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TECHNICAL SPECIFICATIONS OF THREE PHASE TRANSFORMER TURNS RATIO METER

Sl. No.	GENERAL DESCRIPTION	Remarks
1	The test set should be fully automatic for finding out the Turns ratio & Voltage ratio of three phase & single phase Power Transformers, Auto transformers up to 400 kV class & 315 MVA, Rectifier Transformer , CT's, VT's etc.	
2	The test set should be able to give direct readings of the ratio of test object automatically i.e. Microprocessor/PC based without any bridge balancing method involved.	
3	The test set should be able to take the measurements automatically. For three phase transformer measurement of the three phases to be conducted simultaneously & automatically without any manual changeover of phases. Phase changeover should be automatic through instrument's internal circuit. Instrument should have provision for detecting & displaying the following electrical parameters.	
4	**Data Display:** i) Turns/Voltage ratio of all three phase ii) Phase angle deviation of all three phase iii) Display & detection of vector group of transformer under test iv) % Error of all three phase v) Excitation current of all three phase	
5	**Display:** Back lit graphic display / bright red LED easily readable with large character size viewable in direct sunlight and low light level. Display parameters ratio, excitation current, phase angle deviation.	
6	The test voltage to be applied on the object under test should be independent of the supply frequency to avoid any variation in the frequency during the testing.	
7	The accuracy, reliability, steadiness and the repeatability of the readings should not be affected with the test voltages.	
8	**Input power supply:** 230V ± 10% , 50 Hz Single phase, 2 Amp	
9	Excitation voltage for Test 40 volts or higher with user selection criteria	
10	The test set should have necessary provision for storage of the test results for retrieval and analysis in the associate laptop PC. The required software for Measurements and data storage should also to be supplied along with the test set. The software should be user friendly and Window based.	
11	Operator control Key pad/ Menu driven for setup, data input, result storage	
12	Internal test record storage with RS-232 Interface	

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13	**Environmental conditions:** Operating Temp.: 0^0C to 50 ^{0}C, Humidity: 0-90% non-condensing, Storage Temp.: 0^0C to 50^0C and Ambient Temp.: 0^0C to 50^0C
14	**Protection:** Instrument should be protected against following; Transformer high excitation current due to shorted turns/faults, incorrect connection, Transient voltage protection, Surge voltage protection etc.

The ranges, resolution, accuracy of the test set for different parameters should be at least as per the points mentioned below

15	**Ratio Range**: 1 to 10000 (Auto Range) **Resolution**: 4 digit or better & **Accuracy For**: i) Rage 0.8 to 2000: ± 0.1% rdg. or better ii) Rage 2001 to 4000: ± 0.25% rdg. or better iii) Rage 4001 to 10000: ± 0.5% rdg or better
16	**Phase angle Range:** ± 90 degrees **Resolution** : 0.1 degree & **Accuracy**: (±) 0.2 degree or better
17	**Current reading range:** 0 - 2 Amp **Accuracy** : ± 2% rdg (± 1 mA)
18	The instrument should have detachable test leads for avoiding damage to the cables as well as to the instrument.
19	The test set should have safety monitoring system to ensure perfect grounding of test system while test is under progress and the accessories required for the same are also to be supplied along with the instrument.
20	The test kit shall meet all the relevant safety specifications as per applicable standards.

The Test equipment shall be offered complete with the items mentioned below:

21	Main equipment i.e. Transformer Turns Ratio meter. Power supply cord , Storage case and bag for cables
22	Cable Set 15 meter single phase set with alligator clip termination 15 meter three phase set with alligator clip termination Safety ground lead 10 meter (min) with clamp
23	Two sets of operating and maintenance manuals in English language. One additional set of all the above documentation in soft copy.
24	Three sets of calibration reports from NABL Accredited Lab covering full range of the equipment with following details should be provided. Calibration date, periodicity, calibration validity duration & next calibration due date. Traceability details of standard used for calibration. All documents should be endorsed by authorized signature.

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25	**Performance & Warranty/Guarantee certificate:** The Supplier shall guarantee the product performance for 24 months from the date of successfully commissioning at BHEL Jhansi works and shall provide spares and services during guarantee period to maintain the three phase TTR in working condition.	
26	**Live Demonstration:** Live demonstration of offered meter shall be called during technical evaluation if required.	
27	**Installation/Commissioning/Acceptance:** Installation/Commissioning of the instrument to be done at BHEL work by supplier's representative free of charge. Demonstration of all features of TTR & all accessories to satisfaction of BHEL for their efficient and effective use for at least five no of jobs. Instrument shall be accepted only after successful commissioning at BHEL Works.	
28	Original technical catalog to be included along with technical bid.	
29	**Spares:** All types of spares for the Turn Ratio Meter and its accessories should be available for at least five years trouble free operation to be included after supply of the instrument. The vendor shall provide list of spares and drawing of parts/details of spares. Supplier should also provide any other attachment /accessories required for smooth functioning of the instrument.	
30	Supplier should provide past performance certificate of similar equipment supplied within three years along with contact detail of customer (i.e. Name of organization, contact person & contact number).	

Note:

1. **Supplier should submit his technical compliance/comments against each of the above points in above format. Technical bid without complete technical compliance sheet will not be considered for technical evaluation.**

Prepared by 20.07.16

Checked & Approved 26.7.16
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