PAPER n. 236

ICREPQ'21
19th International Conference on Renewable Energies and Power Quality (ICREPQ'21)
Almeria 28-30 July, 2021

Department of Industrial and Information Engineering and Economics
University of L'Aquila
L'Aquila (Italy)

Presented by
Andrea Fioravanti
andrea.fioravanti@graduate.univaq.it

This work shows a program created in a Labview environment to verify the correct functioning and regulatory compliance of isolation transformers and isolation transformers for medical use.

The transformer tests will be divided into acceptance tests and type tests. For each type of test, the program will be able to provide information for correct testing and to speed up the test path.

The guided test procedure will accompany the author up to the automatic printing of the test reports.

Finally, considerations will be made on which tests to perform on already installed transformers that require recertification.

Isolation transformers are an important element of the system especially when it is necessary to increase the safety of the electrical user systems. Isolation transformers for medical use are widely used in hospitals and health centers as they are mounted both for powering operating rooms and inside electro-medical equipment

FAST TESTING PLATFORM FOR THE ISOLATION TRASFORMER

G. Bucci, F. Ciancetta, A. Fioravanti, E. Fiorucci, S. Mari and A. Prudenzi

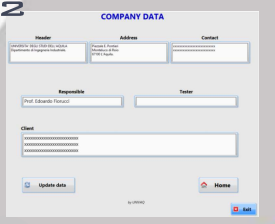
The CEI-EN 61558 standard defines the acceptance tests in Annex L and the type tests from Article 8.15 to Article 28. Table shows the most important tests to be performed on each machine: the letter (T) indicates the type tests and the letter (A) the acceptance tests.
In the presence of sub-tests, the main test is passed only if all the sub-tests are positive.

Test number	Test	Under-test	Typology
1	Conformity of plate data;		A
2	Ground connection continuity test		A
3	Check of the secondary voltage in no-load condition		T
4	Dielectric strength test		A
5	Verification of assembly of protective devices		A
6	Check the short-circuit voltage (IT-M)		A
7	Verification of the primary no-load current (IT-M)		A
8	Checking the inrush current (IT-M)		A
9	Indelible and legible marking		T
10	Protection against electric shock and change of supply voltage;		T
10.1		Determination of dangerous live parts	T
10.2		Accessibility to non-dangerous live parts	T
10.3		Accessibility to dangerous live parts	T
10.4		Changing the power supply voltage	T
11	Secondary voltage and secondary current under load;		T
12	No-load secondary voltage		T
13	Short-circuit voltage and inrush currents		T
13.1		Measurement of short-circuit voltage	T
13.2		Measurement of primary current in no-load condition	T
13.3		Measurement of inrush current	T
14	Measurement of winding and insulating temperature, contact current measurement, current measurement of the protective earth conductor		T
15	Accelerated aging test for undeclared insulation		T
15.1		Heat Test	T
15.2		Vibration test	T
15.3		Moisture test	T
16	Short circuit and overload protection		T
16.1		Short circuit test	T
16.2		Overload test	T
17	Mechanical resistance		T
18	Protection against harmful penetration of dust, solid bodies and humidity		T
19	Insulation resistance, dielectric strength and leakage current		T
19.1		Measurement of insulation resistance	T
19.2		Dielectric strength test	T
20	Construction audits		T
21	Conformity on components		T
22	Internal wiring checks		T
23	Network connection or other flexible cables		T
24	Conformity of terminals for external conductors		T
25	Compliance on protective earth		T
26	Conformity of screws and connections		T
27	Surface distances, in the air and through the insulation		T
28	Resistance to heat, fire and surface currents		T
28.1		Verification of heat resistance	T
28.2		Verification of heat resistance in fault conditions	T
28.3		Verification of fire resistance	T
28.4		Verification of surface currents	T
29	Protection against rust		T

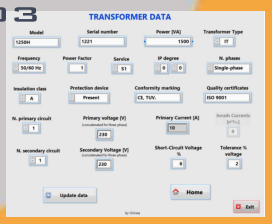
Given a large number of tests and the difficulty in carrying out all the tests, it was decided to develop software to assist the tester. Once the general data of the device under tests (DUT) and other required parameters have been entered, it is possible to carry out the acceptance tests in a simple and guided way, having, at the end of the execution of the tests, the possibility of automatically printing the test report with all the results and values measured during the tests. The program was created in the NI LabVIEW environment.The core of the algorithm was developed through the use of an "Event State Machine" so that future developments can be made through the implementation of small pieces of code.

01

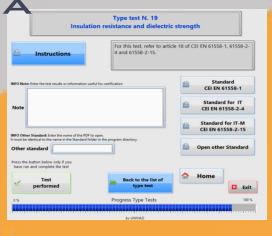
02



03

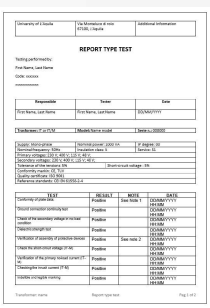


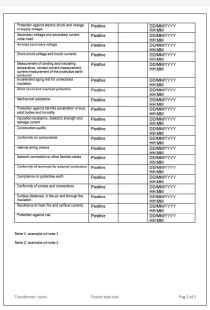
04-A

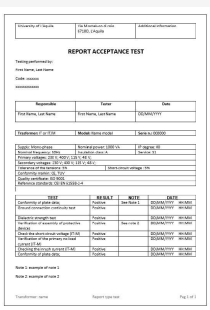


04-B

TEST REPORT







The test report contains data such as manufacturer and model of the transformer and information on the tester. In addition, the entire list of tests carried out with the results obtained is shown and any notes at the bottom of the page. This bulletin will then be attached to the transformer and bagged with it if the tested transformer is a commercial product.

All the acceptance tests were made rigid and consecutive to speed them up and to avoid errors if the software were used repeatedly in the production phase. For the type tests, however, greater freedom was left on how and when to perform the tests, also because some tests also have a duration of more than 24h and therefore the tester can move between them to update the data of several DUTs in parallel.