

AUTOMATIC CAPACITANCE AND TAN DELTA BRIDGE



ACTS BRIDGE

FEATURES

- Automatic Microprocessor controlled Guarded Bridge Circuit.
- Suitable for testing at voltages up to 500kV.
- Can be used to measure Un-Grounded and Grounded Specimen Test.
- Automatic guard circuit for three-terminal measurements.
- Interference measurement and automatic interference suppression circuitry.
- Optional Range Extension Transformer for large capacitance values.
- Test data storage facility.
- RS232 computer interface and a USB printer interface.
- Windows Interface Software for data transfer.
- The temperature correction can be applied in interface software and the corrected results are stored in data base.

Etel Automatic Capacitance & Tan Delta Bridge (ACTS Bridge) is an instrument designed to be used independently with an external HV power supply source, & HV SF-6 Gas Filled 3 Terminal Standard Capacitor. The bridge can be used to make C & DF measurements in the UST configuration. If the external power source is properly shielded and guarded, and has the low voltage end of the HV winding accessible, then the bridge can also be used in the GST configuration. The operation with external supply and capacitor allows for changing the operating voltage and capacitance range of the instrument.

The ACTS C&DF Bridge provides direct digital display of :

- Voltage. • Current (drawn by specimen) • Capacitance
- Power • Power factor OR Dissipation factor
- Frequency • Interference Current • Time and Date

APPLICATIONS

The ACTS C&DF Bridge is primarily suitable for shop, laboratory or factory testing of electrical insulation at high-voltages. The bridge measures the capacitance and loss of insulation within electrical equipment, providing values of Capacitance and Dissipation Factor (Tan Delta) or alternatively Capacitance and Power Factor. Such measurements are typically measured when designing high voltage electrical equipment or verifying the quality of electrical insulation. These quantities are typically measured during the assembly of electrical apparatus, during equipment's final acceptance testing as well as during planned periodic maintenance programs. The test is typically non destructive to good insulation and the test results are used for trending and predicting the in-service life for the equipment. The ACTS C&DF Bridge makes it possible to test insulation at considerably higher voltage than is possible with typical portable Capacitance & Tan Delta measuring equipment. Portable equipment is typically limited to tests at 10kV or 12kV and the limited rating of such portable equipment limits the capacitance of test samples. In contrast to the portable equipment, the ACTS C&DF Bridge is meant to test equipment at or above their normal operating voltage. The test set can be configured with a suitable power source (10 to 500 kV), standard capacitor (15 to 500 kV) and possibly with a Range Extension Transformer to solve the particular testing requirements of a manufacturer. The flexibility of the arrangements makes it possible to use the ACTS C&DF Bridge to measure Capacitance of high voltage Equipment - like CTs, PTs, CVTs, Bushings, HV Capacitor and Power Cables, and Rotating machine at rated voltages from 10 to 500 kV.

DESCRIPTION

THE BRIDGE CIRCUIT

The ACTS C&DF Bridge is an automatic microprocessor based transformer ratio arm bridge. The bridge provides high accuracy, resolution and sensitivity. The transformer ratio arm circuit provides an automatic guard terminal that does not require balancing and also provides a high accuracy of measurement & is very stable as the high accuracy is derived from the precision toroidal transformer. The bridge is rated at 1 ampere, thus a range extension transformer is required for samples drawing higher charging current due to high capacitance or high voltages.

INTERFERENCE SUPPRESSION

The Test set has a fully Automatic Interference measurement and suppression circuitry. The circuitry automatically measures and suppresses the interference, which enables accurate measurements in areas where interference levels are normally high. Interference Suppression in the Model ACTS-Bridge is derived from a Phase locked Oscillator that provides separate Capacitance & Tan Delta adjustments. This Oscillator can be phase locked to the Line Frequency.

EXTERNAL HIGH VOLTAGE POWER SUPPLY

The power supply used for operating the ACTS Bridge should have a secondary terminal that has an accessible zero or neutral connection that is not permanently connected to ground (i.e. has the low voltage end of the HV winding accessible). In this way the ACTS Bridge can measure samples using the UST and GST** configurations. If the low end of the HV winding is not available, only UST measurements are possible. The ACTS Bridge is supplied with LV testing leads and the HV testing Leads are to be provided or made available alongwith the HV Power Supply unit. Both the ACTS Bridge and the Power Supply will have to be powered using the same power supply line.

RANGE EXTENSION TRANSFORMER

For applications involving large capacitances or test samples that draw charging current in excess of 1 ampere, a precision Range Extension Transformer is required. The Range Extension Transformer is basically a precision current transformer that increases the range of the ACTS Bridge and at the same time reduces the charging current applied to the bridge. The ELTEL Range Extension Transformer provides ratio of 10 to 1. With a 1 ampere secondary, the range extension can handle current of 1,000 milli amperes. The ratio of the range extension can be entered into the ACTS Bridge at the time of set-up to provide a direct reading of the measured capacitance and dissipation factor. The CTS-RE Range Extension Transformer increases the Bridge Capacitance Range by a factor of 10. This has to be included in the measuring circuit for measuring Capacitance values that are higher than the Bridge Capacitance range. (This high Capacitance can be measured at the desired HV – provided the HV power supply has adequate kVA rating).

STANDARD CAPACITOR

The ACTS C&DF Bridge is designed to be used with a loss-free Standard Capacitor in the range of 50 to 1000 pF. To ensure high accuracy of measurement and linearity over the entire operating voltage range, typically a SF-6 3 terminal compressed gas capacitors are used. The ACTS Bridge capacitance range depends on the value of the standard capacitor (Cn) used. Once the exact value of the standard capacitor (Cn) is entered into the memory of the microprocessor, the instrument will display the accurate capacitance as well as test voltage. The bridge has provisions for correcting small losses in the standard capacitor (Cn). In the event that a second Standard Capacitor of higher voltage rating and same or different Capacitance value is to be used with the ACTS Bridge, then the Bridge will have to be re-tuned. The ACTS Bridge can be tuned/ used with one value of Standard Capacitor only.

For different Standard Capacitor values, the typical Bridge Capacitance ranges are as indicated in the chart below

Value of Standard Capacitor	Test Voltage	Bridge Capacitance Range - μF
50 pF	500 kV	0.065
100 pF	250 kV	0.13
200 pF	120 kV	0.26
1000 pF	25 kV	1.3

SPECIFICATIONS

CAPACITANCE

Bridge Capacitance Range

: As indicated in above Chart. (Depends on value of Standard Capacitor used)
(The max value of Capacitance that can be measured at a particular voltage Will depend on the kVA rating of the HV Power supply used)

Accuracy (*) : $\pm 0.1\%$ of reading $\pm 1\text{pF}$ (UST)
 $\pm 0.2\%$ of reading $\pm 10\text{pF}$ (GST)

(*) The accuracy indicated is that due to the instrument only. Additional errors may be introduced due to the characteristics of the Reference Capacitor – stability of its capacitance and loss.

(**) In GST mode ACTS BRIDGE can be used to measure capacitance above 0.05 μF .

Resolution : 5 digits

POWER FACTOR

Range : 0 to 100 %

Accuracy (*) : $\pm 1\%$ of reading $\pm 0.05\%$

Highest Resolution : 0.00001, PF display is in absolute value or percentage

Readout : 5 digits.

DISSIPATION FACTOR (Tan Delta)

DF Range : 0 to $\pm 10,000\%$

Accuracy (*) : $\pm 1\%$ of reading $\pm 0.05\%$

Highest Resolution : 0.00001, DF display is in absolute value or percentage

Readout : 5 digits

VOLTAGE MEASUREMENT

Accuracy (*) : $\pm 1\%$ of reading, peak or RMS responding

Resolution : 6 digits

INTERFERENCE CURRENT

Range : 0 to 100 mA

Accuracy : $\pm 1\%$ of reading

Best Resolution : 1 micro ampere

FREQUENCY

Operating Range : 45 - 65 Hz

Accuracy : ± 0.02 Hz

Resolution : 0.01 Hz

DATA STORAGE FACILITY

Can store upto a maximum of 160 readings & the data is retained in memory even when the instrument is switched OFF

INDICATION

240 x 128 dot matrix LCD panel with back light

INTERFACE

RS232C serial interface to PC for control

USB port for printer interface

KEYBOARD

20 keys, membrane keyboard on front panel

FREQUENCY

The ACTS Bridge uses a measuring circuit that synchronizes to the excitation frequency and thus becomes sensitive only to that frequency. It can be operated correctly at any frequency from 40 Hz to 70 Hz. The frequency of the excitation source must be stable in order to provide stable and accurate readings. Both the excitation power supply and the ACTS C&DF Bridge have to be powered at the same frequency from the same source.

ENVIRONMENTAL

Temperature : Operating range - 0 to 50°C

Humidity : Ambient to 95% RH, non-condensing

MECHANICAL DATA

Bridge : Approx 10 kgs
483 x 425 x 133 mm (LxBxH)

Bridge with Carrying Case : Approx 15 kgs
740 x 640 x 310mm (LxBxH)

Cables with Carrying case : Approx 15 Kgs
610 x 410 x 330 mm (LxBxH)

APPLICABLE STANDARDS

ACTS Bridge meets the EMI/ EMC Test requirements as per IEC 61000-4-3 - Radiated Susceptibility Test

IEC 61000-4-5 - High Energy Surge Immunity Test

IEC 61000-4-11 - Voltage dips & Interruption Tests

STANDARD ACCESSORIES

- Two sets of LV screened cables of 20m length equipped with clips.
- Mains connecting cable of 2m.
- RS232 cable for PC Interface 2m.
- USB Printer cable - 2m.
- Ground Cable - 10m & 20m equipped with battery clips.
- Operation manual & RS-232 TO USB Converter cable.

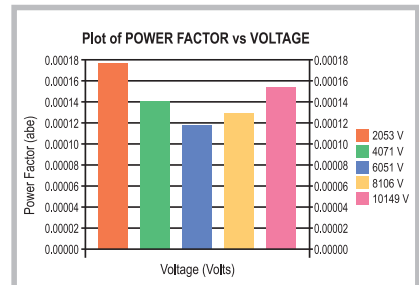
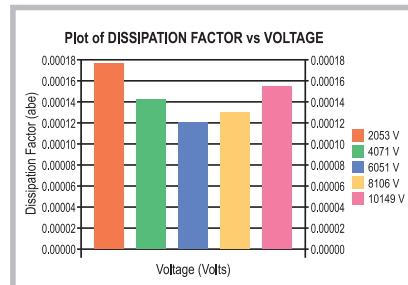
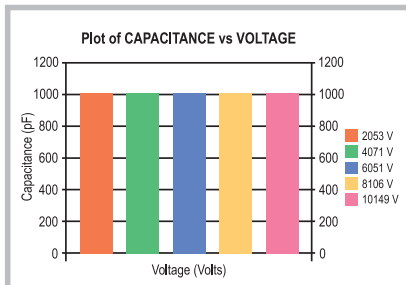
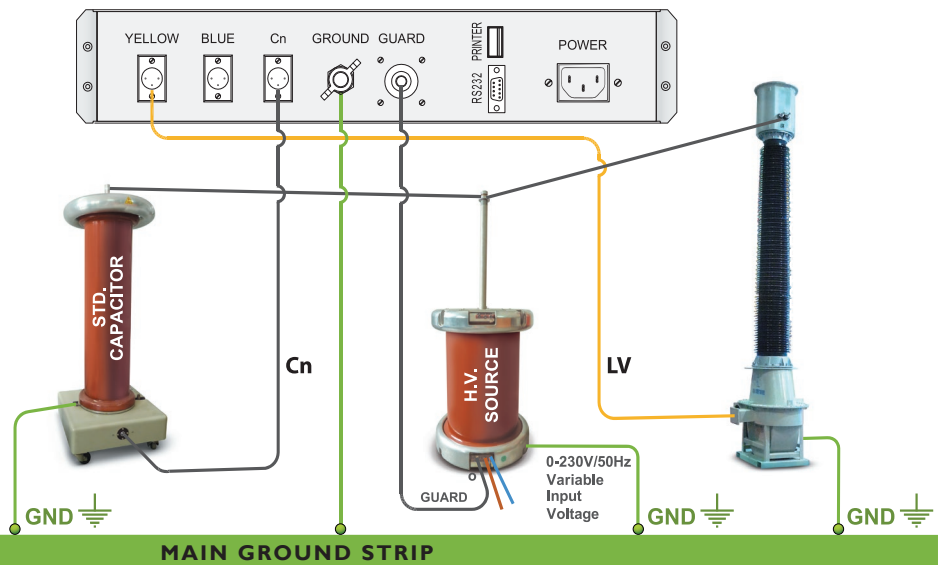
OPTIONAL ACCESSORIES

RANGE EXTENSION TRANSFORMER:
CTS-RE (1:10) to extend the Bridge Capacitance range.

WINDOWS INTERFACE SOFTWARE:
Windows based software for transferring test results from the Bridge to the PC.



Connection diagram for using acts Bridge with external power supply and external SF-6 three Terminal Standard Capacitor



OTHER PRODUCTS

- Manual & Automatic Transformer Ratio Meters.
- Digital Micro Ohm Meters with built in 100Amp source.
- Manual & Automatic Transformer Winding Resistance & On Load Tap Changer Test sets.
- Automatic CT/VT Test Sets & Systems.
- Automatic 12 kV & 5 kV Capacitance & Tan Delta Test Sets.
- Relaying Current Transformer Analyser.



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Eltel Industries, established in 1983, is a market leader in the development and manufacturing of test instruments for electrical power industries and utilities. We are pleased to announce the NABL-accreditation of the Eltel Industries – Calibration Laboratory (including on-site calibrations) in electro-technical discipline in accordance to ISO/IEC:17025/2005.

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(Specifications subject to change without notice)