. See outline drawing for the size of holes and thickness of the pad.

3.2.2 UPPER CAPACITOR ASSEMBLY (IF APPLICABLE)

Join the upper and bottom capacitor units together with the hardware provided as follows:

- Eight sets of bolts, washers, and nuts, as supplied, per upper capacitor unit. (See figure 5)

3.2.3 ASSEMBLY PROCEDURE FOR TWO OR MORE CAPACITOR UNITS

Position upper capacitor units with their nameplates aligned with the unit main nameplate. Slowly lower capacitor units one at a time with a crane and insert the bolts into the upper unit mounting holes. Lower the upper unit onto the lower one and tighten the bolts. Repeat the same procedure for the subsequent unit(s).

CAUTION: It is essential that the capacitor unit serial numbers shown on the master nameplate match the actual serial numbers of the capacitor units installed on the device. Accuracy performance may be affected if incorrect capacitor units are assembled together.

3.2.4 HIGH VOLTAGE TERMINAL

If shipping height permits, AREVA T&D-Ritz provides the CCVT with the high voltage terminal installed on the uppermost capacitor unit. The terminal orientation can be adjusted as required by removing the bolts attaching the terminal base to the upper expansion chamber cover. If not installed, the high voltage terminals should be attached to the unit using supplied hardware. In addition, adhere to the permissible cantilever load specified on the outline drawing when making the connection to the line.

3.2.5 ELECTRICAL SHIELD (CORONA RING)

Corona rings are only supplied with certain designs based on BIL requirements. If supplied, assemble the shield over the flanges with the bolts provided on to the high voltage terminal assembly as illustrated in figure 5.

4.0 ELECTRICAL CONNECTIONS

4.1 GROUND AND CARRIER TERMINAL CONNECTIONS

CAUTION: Never work on a CCVT without first having short-circuited and grounded all terminals and intermediate flanges for 30 seconds. Connect the ground terminal (4) of the base tank to the station grounding system. Before commissioning the CCVT, ensure the carrier terminal “HF” (7) is grounded via the carrier drain coil (13) or grounding link. For CCVT’s with carrier accessories, bring the lead-in cable through the carrier entrance bushing at the bottom of the terminal box and connect to the “HF” terminal.

4.2 CONNECTION OF THE SECONDARY TERMINALS

Bring measuring cables into the terminal box through conduit couplers. Since cable resistance causes measurement error, these cables should have the largest possible cross-sectional area. Example: If the cable resistance is 0.2 Ω connected to a 200 VA load on the 115-V winding, the voltage drop will be 0.35 V, i.e. about 0.3% of the rated voltage. When the winding provides the full power, the voltage drop in the cable alone may exceed the limits of accuracy. The secondary wiring has to be connected as specified on the wiring diagram plate, which is located on the backside of the door of the terminal box.

4.3 SECONDARY CABLES AND WIRING

Both analysis and operating experiences indicate that high frequency (oscillatory) surge currents with magnitudes of a few kA flow through the high-capacitance coupling capacitors during line switching operations and lightning disturbances. Unless precautions are taken to minimize the coupling between high voltage loops, large induced voltages can occur in instrumentation, relaying and control circuits, which may cause them to malfunction. In extreme cases, damage to the secondary insulation including the potential device may occur. To minimize the induced voltages, the secondary cables should follow the ground conductor as closely as possible between the base tank ground terminal and the point the ground conductor attaches to the ground grid. In the horizontal run into the control room, the secondary cables should be physically close to the ground grid. If necessary, enclose the secondary cables in a copper or aluminum conduit. Ground the conduit at both the CCVT and the control room to eliminate the loop coupling. It also provides electrostatic shielding for the cable and reduces the ground impedance between the CCVT and the control room so that transient differences in the ground potential do not cause excessive current in the secondary circuits.

For single-phase secondary connection, it is a common practice to ground the non-polarity secondary terminals “X3” and “Y3”. Make this ground at one point only, as remote from the CCVT as possible and preferably in the control room. Multiple grounding tends to impress transient potential differences in ground potential across the secondary winding rather than from winding to ground. Follow the same practices in 3-phase secondary connections such as in grounding the common neutral of a wye-connection or on one corner of a broken delta connection. Ground the non-polarity terminal of the unused secondary windings.
5.0 EFFECT ON NON-LINEAR BURDEN

Exercise caution when applying non-linear (or magnetic) burdens to CCVTs. The effect of a non-linear burden on the CCVT is to cause harmonics in the output voltage current, which, in turn, may cause variation in ratio and phase angle errors as well as increasing the voltage across the protective device. During momentary over-voltage conditions, the effects of a non-linear burden may cause gap flashover and, thereby, interfere with the operation of the relaying system.

Most relays, synchroscopes, voltmeters, and other generally used instruments are essentially linear burdens up to twice normal voltage. Burdens with closed magnetic circuits, such as auxiliary potential transformers, may not have linear characteristics over the entire voltage range. If the user connects such devices to the secondary circuits, he should select these such that the operating flux density of the iron core is less than one-half the knee-point flux density. For example, it is desirable to use a 230:230-V auxiliary potential transformer in the 115-V circuit instead of one having a 115:115-V rating. The same should apply to relay coils.

6.0 SPECIAL DESIGNS

6.1 50 HZ SUPPLY

These instructions apply to both 50 Hz and 60 Hz CCVTs.

6.2 LINE TRAP MOUNTING

If the CCVT is intended to support a line trap, refer to the supplementary dimension drawing. A line trap adaptor plate with or without a detachable HV terminal should be ordered as necessary. Reference the outline drawing to make sure the mechanical load imposed by the line trap does not exceed the rating of the CCVT.

6.3 SUSPENSION MOUNTING

These instructions also apply to CCVTs designed for suspension mounting. A suspension mounting kit should be ordered as an accessory. Reference the outline drawing to make sure the pull applied does not exceed the rating.

7.0 PREVENTIVE MAINTENANCE AND REPAIRS

AREVA T&D-Ritz CCVTs do not require any programmed maintenance. However, AREVA T&D-Ritz recommends an annual visual inspection for oil traces on or around the unit, proper oil level in the base tank, and condition of the protective gaps during other substation routine checks. If desired some of the tests outlined in Section 12 and 13 may be performed. Report leaks or cracks during transport, or in operation to AREVA T&D-Ritz, stating the CCVT serial number, operating hours and type of fault. Do not break any hermetic seals without AREVA T&D-Ritz consent.

8.0 PROPER USE OF THE POTENTIAL GROUNDING SWITCH (PGS)

AREVA T&D-Ritz provides a potential grounding switch (PGS) (10) for safety purposes. To service the unit, close the PGS so that the terminal box is not live. Keep the length of time the ground switch is closed to a minimum because the CVD is subject to higher stress as closing the PGS eliminates the insulation of C2 capacitor. If the secondary outputs are not required for the application, AREVA T&D-Ritz recommends grounding the non-polarity terminals and leaving the secondary windings unconnected. AREVA T&D-Ritz discourages the practice of closing the PGS for extended time (more than 6 hours).

9.0 PERFORMANCE

AREVA T&D-Ritz factory adjusts the unit to meet the accuracy performance as specified on the master nameplate. Field adjustment is, therefore, unnecessary. The burden may be applied to any secondary or all windings simultaneously as long as the total burden to the unit is not in excess of the declared burden rating of each individual secondary. Refer to the master nameplate for the thermal burden rating of the CCVT.

10.0 FUSE ASSEMBLY

If fuse protection is required, AREVA T&D-Ritz suggests the following fuses:

<table>
<thead>
<tr>
<th>CCVT Type</th>
<th>~69-V Winding</th>
<th>115-V Winding</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTCF...SR/SR/IR/IR/ER</td>
<td>20 A</td>
<td>10 A</td>
</tr>
<tr>
<td>OTCF...IM/EM</td>
<td>25 A</td>
<td>15 A</td>
</tr>
</tbody>
</table>

7 - For CCVT of 48 kV or below system voltage, AREVA T&D-Ritz forbids the closing of PGS, while the unit remains energized at rated voltage, for more than 3 hours.
11.0 HEATER

The use of a heater in the terminal box is not necessary as the normal voltage developed between terminals is less than 600 volts and the insulation provided far exceeds the required value. Moreover, once the assembly is in service the heat generated within the base tank will prevent condensation. However, during periods of extended storage in humid environments, the use of a heater of rated from 6 to 12 W may reduce surface condensation and mildew build-up. AREVA T&D-Ritz does not recommend keeping a heater energized when the unit is in service, particularly when the ambient temperature exceeds 40º C.

12.0 ELECTRICAL MEASUREMENTS

If the maintenance program calls for periodic electrical measurements, AREVA T&D-Ritz recommends the following as a guide. It is important to use capacitance measurement equipment that can provide readings with a minimum 0.5% accuracy. Note that AREVA T&D-Ritz stamps the nameplate with the capacitance taken at rated voltages and rounded off to the hundreds of pico-farads. Readings taken during the commissioning should be kept as a reference for subsequent measurements. An increase of 1% in capacitance is a concern, as this may be an indication of internal insulation failure.

12.1 FIELD TEST SET METHOD

In general, the test set is capable of generating a voltage up to 10 kV or higher for measurement purposes. For different test sets, the procedure and technique are not the same. It is best to refer to the operating manual of the test set. The precautions and principle of the test outlined below are for reference. Please refer to figure 3.

12.1.1 PRECAUTIONS

A. Reinstall any connection undone for field tests.
B. The maximum voltage applied to the “Car” lead after removal from the “HF” (Low-Voltage) terminal of the bottom capacitor unit is 2 kV.
C. The maximum voltage applied to the “P2” lead after removal from the ground of the EMU is 2 kV.
D. The rated voltage of the intermediate voltage terminal is 7.0 kV for SR, SI, SM, and ER units and 12.5 kV for IM and EM units. AREVA T&D-Ritz recommends the capacitance \( C_a \) reading of the bottom capacitor unit taken at voltage below 10% of the rated (of the bottom capacitor) so that the voltage developed across P1 and P2 terminals if left floating is below the rating of the protective gap.
E. After the removal of the connection at “HF” and “P2” terminal, do not attempt to energize the unit with rated voltage.
F. Apply the test voltage in a controlled manner. Shut off the power, as the conditions require, such as noise and flashover coming from the CCVT under test.
G. Before handling the capacitor units, short circuit the units for 30 seconds minimum to drain off any possible stored charges.

12.1.2 THE PRINCIPLE OF THE TEST

Because the intermediate-voltage terminal of the bottom capacitor unit comprising \( C_{1-1} \) and \( C_2 \) is not readily accessible, the user can only determine the rated capacitance \( C_a \) based on the measured value of \( C_{1-1} \) and \( C_2 \). The presence of the choke coil has insignificant effect on the measurements at 60 Hz.

A. Measure the capacitance of the upper capacitor units with the test set across. (See Figure 3A and 3B).

B. In order to measure \( C_{1-1} \) and \( C_2 \), close the PGS and disconnect the Low Voltage or “Car” lead at the “HF” terminal.
C. Refer to Figure 3C for the measurement of the capacitance \( C_{1-1} \).
D. Refer to Figure 3D in order to obtain the capacitance \( C_2 \).

The user can determine the rated capacitance \( C_a \) as follows:

\[
C_a = \frac{(C_{1-1} C_2)}{(C_{1-1} + C_2)}
\]

E. After the test, re-install the connection at “HF” terminal and open the PGS.
F. Verify the voltage transformation ratios of the secondary windings with voltage applied to the bellow housing of the bottom capacitor unit and with the tank grounded. For multi-capacitor CCVTs, AREVA T&D-Ritz recommends the test carried out with the tank grounded. More sensitive results than the test performed on a complete unit assembly should be obtained. The following gives the expected voltage of the secondary winding:

\[
nV/R
\]

Where:

n: Number of capacitor units forming the CVD

V: Applied voltage

R: Transformation ratio shown on the master nameplate

The voltage across all secondary terminals can be measured, i.e., voltage across

a) \( X_1-X_3 \)  

b) \( Y_1-Y_3 \) 

c) \( X_2-X_3 \)  

d) \( Y_2-Y_3 \) 

Reading of a) should match that of b) and reading of c) should match that of d) if the ratios of both windings are the same. The test voltage divided by the master nameplate ratio should give the reading obtained during the test.

Example: A standard OTCF_245.SR comprises 2 SHC capacitor units. The voltage transformation ratio for \( X_2-X_3 \) is 2,000:1. The expected voltage across \( X_2-X_3 \) with 10 kV applied to the base unit assembly is 10,000/(2,000/2) = 10 V. If the readings are not as expected, notify the factory.

8 - The user may contact AREVA T&D-Ritz for a copy of the complete field test procedure of CCVT.

9 - The lead connects to the low voltage end of the bottom capacitor unit. AREVA T&D-Ritz brings the lead to the “HF” terminal of the terminal board.

10 - The expression is valid assuming the capacitor units of the CVD are of the same rating.
12.2 CAPACITANCE BRIDGE METHOD

This test can be performed with a bridge at a voltage less than 1.0 kV and at a frequency less than 100 Hz. For a unit supplied with the choke coil assembly, the user should note that the operating frequency should be less than twice the system frequency because the choke coil reactance at high frequency will introduce significant error to the measurement.

A. Obtain the capacitance of the upper capacitor units directly with the test leads across the unit. (See Figures 3A and 3B)
B. For the base unit assembly, the user should follow the procedure provided below (See Figures 3C and 3D)
   i) With the PGS closed and the ground Low Voltage or “Car” lead removed from "HF" terminal, measure the capacitance C1-1 with the leads of the bridge attached to the bellow housing and the tank.
   ii) Measure the capacitance C2 between the Low-voltage lead and the tank with the PGS still closed. Use the formula, given in paragraph 12.1.2, for C3 to determine the capacitance of the bottom capacitor unit.

12.3 IONIC (GARTON) EFFECTS

Since the synthetic capacitor fluid used by AREVA T&D-Ritz is a powerful solvent, it is unavoidable that the oil dissolves some foreign materials on the capacitor elements and insulators forming of ions. This increases the dissipation factor when measured at reduced voltage (i.e. at 10% rated voltage). For brand new capacitors, the Garton effect influence, in any case, should not result in a dissipation factor of 0.30% or higher at 10% rated voltage. Readings higher than this would be indicative of poor oil quality and the user should consult the factory.

For performing power factor tests on capacitors which have been in service for some time, AREVA T&D-Ritz recommends measurement be taken within 48 hours after removal from service. Waiting more than 3 days can result in the power factor being as high as 1.0% after removal from service. Waiting more than 3 days have been in service for some time, AREVA T&D-Ritz is a powerful solvent, it is unavoidable that the oil dissolves some foreign materials on the capacitor in service, has become uniform and complete.

i) Ionic concentration in the system, because of the oil circulation within the capacitor in service, has become uniform and complete.
ii) The ions distribute more uniformly within the thin oil film between the capacitor elements than the time when AREVA T&D-Ritz manufactured the unit.

12.4 CORRECTION FACTORS FOR CAPACITANCE AND DISSIPATION FACTOR

The curves for temperature correction factor and for capacitance and dissipation factor are provided in for reference. See enclosed graphs. AREVA T&D-Ritz recommends the use of correction factors under extreme ambient conditions, e.g. –35 °C.

13.0 OTHER PERTINENT TESTS

The tests outlined below are for checking that the CCVT is in proper working condition. Incorporating such tests in both the commissioning and scheduled maintenance program for AREVA T&D-Ritz CCVTs should be considered.

13.1 SERIES REACTANCE TEST

To check if the reactor is working properly, apply a short circuit on one of the secondary windings and connect a voltmeter across P1 and P2 terminal. Set the voltmeter at the highest possible range scale. Raise the voltage applied to the high voltage terminal of the CCVT. If the voltage across the P2 and P1 increases quickly with the applied voltage, the reactor is in satisfactory condition. Conversely, if the voltage across P1 and P2 does not respond to the applied voltage, the reactor may be defective. In this case, report the test results to the factory. (The test may be performed on the base unit assembly.)

13.2 BACK-FEED OR LOW VOLTAGE TEST (REFERENCE FIGURE 4)

The application of a 110V power source protected with a series resistor of 10- Ω is adequate for the following tests.

A. Connect the main supply to the secondary terminals X and X with the ground connection at the “HF” terminal temporarily removed. Make sure the PGS is in the “Open” position. [Figure 4A]
B. Raise the voltage up slowly to approximately 120 V and take corresponding reading of the ammeter A, (i) which is essentially the exciting current of the transformer. Check if the voltage across Y1 and Y2 is the same as the applied voltage. Bring the tests voltage back to zero. Calculate the impedance Z1.
C. Close the PGS and repeat step B. [Figure 4B]. The current essentially for the series reactance reflected to the secondary side of the transformer, increases rapidly with the test voltage. The protective gap for the series reactance will spark over at a certain supply current level (ii). Reduce the test voltage as soon as the protective gap arcs over. Determine the impedance Z2.
D. After grounding both the line and “HF” terminals, repeat the test with the PGS open. [Figure 4C]
   Cautiously bring up the voltage. The supply current increases rapidly with the test voltage because the intermediate voltage side is a series-tuned circuit. The protective gap for the series reactance will spark over at a certain supply current level. Reduce the test voltage as soon as the protective gap arcs over. Determine the impedance Z3.

11 - The lead connects to the low voltage end of the bottom capacitor unit. AREVA T&D-Ritz brings the lead to the “HF” terminal of the terminal board.
13.3 FERRO-RESONANCE TEST

– PGS OPERATION

The PGS operation test can be performed with the burdens disconnected. The test will confirm whether:

A. The ferro-resonance suppression device is working properly, and
B. The components within the CCVT are in satisfactory condition.

13.3.1 THE TEST PROCEDURE IS AS FOLLOWS:

1. With the unit assembled on the pedestal, disconnect the burden to the unit by the removal of fuses or links at the junction box.
2. Connect a recorder of a voltmeter on one of the secondary windings (at the fuse-blocks). Ensure the scale is at least 4 times the secondary voltage of the recorder.
3. Energize the unit with the PGS closed.
4. With a hook stick operate the PGS for a couple of times and record the voltage trace simultaneously (or observe the response of the voltmeter). Close the PGS at the end of this test. Examine the voltage trace to see if the voltage recovers its normal pattern. If not, de-energize the unit and obtain further instructions from AREVA T&D-Ritz.
5. If the voltage trace is satisfactory, repeat the test five or six more times. If the voltage trace confirms previous results, the unit is ready to put in service. Close the PGS and reconnect the burdens by re-installing the fuses and links in the junction box.
6. Repeat the test five or six times with the burden connected. Examine the voltage recovery after each test in order to avoid damage of the instrumentation in the secondary circuit. Close the PGS and consult AREVA T&D-Ritz if the burden is the cause of ferro-resonance.

12 – AREVA T&D-Ritz assumes that the user has checked the burden to be linear and not short circuit.
CORRECTION FACTOR FOR CAPACITANCE VS TEMPERATURE

CORRECTION FACTOR FOR TAN δ (DISSIPATION FACTOR) VS TEMPERATURE
TYPICAL RITZ CCVT SCHEMATIC DIAGRAM

1 - HIGH VOLTAGE TERMINAL
2 - SERIES REACTANCE
3 - TRANSFORMER
4 - GROUNDING TERMINAL
5 - FERRORESONANCE SUPPRESSION DEVICE
6 - DAMPING RESISTOR
7 - CARRIER HF TERMINAL
8 - OVERVOLTAGE PROTECTIVE DEVICE
9 - CHROME COIL AND GAP
10 - POTENTIAL GROUNDING SWITCH
11 - SECONDARY TERMINALS
12 - CARRIER GROUNDING SWITCH (OPTIONAL)
13 - CARRIER DRAIN COIL AND PROTECTIVE GAP (OPTIONAL)

TYPICAL SECTION VIEW OF CCVT

1 - PRIMARY TERMINAL
2 - CAST ALUMINIUM BELLOW HOUSING
3 - STAINLESS STEEL EXPANSION BELLOW
4 - COMPRESSION SPRING
5 - INSULATED VOLTAGE CONNECTION
6 - CAPACITOR ELEMENTS
7 - INSULATOR (PORCELAIN OR SILICON RUBBER)
8 - VOLTAGE DIVIDER TAP CONNECTION
9 - CAST-EPOXY BUSHING
10 - HF TERMINAL CONNECTION
11 - FERRORESONANCE SUPPRESSION DEVICE
12 - SECONDARY TERMINALS
13 - OIL LEVEL SIGHT-GLASS
14 - TERMINAL BOX
15 - INTERMEDIATE TRANSFORMER
16 - OIL/AIR BLOCK
17 - OIL DRAIN VALVE
18 - COMPENSATING REACTOR
19 - ALUMINIUM COVER PLATE

FIGURE 1

FIGURE 2
C1-3 Measurement
(3-Capacitor Unit CCVT)
(GST/GUARD Mode)

Note: All intermediate tap for the bottom unit, which divides the complete stack into C1 and C2, with the PGS closed is grounded.

Fig. 3A

C1-2 Measurement
(3-Capacitor Unit CCVT)
(UST Mode)

Note: a) the intermediate tap for the bottom unit, which divides the complete stack into C1 and C2, with the PGS closed is grounded.

Fig. 3B
C1.1 Measurement
(3-Capacitor Unit CCVT)
(GST/Guard Mode)

Note: all the intermediate tap for the bottom unit, which divides the complete stack into C1 and C2, with the PGS closed is grounded.

Fig. 3C

C2 Measurement
(3-Capacitor Unit CCVT)
(GST/Ground Mode)

Note:
1. The intermediate tap for bottom unit, which divides the complete stack into C1 and C2, with PGS closed is grounded.
2. The "CAR" test point is created by removing the b/w lead from the "HP" terminal.

Fig. 3D
Backfeed Test - 1 \(<Z_1>\)

1. Lift up the lead at HF and then isolate the leads from one another
2. Open PGS

\[ Z_1 = \frac{V_1}{I_1} \]

Fig. 4A

Backfeed Test - 2 \(<Z_2>\)

1. Lift the lead at HF and then isolate the leads from one another
2. Close PGS

\[ Z_2 = \frac{V_2}{I_2} \]

Fig. 4B
Backfeed Test - 3 <Z₃>

1. Re-install the connection at HF
2. Open PGS
3. Ground "B1" [or HV term]

*Bring the voltage up very slowly!

\[ Z₃ = \frac{V₃}{I₃} \]

\[ \text{Expect } Z₁ > Z₂ > Z₃ \]

Fig. 4C

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CVT Uncrating and Installation

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Oil Level Indicator

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Figure 5

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Figure 6
On August 1, 2006, RITZ High Voltage became part of AREVA T&D.
AREVA T&D Instrument Transformers equipment portfolio now includes RITZ High Voltage extensive range.
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