TIME ELECTRO & CONTRACTING CO.
شركة الوقت للكهرباء والمقاولات ذ.م.م.

ONSITE TESTING - HV AC RESONANT TEST SYSTEM

BROCHURE

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ISO 9001 BUREAU VERITAS Certification

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ON-SITE TESTING WITH HV AC RESONANT TEST SYSTEM (HIGH VOLT)

INTRODUCTION

TIME ELECTRO & CONTRACTING COMPANY W.L.L. is a leading corporate in the United Arab Emirates offering quality services in the field of High Voltage Electrical work 400, 132 & 33 kV and Medium Voltage Power Distribution to Build Nation, Mechanical and Civil works in compliance with International Quality Standards ISO 9001:2008 requirements to which the company is accredited. Time Electro undertakes projects covering the scope that includes supply, installation, testing & commissioning, and execute the works professionally as per laid down specifications and standards.

Time Electro has subsequently developed a team of highly educated and well experienced Engineers and Supervisory Staff who delivers the goods in most professional manner. The company has skilled, unskilled labor and adequate machinery resources to fulfill and complete the projects in time and to the entire satisfaction of the Clients/Customers.

In addition to the above, Time Electro's services also include HV AC Testing through the latest AC Resonant Test System Equipment from HIGH VOLT capable to do the tests up to 320kV. The on-site HV AC testing of Power Cable is carried-out with variable frequency that generates a practically infinite variable AC test voltage against earth for testing. The following On-Site Tests on Power cables are conducted:

- Phase Identification Test
- Electrical Tests on Non metallic Sheath
- DC Resistance Conductor Test
- Measurement of Capacitance
- Insulation Resistance Measurement
- Measurement of Positive & Zero Sequence Impedance
- Measurement of Earth Resistance
- High Voltage DC test
- High Voltage AC Tests on Cables upto 320 kV
- High Voltage AC Tests on GIS, Switch gears, and Small lengths between Transformers

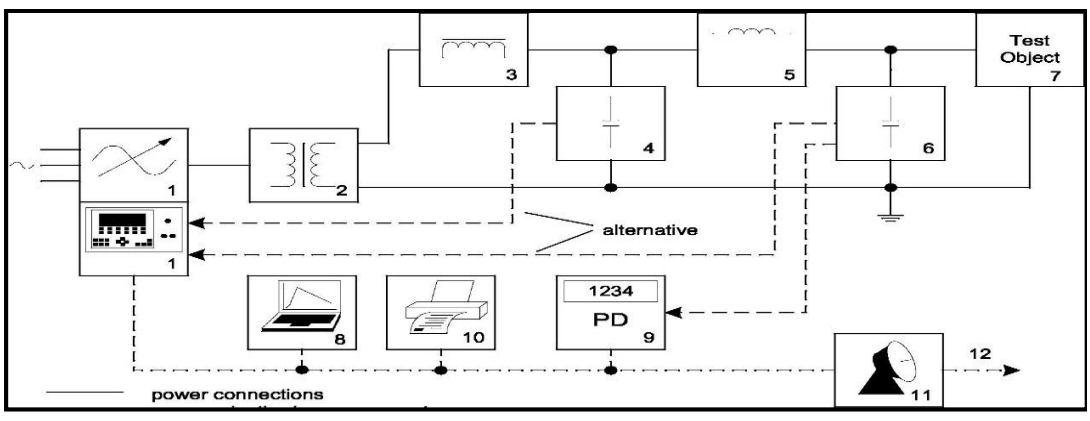
Please see below the Technical Specifications & System Parameters of High Voltage Test Equipment System.

GENERAL PRINCIPLE OF HV TEST ON-SITE

The general principle of the applied HV test method simulates the stress that may occur during the operation. The HV on-site tests are mainly performed to check the quality of the accessories and their assembling. It also identifies the dangers of any defects in insulation and further to determine that there are no defects during transportation and installation for its capability during future operations. This on-site test is carried-out with a larger frequency tolerance. The withstand test may be combined with the partial discharge (PD) measurement test. The HV AC on-site testing is acknowledged widely and recommended by relevant IEC and other Standards for its reliability.

The frequency range of 20 to 300 Hz is considered acceptable especially for the low specific system weight kg/kVA since it gives an advantage of the test system also for very long cable lengths and for a tunable frequency of 50 or 60 Hz.

On-site test of a cable - image



Block diagram of test system

VARIABLE FREQUENCY VS. VARIABLE INDUCTIVITY

	variable inductivity	variable frequency
frequency range	50...60	20...300
load range	Cmax/Cmin = Lmax/Lmin = **20**	Cmax/Cmin = $(fmax/fmin)^2$ = **225**
quality factor	approx. 50	100...200
feeding power	single or two phase	three phase (symmetrical)
weight-to-power ratio	3 ... 8 kg/kVA	0.8 ... 1.5 kg/kVA
application	routine test of cables in test field (one fabrication length)	on-site testing of complete cable systems and GIS

HV AC SYSTEM TECHNICAL SPECIFICATION

System Description

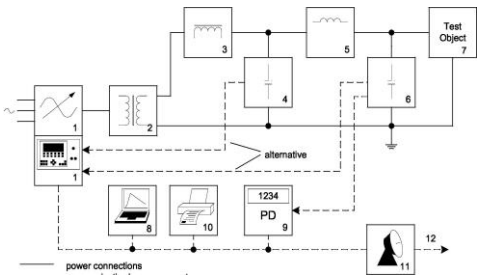
The AC resonant test system with variable frequency generates a practically infinite variable AC test voltage against earth for testing of HVAC cables. All technical requirements according to IEC 60060-1 and IEC 60060-3 are guaranteed within a range of approx. 10% to 100% of rated voltage.

The components of the HV test system and the load (power cable to be tested) form an oscillating circuit of a certain natural frequency. When the frequency of the test system is tuned to that natural frequency, the system operates in resonance. It establishes a high test voltage up to very large capacitive currents at minimum power input.

The control of test system searches for the resonant frequency f_n automatically and the HV test is carried out at that frequency.

Main features of the system are:

- The components of the test system are designed for on-site testing and frequent traveling.
- The test system has a very compact and robust design and is easy to install.
- It has very low power consumption.
- The test system has an advanced computer-aided control for full automatic operation, easy data handling / recording and protocol printing.
- Electrical equipment capable of withstanding over voltages during operation.



1. Control and feeding unit measuring instrument
2. Exciter transformer
3. HV reactor access
4. Voltage divider
5. Blocking impedance
6. Filter capacitor
7. Test object *)
8. Industrial PC or notebook
9. PD
10. Printer *)
11. Remote
12. Internet *)

Fig. 1 Block diagram of test system

The HV test system consists mainly of the oil-insulated, metal-tank HV reactor (3), the exciter transformer (2), the control and feeding unit (1 - including the frequency converter), a blocking impedance (5) and a voltage divider. The low-voltage power supply is realized by a three-phase cable to the power and feeding unit. The connections from there to the exciter transformer and from this transformer to the reactor are achieved by cables. The test object (7) will be connected to the test system at the connecting element of the voltage divider. For the earth connection a copper foil will be used.

SYSTEM PARAMETERS

Rated voltage	kV 260
Minimum voltage	kV 26
Rated current[1)]	A 83
Frequency range	Hz (20[2)]...) 31 ... 300
Duty cycle at rated power	1h ON - 1 h OFF, 3 cycles per day
Min. load capacitance[3)]	nF 17.4
Max. load capacitance	nF 1650 (3909[2)])
Mains supply at stiff grid[4)]	3PE
	V 230/400
	Hz 50/60
	kVA 320
Quality factor of complete test circuit[5)]	≥ 80
Operating conditions:	
Ambient temperature	°C 5 ... 40
Daily mean temperature	°C ≤ 25
Max. relative humidity	% 90 (no condensation)
Height above sea level	m ≤ 1000 (at higher altitude with reduced voltage)
Ambient temperature for storage and transportation	°C -10 ... 50
Maximum shock loading in all directions	2 g
Installation	Outdoor under fair weather conditions, mobile

1) The current available for the object to be tested is reduced by the value of the capacitive current of the HV measuring capacitor.

2) At reduced voltage, U ≤ 169 kV

3) If the system shall operate without test object the capacitance must be at least min. load capacitance. The suggested voltage divider will not fulfill this requirement.

4) No current-operated earth-leakage protection

5) This value is related to HVAC cables. If other objects shall be tested it should be announced for an optimum design. The losses of the test object must be specified by the customer.

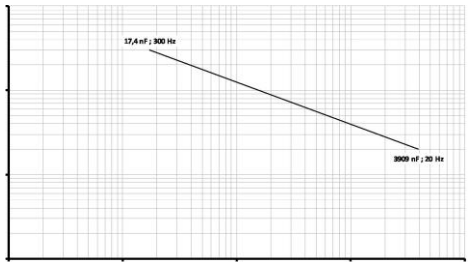


Fig. 2 Test frequency depending on load capacitance

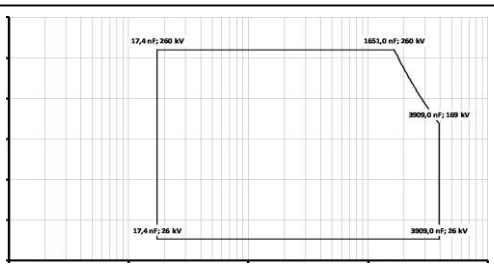


Fig. 3 Operating range of test system

The dielectric strength of the external insulation of the test system applies to the following climatic conditions:

- Atmospheric pressure - MPa 0.1
- Temperature - °C 20
- Atmospheric humidity - g/m^3 11

CONTACT DETAILS

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Trailer Sketch.