SCOPE

TRM 50
TRM 50+
Transformer Winding Resistance Meter

The most advanced Transformer Winding Resistance Meter injects up to 50A DC ...
...TRM 50

The Product

TRM 50 / TRM 50+ : Advanced Transformer Winding Resistance Meter

SCOPE introduces 50A state of the art precision winding resistance meter, specially designed for field testing as well as factory testing of large transformers up to 500MVA. Winding resistance value of transformer and rotating machine are directly displayed on 5.7" TFT display. TRM 50 is designed to work in live EHV switchyard conditions, ensuring operator's safety and repeatability of results. Maintenance time saving is ensured by one time connection to transformer with simultaneous resistance measurement of three / six windings, measurement of resistances of all taps with automated tap change and demagnetization facility. The meter is protected against the back-EMF offered by large inductive windings.

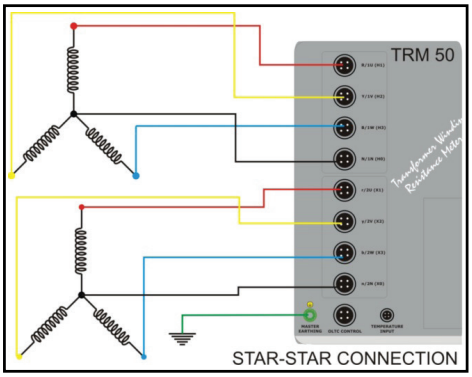
OLTC Test feature (Optional) :

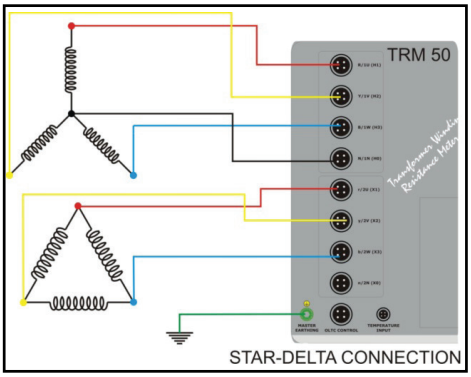
The TRM 50 / TRM 50+ come with the optional OLTC test facility for checking the performance of OLTC during tap change for either single or three three phases simultaneously. The variations in the DC current, flowing through the winding during tap change is sampled at high speed and plotted against time. The feature helps to understand the condition of OLTC contacts (healthiness of OLTC contacts), % drop in current during tap change and time required to change the tap position from one tap to other tap (i.e. transition time). The instrument carries automatic tap change test from first to last tap and stores the record of each tap for further analysis. Single report of results of all the taps is generated.

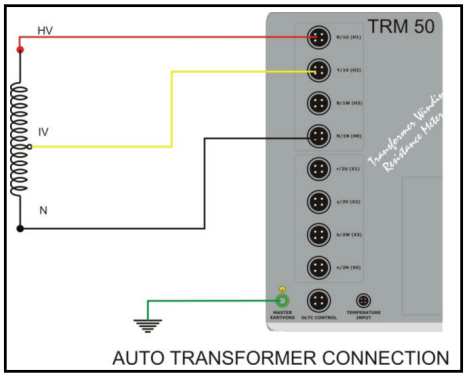
The Measurement

TRM: The winding resistance measurement helps is assessing I^2R loss in the transformer. This also helps in finding the possible damage in the winding. The winding resistance measurement is done on site to find out the problems due to lose connection, shorts, broken winding and high contact resistance in tap changer. Measuring the resistance of the windings assures that the connections are correct and there are no severe mismatches or opens.

Connection configurations



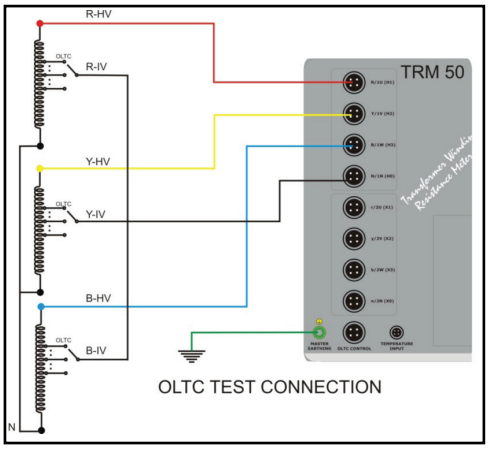




Above connection configuration is possible in TRM 50+ model.
TRM 50 is having 3 channels, so only primary connection at a time is possible.

OLTC test: Tap changer failures represent more than 40 % of all failures on power transformers. OLTC failures, caused by degradation of OLTC contacts are increased. The OLTC test gives the variation in current flowing through the contacts, which shows the healthiness of contacts. It is also possible to calculate transition time which shows healthiness of mechanism. The drop in current during OLTC transition indicates change in transition resistance. The test is very useful for assessing health of OLTC.

Connection for OLTC test

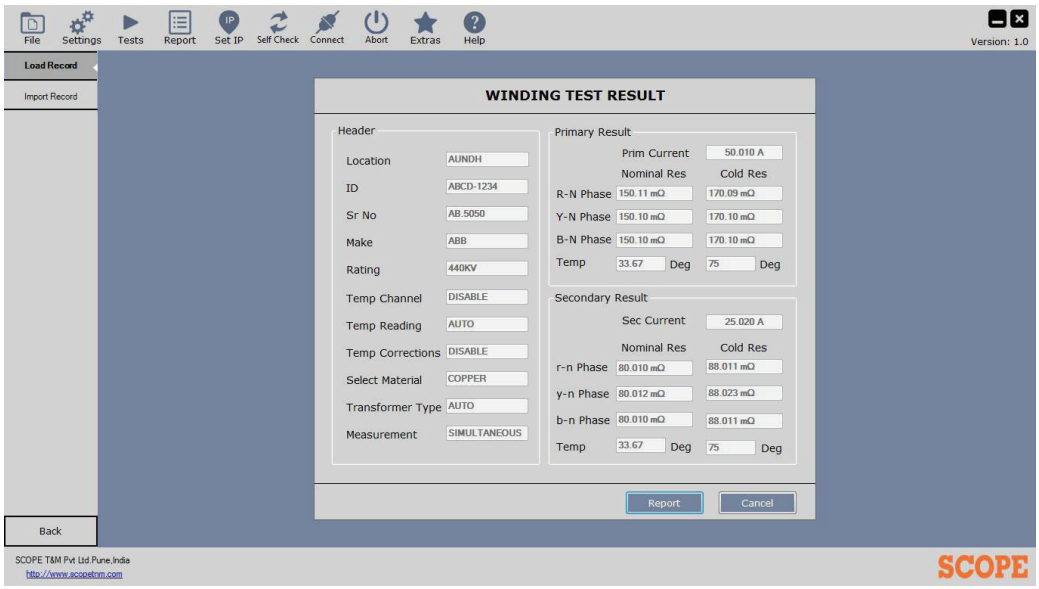


CTrans Software

Powerful and user friendly CTrans software controls the Instrument when used in control through external PC / Laptop mode. With CTrancs all the tests can be carried through laptop.

WRT (Winding Resistance Test):

This test can be selected to measure the resistance of connected phases. In case of TRM 50+ user can connect all the phases of primary as well as secondary at a time and in case of TRM 50 either all phases of primary or secondary can be connected at a time. In this test, the current is stabilized in the winding and instruments reads resistance of each winding one by one. Resistances of all windings of all phases are displayed in one screen as follows. If temperature channel is enabled, the temperature and temperature corrected values are also displayed.



The result can be stored or detailed report with test header and results can be generated. The report can be further exported to other formats like pdf, excel .

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WRT TEST REPORT

SCOPE T&M Pvt Ltd www.scopetnm.com

HEADER :

Location	AUNDH	Serial Number	AB.5050
ID	ABCD-1234	Date	29-07-2015
Make	ABB	Time	05:09:03 pm
Transformer Rating	440KV		

SETTINGS :

Transformer Type	AUTO	CH1	ENABLE
Primary Current	50 A	CH2	ENABLE
Secondary Current	25A	CH3	ENABLE
Measurement Type	SIMULTANEOUS	CH4	ENABLE
Temp Channel	ENABLE	CH5	ENABLE
Temp Reading	AUTO	CH6	ENABLE
Manual Temp	DISABLE	Material	COPPER
Temp Correction	ENABLE	Cold Temp	75

RESULT :

PRIMARY

CURRENT	50.010 A

Phase	Nominal Temperature	Cold Temperature
R-Phase	150.11 mΩ	170.09 mΩ
Y-Phase	150.10 mΩ	170.10 mΩ
B-Phase	150.10 mΩ	170.10 mΩ

SECONDARY

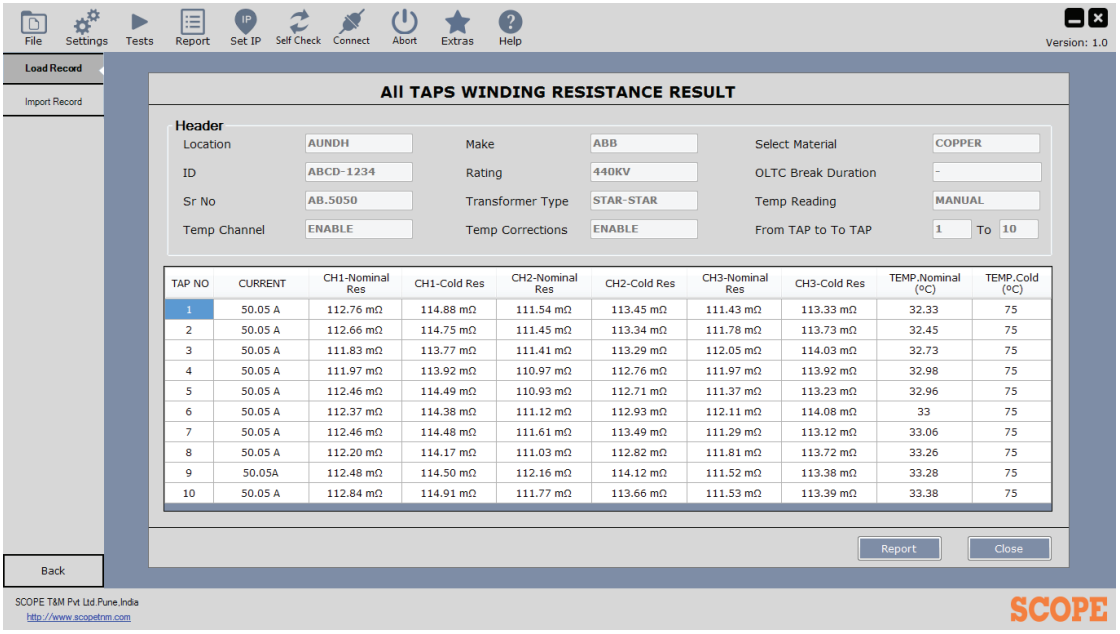
CURRENT	25.020 A

Phase	Nominal Temperature	Cold Temperature
R-Phase	80.010 mΩ	88.011 mΩ
Y-Phase	80.012 mΩ	88.023 mΩ
B-Phase	80.010 mΩ	88.011 mΩ

TEMPERATURE

Nominal	33.67	Cold	75

ATWRT (All Taps Winding Resistance Test):
The instrument has facility to operate the OLTC. Special feature of measurement of winding resistance of all the taps, automatically recording the results and generating single report is provided in this test. If user selects the Raise cycle, the tap is brought to first tap position. The current in the winding is stabilized and resistance of first tap is measured and stored. Then instrument operates the OLTC for Raise operation and reads the second value. Thus resistances of all the taps are measured and displayed in tabulated form. Same test can be repeated for Lower operation. It is possible to measure all 3 phases simultaneously. The result is displayed as follows.



TAP NO	CURRENT	CH1-Nominal Res	CH1-Cold Res	CH2-Nominal Res	CH2-Cold Res	CH3-Nominal Res	CH3-Cold Res	TEMP.Nominal (°C)	TEMP.Cold (°C)
1	50.05 A	112.76 mΩ	114.88 mΩ	111.54 mΩ	113.45 mΩ	111.43 mΩ	113.33 mΩ	32.33	75
2	50.05 A	112.66 mΩ	114.75 mΩ	111.45 mΩ	113.34 mΩ	111.78 mΩ	113.73 mΩ	32.45	75
3	50.05 A	111.83 mΩ	113.77 mΩ	111.41 mΩ	113.29 mΩ	112.05 mΩ	114.03 mΩ	32.73	75
4	50.05 A	111.97 mΩ	113.92 mΩ	110.97 mΩ	112.76 mΩ	111.97 mΩ	113.92 mΩ	32.98	75
5	50.05 A	112.46 mΩ	114.49 mΩ	110.93 mΩ	112.71 mΩ	111.37 mΩ	113.23 mΩ	32.96	75
6	50.05 A	112.37 mΩ	114.38 mΩ	111.12 mΩ	112.93 mΩ	112.11 mΩ	114.08 mΩ	33	75
7	50.05 A	112.46 mΩ	114.48 mΩ	111.61 mΩ	113.49 mΩ	111.29 mΩ	113.12 mΩ	33.06	75
8	50.05 A	112.20 mΩ	114.17 mΩ	111.03 mΩ	112.82 mΩ	111.81 mΩ	113.72 mΩ	33.26	75
9	50.05A	112.48 mΩ	114.50 mΩ	112.16 mΩ	114.12 mΩ	111.52 mΩ	113.38 mΩ	33.28	75
10	50.05 A	112.84 mΩ	114.91 mΩ	111.77 mΩ	113.66 mΩ	111.53 mΩ	113.39 mΩ	33.38	75

The result can be stored or detailed report with test header and results can be generated. The report can be further exported to other formats like pdf, excel .

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ATWRT TEST REPORT

SCOPE T&M Pvt Ltd
www.scopetnm.com

HEADER :

Location	AUNDH	Serial Number	AB.5050
ID	ABCD-1234	Date	13-08-2015
Make	ABB	Time	03:14:01 pm
Transformer Rating	440KV		

SETTINGS :

Transformer Type	STAR-STAR	Primary Or Secondary	PRIMARY
Current Range	50A	CH1	ENABLE
OLTC Present	HV-N	CH2	ENABLE
Measurement Type	SIMULTANEOUS	CH3	ENABLE
From Tap	1	Cycle	1
To Tap	10	Current Tap Position	9
Temp Channel	ENABLE	Total Taps	42
Temp Reading	-	OLTC Break Duration	-
Manual Temp	DISABLE	Material	COPPER
Temp Correction	ENABLE	Cold Temp	75

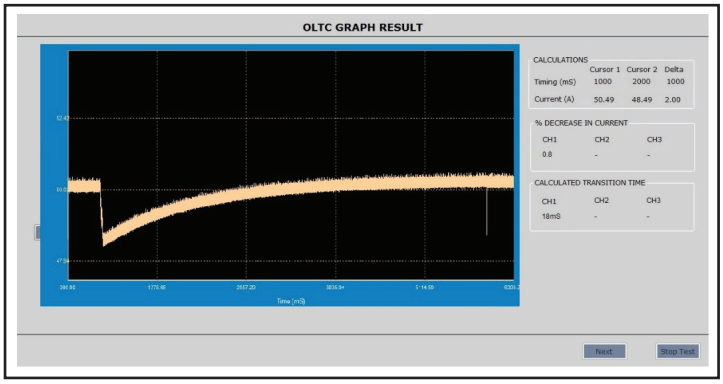
RESULT :

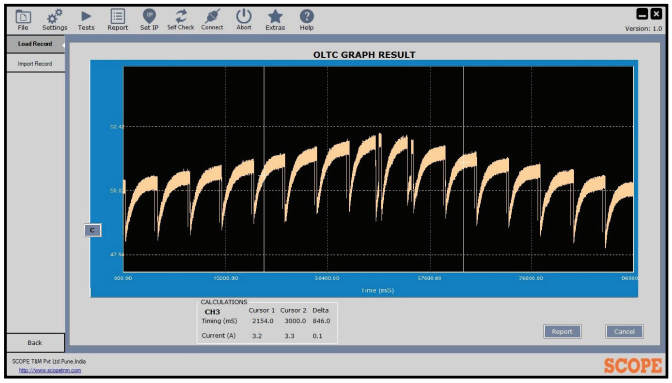
Tap No	Current	CH1 Resistance		CH2 Resistance		CH3 Resistance		Temperature	
		Nominal	Cold	Nominal	Cold	Nominal	Cold	Nominal	Cold
1	50.05 A	112.76 mΩ	114.88 mΩ	111.54 mΩ	113.45 mΩ	111.43 mΩ	113.33 mΩ	32.33	75
2	50.05 A	112.66 mΩ	114.75 mΩ	111.45 mΩ	113.34 mΩ	111.78 mΩ	113.73 mΩ	32.45	75
3	50.05 A	111.83 mΩ	113.77 mΩ	111.41 mΩ	113.29 mΩ	112.05 mΩ	114.03 mΩ	32.73	75
4	50.05 A	111.97 mΩ	113.92 mΩ	110.97 mΩ	112.76 mΩ	111.97 mΩ	113.92 mΩ	32.98	75
5	50.05 A	112.46 mΩ	114.49 mΩ	110.93 mΩ	112.71 mΩ	111.37 mΩ	113.23 mΩ	32.96	75
6	50.05 A	112.37 mΩ	114.38 mΩ	111.12 mΩ	112.93 mΩ	112.11 mΩ	114.08 mΩ	33	75
7	50.05 A	112.46 mΩ	114.48 mΩ	111.61 mΩ	113.49 mΩ	111.29 mΩ	113.12 mΩ	33.06	75
8	50.05 A	112.20 mΩ	114.17 mΩ	111.03 mΩ	112.82 mΩ	111.81 mΩ	113.72 mΩ	33.26	75

For OLTC test:

This is the laptop operated feature. In this test the variation in the DC current flowing through the winding during tap change is sampled and plotted against time. The graphs of entire Raise or Lower cycle are captured and results of each operation are stored and presented in tabular form in report. User can select either Raise or Lower cycle. If the Raise cycle is selected, the tap is first brought to first position. Then current is stabilized in the winding. TRM operates the OLTC for Raise operation and waits for drop in current during contact changeover. This drop in current is trigger for sampling. TRM samples the data and graph is displayed on screen. From this data % decrease in current, transition time is calculated and displayed on screen. Thus the graphs of all other tap change are captured and also % decrease and transition time for each tap change is calculated and stored. Same test can be carried for complete Lower cycle.

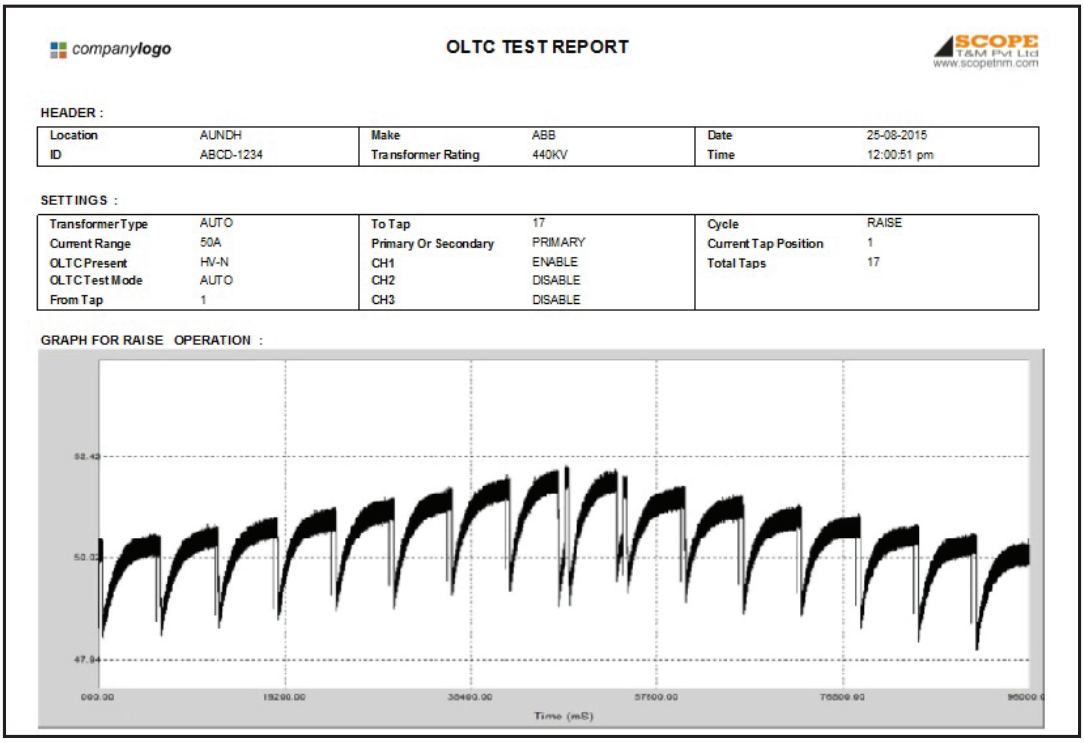
After completing the cycle of Raise or Lower from first to last tap, all the graphs are combined and displayed as shown below:





OLTC Test Report:

It is possible to reload all the stored graphs and generate single report for all the taps. One report is generated for one cycle of Raise or Lower. This report gives the resistance of each tap with % decrease in current and transition time for all taps. The report can be exported to other formats like pdf, excel.



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OLTC TEST REPORT

SCOPE T&M Pvt Ltd www.scopetnm.com

HEADER :

Location	AUNDH	Make	ABB	Date	25-08-2015
ID	ABCD-1234	Transformer Rating	440KV	Time	12:00:51 pm

SETTINGS :

Transformer Type	AUTO	To Tap	17	Cycle	RAISE
Current Range	50A	Primary Or Secondary	PRIMARY	Current Tap Position	1
OLTC Present	HV-N	CH1	ENABLE	Total Taps	17
OLTC Test Mode	AUTO	CH2	DISABLE		
From Tap	1	CH3	DISABLE		

GRAPH FOR RAISE OPERATION :

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OLTC TEST REPORT

SCOPE T&M Pvt Ltd www.scopetnm.com

RESISTANCE AND CURRENT VALUES FOR EACH TAP (RAISE OPERATION) :

Tap No	Current CH1	Resistance CH1	% Decrease in current CH1	Transition Time CH1	Current CH2	Resistance CH2	% Decrease in current CH2	Transition Time CH2	Current CH3	Resistance CH3	% Decrease in current CH3	Transition Time CH3
1	50.05 A	112.57 mΩ	10.01	35.4 ms	50.05 A	112.16 mΩ	10.34	35.4 ms	50.05 A	113.57 mΩ	10.34	34.4 ms
2	50.05 A	113.57 mΩ	10.20	36.4 ms	50.05 A	114.16 mΩ	12.30	33.4 ms	50.05 A	113.57 mΩ	10.22	35.4 ms
3	50.05 A	111.57 mΩ	10.32	37.4 ms	50.05 A	112.16 mΩ	11.30	34.4 ms	50.05 A	114.57 mΩ	10.54	35.4 ms
4	50.05 A	112.57 mΩ	10.01	38.4 ms	50.05 A	115.16 mΩ	10.40	37.4 ms	50.05 A	115.57 mΩ	10.20	36.4 ms
5	50.05 A	112.57 mΩ	10.14	35.4 ms	50.05 A	152.16 mΩ	10.30	35.4 ms	50.05 A	113.57 mΩ	10.15	35.4 ms
6	50.05 A	111.57 mΩ	10.01	33.4 ms	50.05 A	112.16 mΩ	10.70	35.4 ms	50.05 A	118.57 mΩ	10.18	37.4 ms
7	50.05 A	112.57 mΩ	10.13	35.4 ms	50.05 A	122.16 mΩ	14.30	35.4 ms	50.05 A	113.57 mΩ	10.20	35.4 ms
8	50.05 A	112.57 mΩ	10.01	35.4 ms	50.05 A	112.16 mΩ	10.30	38.4 ms	50.05 A	112.57 mΩ	10.24	38.4 ms
9	50.05 A	113.57 mΩ	10.16	35.4 ms	50.05 A	117.16 mΩ	13.30	33.4 ms	50.05 A	113.57 mΩ	10.20	35.4 ms
10	50.05 A	112.57 mΩ	10.01	37.4 ms	50.05 A	117.16 mΩ	10.30	35.4 ms	50.05 A	111.57 mΩ	10.23	33.4 ms
11	50.05 A	112.57 mΩ	10.01	35.4 ms	50.05 A	112.16 mΩ	10.30	33.4 ms	50.05 A	113.57 mΩ	10.20	35.4 ms

Benefits

- Can measure DC winding resistance of large rotating machines, highly inductive test objects like Transformer, Generators and Motors etc.
- 50 A DC current makes it possible to measure low resistances with high accuracy.
- One time connection to either all windings of primary and / or secondary. Simultaneous measurement reduces connection and measurement time.
- Change in winding resistance, short or open windings can be detected from measured values.
- Automatic temperature measurement and temperature corrected value calculation.
- Measurements of winding resistance of all taps of phases in one go. Recoding, printing and storage of results.
- OLTC contact opening and compete OLTC performance test facility. Testing of either single or three phases in one test. Single report generation.
- To know condition of OLTC contacts, OLTC mechanism, transition resistor.
- Discharges and demagnetizes the object after test.

Specifications

Parameter	TRM 50 / TRM 50+
No of Channels	3 / 6 current channels 3 / 6 Voltage channels , 1 Temperature channel
Connections	One time connection to primary or secondary winding of transformer.
Current Ranges	50A, 40A, 25A, 10A, 5A, 1A, 100mA, 10mA
Resistance Ranges	Up to 2000 Ω (Auto ranging)
Resolution	4 ½ digit
Accuracy	Value ± 0.5% ± 5 counts
Current and Resistance ranges	See Below Ranges & Resolution Table
Open Circuit Voltage	50V
Demagnetization Facility	Yes
Display	5.7" TFT display with touch screen
Printer	58 mm, Inbuilt thermal printer
Communication Port	Ethernet for PC communication
Data Port	USB for extrernal memory stick connection

External Control	Possible via Notebook PC through Ethernet port and software
Temperature measurement	Range 0 to 100 deg, Accuracy ± 1 deg, Resolution 0.1deg
Temperature correction	for copper and aluminum
Temperature Input Channel	Compatible to accept RTD input
User Interface	Resistive touch screen
Back EMF Protection	Yes. Automatic protection after measurement and during accidental disconnection of current path. Protection operates even if Mains supply fails.
Discharge Facility & Indication	Automatic Discharge of DUT & messages on screen
Tap Changer Test	Detects discontinuity during tap changer test
OLTC Test Facility (Optional)	OLTC test facility with current v/s time graph, Single or Three Phases simultaneously. Available in control through PC option only.
OLTC current Ranges	50A, 40A, 25A, 10A, 5A
Protection	Shut down of power source on Over voltage, Over current, Over temperature
Indications	Polarity reversal, Test connection continuity and discharge
Diagnostics Check	At power On instrument does self-check of channels and shows the message
Test Leads	Measuring leads, AC supply, earth leads and temperature sensor lead.
Operating Environment	-10°C to 50°C, 95% RH (non condensing)
Storage Temperature	-20°C to 60 °C
One side earthing	Instrument is able to do the measurement with one side earthing (with neutral earthing)
Input Supply	110V AC ±15% 50/60 Hz ±10% Or 220V AC ±15% 50/60 Hz ±10%.
Dimensions	630 x 500 x 302mm
Weight	22Kg. approx

Range & Resolution Table

Current Range	Resistance range	Resolution
50A	400μΩ	0.1μ
	4mΩ	1μ
	40mΩ	10μ
	200mΩ	100μ
40A	500μΩ	0.1μ
	5mΩ	1μ
	50mΩ	10μ
	250mΩ	100μ
25A	800μΩ	0.1μ
	8mΩ	1μ
	80mΩ	10μ
	800mΩ	100μ

Current Range	Resistance range	Resolution
10A	2mΩ	0.1µ
	20mΩ	1µ
	200mΩ	10µ
	2Ω	100µ
5A	4mΩ	1µ
	40mΩ	10µ
	400mΩ	100µ
	4Ω	1m
1A	20mΩ	1µ
	200mΩ	10µ
	2Ω	100µ
	20Ω	1m
100 mA	200mΩ	10µ
	2Ω	100µ
	20Ω	1m
	200Ω	10m
10 mA	2Ω	100µ
	20Ω	1m
	200Ω	10m
	2000Ω	100m

Ordering Information

Description	Std Qty
Transformer Winding Resistance Meter, Model TRM 50 complete with standard accessories	1 set
Standard Accessories	
Test Cables 20m long, with CK clamps, 75mm opening	8 / 4 Sets
OLTC Control Cable, 15m long	1 No
Master Earthing Cable, 7m long	1set
Mains Cord, 3m long	1 No
RTD sensor with 10m long lead and connectors	1 No
Spare Fuses	1set
PC Communication Cable (Ethernet)	1 No
C Trans : Communication, Operation & Data Downloading Software in CD media	1 No
Optional Accessories	
OLTC test facility	
A box of paper rolls containing 10 rolls of thermal paper	1 Set
Test Cables 15/20m long, with CK clamps of 75/100/150mm opening	1 Set

Simple solutions for difficult measurements®

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