Winding resistance test set

Tests for resistance to transformer winding are conducted as a test type, routine testing, as well as as a field test. At the plant, it helps in determining the following: It is done on the spot in order to check for anomalies due to free connections, broken conductor strands, high contact stability in the shift tap, high voltage leads and bushes. The procedure of measuring the resistance of the transformer For the star connected winding, the resistance must be measured between the line and the neutral terminal. For stellar autotransformers, the HV side resistance is measured between terminal HV and terminal IV, then between the IV terminal and the neutral. For delta-connected windings, winding resistance must be measured between pairs of linear terminals. Since in the delta connection, the resistance of individual windings cannot be measured separately, the resistance to winding is calculated according to the following formula: Resistance for winding 1.5 × Measured valueCondecement is measured at ambient temperature and then converted into resistance at 75oC for all practical comparison purposes with specified design values, previous results and diagnostics. Resistance to winding at a standard temperature of 75oCRt - Resistance to winding at tt - Winding temperatureGenerally, transformer windings are immersed in insulating liquid and covered with paper insulation, hence it is impossible to measure the actual winding temperature in the de-energy transformer while measuring the resistance of the transformer winding. Approximately designed to calculate the winding temperature in this state, as follows: Winding temperature - Average temperature of insulating oil Average temperature Of insulation oil should be taken 3-8 hours after the de-energy of the transformer and when the difference between the top and lower oil temperature becomes less than 5oC.The resistance can be measured by a simple voltmeter by the ammeter method, Kelvin Bridge meter or automatic measurement of the resistance kit (25 amps). Caution for the ammeter voltmeter method: The current should not exceed 15% of the winding's nominal current. Large values can lead to inaccuracies when heating the winding and thus change its temperature and resistance. Note: The transformer winding resistance is measured every time you press. The current method of measuring the Voltage Resistance Voltage Resistance can be measured using the current voltage method. In this method of measuring winding resistance, the test current is inserted into the windings and the corresponding drop in voltage through the winding is measured. Applying the simple law of Om, i.e. Rx and V/I, you can easily determine the value of resistance. The procedure of the current voltage method of measuring the winding resistance before measuring the transformer should be stored in the OFF without arousal for at least 3-4 hours. During this time, the tortuous temperature equal to their oil temperature. The measurement is done using D.C.To minimize observational errors, the polarity of the magnetization of the nucleus should be constant during all indications of resistance. Voltometer leads should be independent of current leading to protection of it from the high voltage that may occur during the turn on and off the current circuit indications must be taken after the current and voltage have reached stable state values. In some cases it may take a few minutes depending on the meandering impedance. The test current should not exceed 15% of the nominal current of the winding. Large values can lead to inaccuracies when heating the winding and thus change its resistance. To express resistance, the corresponding winding temperature during the measurement must be mentioned along with the resistance value. As we said earlier, after turning off within 3-4 hours, the winding temperature will be equal to the temperature of the oil. The temperature of the oil during testing is considered to be the average temperature of the upper oil and the lower oil of the transformer. For a star associated with three phases of winding, resistance for one phase will be half the measured resistance between the two linear terminals of the delta transformer associated with three phases of winding, resistance for one phase will be 0.67 times measure resistance between the two linear terminals of the transformer. This current method of voltage measuring transformer resistance winding should be repeated for each pair of linear winding terminals in each crane position. Bridge Method of measuring meandering resistance The main principle of the bridge method is based on comparing unknown resistance with known resistance. When the currents flowing through the hands of the bridge chains become balanced, the galvanometer readings show zero deviation, which means that in a balanced state, no current will pass through the galvanometer. A very small resistance value (in the milli-om range) can be accurately measured by the Kelvin Bridge method, while a resistance measurement method is used for the higher cost of wheatstone. In the bridge method of measuring winding resistance, errors are kept to a minimum. Resistance is measured by the Kelvin Bridge, all other steps that must be taken while measuring the resistance of the winding transformer in these methods are similar to the current method of voltage measuring the resistance of the transformer winding, except for the method of measuring resistance. Resistance measured by the Wheatstone Bridge, When it comes to measuring winding resistance on three phases of power transformers and autotransformers, the TWA Standard Series offers some of the most technically advanced tools with an LCD display on the market. Both models are capable of testing six transformer windings with a one-time cable connection, as well as a three-step automatic Transformer. The stored magnetic energy is safely automatically reset at the end of the test. Teh Teh The crane change control unit provides an automated test mode in which the device controls the crane changer without entering the operator, and records the results of the resistance winding based on pre-selected stabilization criteria. This option makes the operator's work much easier. Both models can develop test toks from 5 mA to 25 A DC in order to measure winding resistance. TWA40D has a special test mode to check the synchronization of the crane change on the load with three stages simultaneously tested in parallel, in which the total test current can rise up to 40 A DC. TWA40D has additional advantages when it comes to unobtrusive crane change analysis. The unique DVtest method allows you to check the moving contacts of successive cranes during the transition, measure the transition time, detect open circuits and many other types of faults. It is performed with 0.1 ms of sampling speed, concurrently with the measurement of the motor current change crane, which helps with the detection of motor and mechanical problems. A special branded algorithm is used to test the change of crane connected through the built-in range (accelerator) transformer. DVtest can be performed either in one phase or in three phases at a time. It can also be performed as an additional test at the same time as the winding resistance test in all positions of the crane. An additional unique advantage of TWA40D is the ability to simultaneously test the drag resistance of all three phases of the three-tas transformer (connected in the YN configuration). This can significantly reduce the overall testing time - for example, it allows the operator to perform 33 measurements instead of 99 to replace the crane with 33 crane positions. The test results in TWA three-top transformer winding ohmmeters are interchangeable with TRT turns into ratio testers, meaning that both sets of tests can be performed with a single test to bring connection to power transformer terminals. This guide contains an introduction to the methods and procedures of testing the resistance of transformer winding. Photo: TestGuy Winding Resistance Measurements are an important diagnostic tool for assessing possible damage to transformers as a result of poor design, assembly, processing, adverse conditions, overload, or poor maintenance. The main purpose of this test is to check the rough differences between winding and for openings in connections. Measuring the stability of transformer windings ensures that each circuit is properly connected and that all connections are dense. Resistance to winding in transformers will change due to short turns, free connections or deteriorating contacts in successive faucets. Regardless of the configuration, resistance measurements are usually conducted from phase to phase, and readings are compared to each other to determine whether they are acceptable. Measurements of the resistance of the transformer winding are obtained by passing DC current through windings under test and voltage drop measurements each terminal (Om's Law). Modern testing equipment uses the Kelvin Bridge for this purpose; You can think of the winding resistance test set as a very large low resistance ohmmeter (DLRO). Guide To Content Before conducting a resistance to the winding transformer, it is important to observe all safety warnings and take appropriate precautions. Make sure all equipment that will be tested is properly grounded and treat all high voltage power equipment as energized until proven otherwise through proper lockout/tagout procedures. During the test, it is important not to remove the voltage current or wires while the current is still flowing through the transformer. This will cause extremely high voltage to develop through the point where the current is disturbed, which can lead to lethal tension. The Test Set Winding resistance testing equipment is available in a variety of application-based styles. The test kit used for the power transformer will be very different from the set designed for small device transformers. Regardless of type, winding resistance testers are always equipped with a current output, voltage measurement and resistance meter. Photo Testguy Both primary and secondary transformer terminals should be insulated from external connections, as well as measurements made at each stage of all windings. The test equipment connections must be made in the following order: Earth - Make sure that the transformer is first grounded directly to the local land station and then attach to the test site. Accessories - Connect any desired accessories such as remote control, warning beacon, PC, etc. Test leads - With the test leads disconnected from the device in the test, connect the current and voltage leads to the test set and check the integrity of all the connections. Connection to the transformer - Each transformer configuration requires different test connections, some examples are given in the next section. Additional measures should be taken to prevent the fall of leads during testing, or connecting leads on top or too close together. Voltage wires should always be placed inside (between) the electric and the transformer. Input - Connect the test set. Before making this connection, make sure the land power source has a low path of impedance to the local land station. Connecting to the Transformer Under Test for the same phased and simple Delta-Wye configurations, the following connections can be used. Keep in mind that each transformer configuration is different and your specific setting cannot apply to what is shown below, consult with the user manual that came with your test kit to receive Information. One Phase Transformer Example Transformer Winding Resistance Test Connections - Single Winding. Photo: TestGuy 3-Phase Delta Winding Sample Transformer Winding Resistance Trials Connections - 3-phase Delta Winding. Photo: TestGuy Test No. I- V1 V1- V2- V2- A-phase H1 H1 H1 H2 H2 H2 -- -- B-phase H2 H2 H2 H3 H3 H3 -- -- -- H3 H1 H3 H1 -- -- 3-phase Wye Secondary Winding Example Transformer Winding Resistance Test Connections - 3-phase Wye Winding. Photo: TestGuy Test No. I- V1' V1- V2- V2- A-phase X1 X1 X0 X0 X0 -- -- B-phase X2 X2 X0 -- -- C-X3 X0 X0 X0 -- -- Double Winding Test Sample (Single Stage) To save time when testing two-volume transformers, both primary and secondary windings can be tested simultaneously using the connections shown below: Transformer Winding Resistance Test Connections - Dual Winding. Photo TestGuy Test No. I' Jumper I- V1' V1- V2' V2- 1 H1 H2-X1 X1 H2 X2 X2 Dual Winding Test Example (three-phase) 3-phase Dual Winding Resistance Test Connections. Photo: TestGuy Test No. I' Jumper I- V1' V1- V2' V2- A-Phase H1 H2-X1 X0 H1 X1 X1 X1 X1 X1 X1 X0 Phase H2-X2 H2 H2 X2 C-Phase H3 H1-X3 X0 H3 X1 X3 X0 X1 X3 X0 To reduce the time of the kernel saturation of the jumper, used to connect both windings, must be connected to the opposite polarities of the transformer. If the positive lead for the current is connected to the positive primary winding terminal, the current drive test from the primary winding H2 has jumped to a positive X1 secondary winding terminal. Note: If the resistance between the two windings is larger than 10 times, it may be advisable to get readings that are more accurate by checking each winding separately. Current Transformer Sample Current Transformer Winding Resistance Test Connections. Photo: TestGuy Getting measurements of winding resistance when measuring winding resistance, reading should be observed and recorded after the resistance value has stabilized. Resistance values will drift at first due to transformer induction, which is more common in larger, delta-bound windings. For small transformers, the drift lasts only a few seconds; For the single phase of high-voltage transformers, the drift can last less than a minute; For large transformers, the required drift time can last a couple of minutes or more. Any change in current will change the meaning of the resistance. Click Changer Winding Resistance Many power and distribution transformers are equipped with tap shifts to increase or decrease the rotation ratio depending on the power voltage. Because the ratio change involves mechanical movement from one position to another, each crane must be checked during the winding resistance test. During routine maintenance, it may not always be possible to test each faucet due to lack of time or other factors. In such cases, it is permissible to measure the resistance of each winding only in the designated position of the crane. For off-load cranes, the transformer must be discharged between crane changes. On-load crane shifts and voltage controllers can work with the test kit on the left when moving from crane to faucet, it not only saves But can also check to do before the break the function of the faucet change. Interpretation of the results of the test results of the resistance of winding is usually based on a comparison each resistance value with each adjacent winding with the same faucet. If all indications are within one percent of each other, the sample is considered to have passed the test. Comparisons can also be made with the baseline test data measured at the plant using adjusted temperature values, bearing in mind that field resistance tests are not intended to duplicate the manufacturer's test record, which was most likely conducted in a controlled environment at the time of manufacture. Selective test data, depending on the size of the transformer winding in the test, resistance readings will be expressed as oms, millichms or micromes. The table below shows how you can record test data for a simple three-step transformer 13200-208/120V with three primary crane change positions. CRANE RESISTANCE WindingS (MILLIOHMS) H1-H2 1 750.3 H2-H3 1 749.8 H3-H1 1 748.5 H1-H2 731.8 H2-H3 2 731.4 H3-H1 2 729.4 H1-2 3 714.6 H2-H3 3 714.3 H3-H1 3 712.3 X1-X0 N/A 0.3550 X2-X0 N/A 0.3688 X3-X0 N/A 0.3900 Temperature Correction Because resistance depends on temperature, corrected values should be used when comparing results for trend data. The most important thing is to assess the winding temperature during measurement. If the transformer has a winding temperature sensor, use these readings, otherwise the winding temperature is assumed to be the same as the oil temperature. If the transformer is measured without oil, the winding temperature is usually assumed to be the same temperature as the surrounding air. Measured resistance must be corrected to a total temperature such as 75 degrees Celsius or 85 degrees Celsius under the following formula: where: RC is corrected by resistance RM is a measured resistance CF is a factor of copper correction (234.5) or aluminum (2 234.5) 225) CT winding is a corrected temperature (75 degrees Celsius or 85 degrees Celsius) WT is a meandering temperature (KK) during the demagnetization transformer test After completing all tests, perform a demagnetization operation on the transformer. This step is crucial for the smooth operation of the transformer in operation. The demagnetization of the transformer removes the residual magnetic flow caused by the passage of the polarized direct current through the windings during resistance testing. Photo: Wikimedia. If the demagogue operation is not performed, the excess residual flow in the transformer core can lead to the formation of large currents on the main side, which may collide with the protective relay. Demagnetization of the transformer is achieved by passing several cycles of reduced current through windings in both positive and negative direction (alternation of DC). Demagnethization should be performed on only one winding after all resistance tests have been completed. When used test kits with demaga function are recommended to attach to a high side winding for the process of demagnetization of both current and voltage wires. For current transformers, run a saturation test to demagnet CT at the end of all winding windings Tests. Links login or sign up for comments. Comment. transformer winding resistance test set. vanguard winding resistance test set. raytech winding resistance test set