TEST REPORT

This is to Certify that “SHANTI” Insulation Tester

Model No._____S. No._____

Range :_____

_____

ohms, was tested in our Q. C. Dept. as per Indian Standard IS : 2992-1987 and the results, specifications are as follows :

a) Accuracy as per Clause 9.1: OK

b) Insulation Resistance Measured by applying 500V DC as per clause 11.4: OK

c) High Voltage test for 1 minute by applying 2KV A.C. (rms) as per Clause 11.5: OK

d) Terminal voltage as per clause 9.2: OK

Date: TESTED BY:

WARRANTY

SHANTI Insulation Tester is Guaranteed for 12 months from the original date of dispatch against any manufacturing defects. In case of any complaint, please return the instrument securely packed and freight prepaid to enable us to repair and return the same. No other warranty is implied or otherwise is applicable.

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INSULATION TESTER SERIES
ITI, ITHV AND ITMR
Direct Indicating Type

INDIA

OPERATING MANUAL

Manufactured by:

SHANTI INSTRUMENTS PRIVATE LIMITED

KT Legend, Building No. 5, KT Industrial Park No. 2, Waliv, Vasai (East), Dist-Palghar -401208

Tel. No. +91 9607936627, Email : service@shanti-instruments.com

To check the voltage of the Insulator tester

The instrument gives the rated voltage at the terminals when a resistance corresponding to the rated resistance is connected across the instrument and remains to within +/-10% of this rated value, until a resistance corresponding to central scale mark is connected. Since these values are of the order of 100 Megohms to 20,000 Megohms the output voltage cannot be measured with an ordinary voltmeter or an electronic multimeter because their input resistance is of the order of 10 to 50 Megohms, hence we suggest the following procedure for checking the voltage of the insulation tester. Take a chain of resistances of 1 % tolerance corresponding to a value of the rated resistance (or one half or one fifth this value) and connect this in series with a sensitive micro ampere meter across the instrument. This resistance value multiplied by the current reading will give the terminal voltage Ex. for a 2500 volts 5000 Megohms Insulation tester with 1000 Megohms resistance the current is 2.4 microamps, hence the terminal voltage is 1000 Megohms X 2.4 microamps = 2400 volts. The other alternative is to take an electronic multimeter with input resistance of 500 Megohms or more.

In any case make sure that the pointer of the insulation tester is between central scale mark and infinity when measuring the voltage.

Any other specific range in single or multi range can also be manufactured.

STANDARD MODELS

TYPE	VOLTAGE	INSULATION RANGE (any one Megaohm range with infinity)
ITI	100V	0 - 10 to 0 - 200 Megohms
	250V	0 - 20 to 0 - 500 Megohms
	500V	0 - 50 to 0 - 1000 Megohms
	1000V	0 - 100 to 0 - 2000 Megohms
ITMR - 3	1000V	0 - 2000 Megohms
	500V	0 - 1000 Megohms
	250V	0 - 500 Megohms
	Continuity range Discharge	0 - 20 K ohms
ITMR - 4	1000V	0 - 200 Megohms
	500V	0 - 100 Megohms
	250V	0 - 50 Megohms
	100V	0 - 20 Megohms
	Continuity range	0 - 500 ohms
ITHV	2500V	0 - 2000 to 0 - 10000 Megohms
	5000V	0 - 5000 to 0 - 20000 Megohms

READ BEFORE USE

The circuit to be tested must always be 'dead'

1. Insulation testing.

Test to Earth :	Connect terminal marked 'L' to circuit under test and the other terminal, marked 'E' to earth(frame of equipment etc.)
Test between wires :	Connect one wire to each terminal.
2. Continuity i.e. ohms test (ITMR-3 & ITMR-4)	Connect terminals marked L & G to circuit under test Rotate the handle at about 160 r.p.m. and read the scale.

GUARD TERMINAL.

The guard terminal 'G' need only be used if there is a possibility of surface leakage, which it is desired to eliminate. For example, in testing a cable, a leakage may occur across the surface of the insulation which has been 'bared'. In such a case, a bare wire is bound tightly around the insulation and the guard terminal connected to the wire.

CHARGED CIRCUITS.

Many circuits have appreciable capacitance and in the course of testing become charged. Such charged circuits can be lethal. Therefore at least one minute should be allowed to elapse before disconnecting the instrument after carrying out a test.

SHANTI INSULATION TESTER SERIES - ITI, ITHV AND ITMR

Introduction

The SHANTI Insulation Tester is a universal, portable self powered, multipurpose instrument with its own constant voltage generator for checking insulation leakage and conductance during simulated operating conditions in the electric and electronic fields. This rugged precision, instrument can locate intermittent shorts, defective electrical connections, insulation breakdown or conductor failures due to wear, moisture, abrasion deterioration, corrosion or other hostile environment.

Application

In additional to locating and trouble-shooting existing insulation problems, the testers should be used in a programme of preventive maintenance. A simple one minute check will detect potential trouble spots before breakdown occurs and greatly reduce costly repairs and down time. It will reduce periodic overhaul expense, by revealing the electrical condition of wiring and components which might otherwise be replaced unnecessarily.

Construction

The ITI, ITHV and ITMR series Insulation Testers are the culmination of many years of SHANTI experience in building Insulation Testers. Their accuracy is as per clause No. 9.1 of IS : 2992 - 1987.They incorporates the SHANTI Cross coil movement. They are of heavy duty construction made of selected materials and has been engineered to provide you with long periods of trouble free operation.

Maintenance

Given reasonable care it should provide many years of trouble free service. As with any precision test instrument the 'SHANTI' Insulation Tester should not be stored in a place with excessive dampness, humidity, vibration or heat. Avoid location where corrosive gases, oil vapours, moisture, dust or temperature extremes exist. In case the pointer goes to zero with a bang, it is no cause for concern. This is because of Zener Circuitry in the deflection coil. When the handle speed is increased, the pointer will come back to zero.

Choice of Test Instrument

The Insulation Tester are offered with different voltage and resistance ratings from which the range best suited for the intended use may be chosen. This requires consideration of the usual operating voltage and the range of insulation resistance of the equipment or apparatus to be tested. As a general rule, test should be made at a voltage 2 to 5 times the rated voltage of the apparatus under test. Since the instrument is current limited and essentially non destructive, there is little danger of damage to the apparatus even in the event of total insulation breakdown. The chart will aid in selecting the proper test instrument

Voltage Ouput	Application
100V	For Testing low voltage lighting control and communication circuits intercom wiring transistorized electronics equipments etc
250V	For Testing lighting control and communication circuits abroad ships, in trailers, aircraft general aviation, marine and automotive maintenance
500V	General purpose testing of A.C. & D.C. motors, generators, lighting, communication circuit and equipment, panels, circuit breakers, starters, appliances, receptacles, underground wires and cable, refrigeration equipment, hermetic compressors residential and commercial wiring, traffic signal, equipment field service and general purpose trouble shooting of electrical and electronic apparatus rates to operate at 100V TO 400V.
1000V	General purpose testing as above where equipment using voltage above 400 volts are to be tested.
2500V	For testing high voltage cables, solid and liquid insulators, bushings, transformers, power supplies, ignition system wiring, oil circuit breakers and other equipment rates to operate above 1000 volts
5000V	For testing high voltage devices mentioned above rated to operate above 2000V

Checking

Before measuring the insulation resistance, check to confirm that with no connection to the LINE or EARTH terminals (open circuit), and the handle of the tester turned at the working speed (i.e.160 R.P.M.) or higher, the pointer will deflect to infinity.
Further confirm that the pointer will deflect to the opposite end of the scale when the handle is turned with LINE & EARTH Terminals shorted together. If the meter indicates a midscale reading in the above test, the leads may have aged or broken and should be replaced. The meter pointer may rest at any position along the scale when the generator is inactive i.e. when the generator handle is not rotated, This is simply due to the operating principle of the cross coil movement used, and hence should not be taken as malfunction,

Precautions

Before connecting the leads of the tester, always make certain that all electrical power is disconnected from the apparatus of line to be tested. Never Make Any connection to Live Electrical Circuits or Equipment. When carrying out an insulation test between a circuit and ground, connect the LINE terminal of the tester to the circuit and Earth terminal to the ground.

When conducting an insulation test between two conductors connect one conductor to the LINE terminal and the other to the EARTH terminal.

For several examples of the connections the Insulation Tester and multi conductor cables, (used for purposes of power, control signal or communication) generators and motors, see the following figures.

In a D.C. motor, the rotor may be tested separately from the commutator by lifting the brushes from the commutator.

Insulation test of a D.C. generator or a D.C. motor

1. Independent insulation tests may be carried out between the electrical functions of a D.C.generator or motor and ground. Separate the brushes and field coil functions from the rotor. These separated functions may be easily tested independently of each other.

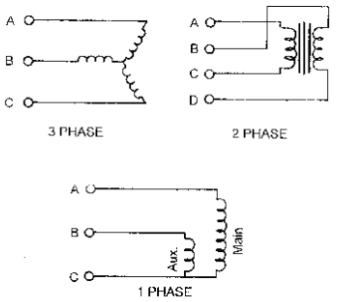

Fig. 1
Common A.C. motor and generator type

This does not apply, however, when an overall insulation test is intended In this case the brushes should remain in contact with the commutator, so that the three sections, (brushes - coil and rotor) may be tested integrally.

2. The above figure illustrates the three most common electrical diagrams of A.C. motors or generators. Readings may be taken one to two minutes after the test has started. When testing 3 phase or single phase motors connect the test lead from the EARTH terminal of the instrument to the motor frame (ground) and the test lead from the LINE terminal to any one of the 3 points A, B or C.

Principle of Operation

The Shanti Insulation Tester is comprised of an insulation resistance measuring system based on the ratio measuring principle (Cross coil movement). An A.C. Brushless generator, the output of which is converted to the required D.C. Voltage provides the necessary power for measuring operation. All the components are integrally enclosed within the same casing. The tester is designed so that the operator is only required to connect the article under study to the terminals and rotate the handle of the generator. The insulation resistance value is measured and read out directly on an individually calibrated meter. The meter system is not equipped with control springs and hence it is to be noted that the meter pointer may stop at any random position on the scale when the generator is not rotated a zero voltage state exists. Infinity adjuster is provided (as per clause No. 4.3 of IS : 2992-1987) in ITHV Series insulation testers. To facilitate accurate read out, select flat space, free from vibration for the measuring operation. The circuitry inside the tester keeps the output voltage constant even if the handle speed is increased beyond the rated speed.

6. The GUARD terminal of the tester provides convenience in high resistance (over 1000 Megohms) measurements. It is used for eliminating minute leakage currents that may develop on the surface of the material situated between the terminals of the object to be tested, For basic GUARD terminal connections, refer Fig-4

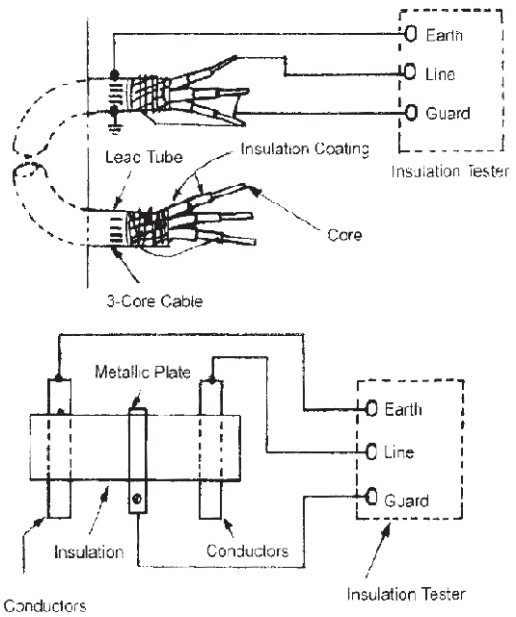

Fig. 4
Typical Guard Terminal Application

7. When a multi voltage range tester is being used the switch should be set at the position representing the rated voltage or resistance covered by the intended measurement. The result is read out from the appropriate scale, using the required multiplication factor.

When testing 2 phase motors, two tests are necessary. Connect the test lead from the EARTH terminal to the motor frame as above.

In the first test, connect the test lead from the Line terminal to point A or C to read out the insulation resistance of one coil winding. In the second test connect the LINE test lead to point B or C to read out the insulation resistance of the second coil winding.

Hermetic Refrigeration Systems motors may be checked as above. Since virtually all motor failures result in damage to the insulation, these tests usually give a rapid and positive indication of motor condition. Since factors such as temperature and moisture affect the readings, it is difficult to give exact readings, however the following guidelines will prove helpful:

(a) A dry motor at room temperature which is in good condition should yield a reading of at least 100 megohms.
(b) Reading from 5 megohms to 100 megohms indicate an operatable motor but with questionable insulation due to wear or moisture. These motors should be watched carefully as early replacement may be necessary.
(c) Reading from 1 megohms to 100 megohms indicate that baking is required. A powerful, portable heater may be employed, or preferably, the motor may be baked in an oven at 90 -120 degrees Centigrade for eight hours and reachecked before starting.

Reading of less than 1 megohm usually indicate damaged insulation and that replacement is required.

Note: To get the insulation resistance values and the baking condition just suited to your motors it would be wise to refer to motor manufacturer's recommendations.

3. When only one of the conductors in a multi-conductor cable is insulation tested, the conductor to be tested should be connected with the LINE terminal of the tester. All of the other conductors may be connected to the cable shield, which is connected to the EARTH terminal of the tester.

4. When one of the conductors in a multi-conductor cable is to be insulation tested against ground, connect the conductor to be tested with the LINE terminal of the tester, while connecting the shield of the cable with the EARTH terminal. The rest of the conductors may be connected together to the GUARD terminal of the tester. This procedure will serve to prevent the current from leaking through those conductors and eliminate misleading surface leakage effects. (See fig. 2)

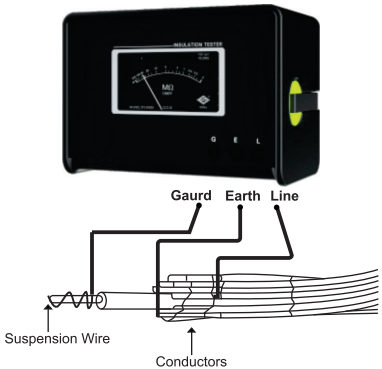

Fig. 2
Connector to Shield using Guard Terminal

5. When one of the conductor in a multi-conductor cable is to be insulation tested against the remaining conductors, connect the single conductor to be tested with the LINE terminal of the tester, while connecting the combined remaining conductor to the E terminal & connect G terminal to shield so as to eliminate the adverse effect of surface leakage currents that could otherwise develop. (Fig.3.)

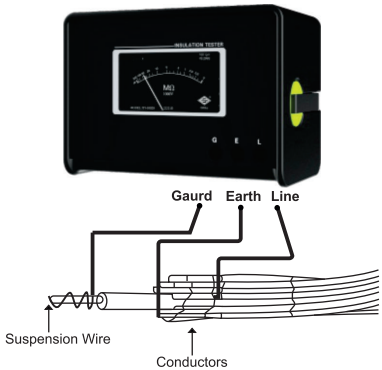

Fig. 3
Conductor to Conductor Test using Guard Terminal