SCOPE

TRM 25+

Transformer Winding Resistance Meter

The most advanced Transformer Winding Resistance Meter injects up to 25A DC... TRM 25+

The Product

SCOPE introduces a 25A 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 values of the transformer and rotating machine are directly displayed. TRM 25+ is designed to work in live EHV switchyard conditions, ensuring the operator's safety and repeatability of results. Maintenance time saving is ensured by one-time connection to transformer with resistance measurement of six windings in a single click, 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.

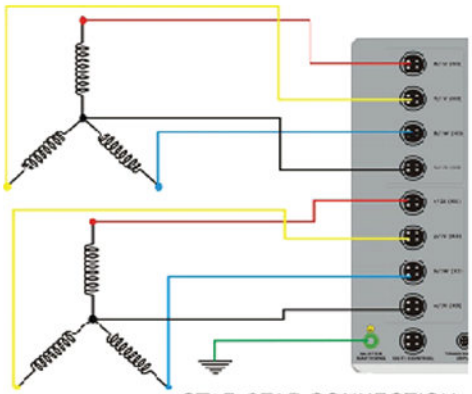
OLTC Test feature (Optional) :

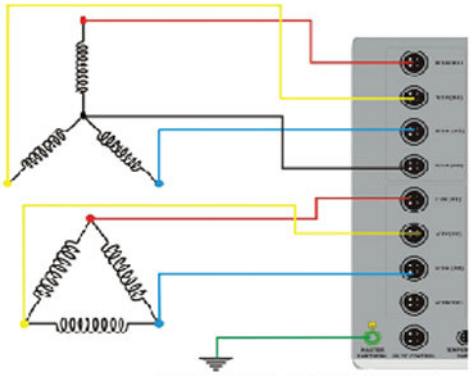
The TRM 25+ comes with the optional OLTC test facility for checking the performance of OLTC during tap change for either single or three phases simultaneously. The variations in the DC current, flowing through the winding during a tap change is sampled at high speed and plotted against time. The feature 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 another tap (i.e. transition time). The instrument carries automatic tap change tests from first to last tap and stores the record of each tap for further analysis. A single report of the results of all the taps is generated.

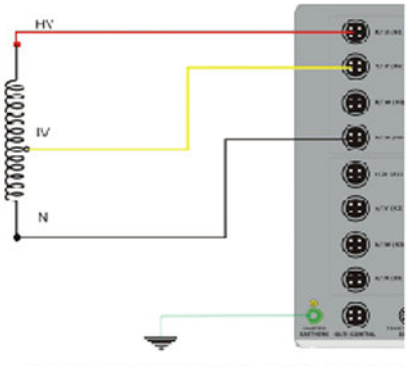
The Measurement

TRM: The winding resistance measurement helps in 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 loose connection, shorts, broken winding and high contact resistance in the tap changer. Measuring the resistance of the windings assures that the connections are correct and there are no severe mismatches or opens.

Connection configurations: 1ph/3ph Transformers,1ph/3ph Auto Transformer, Star/Delta etc. connection configurations are possible. TRM 25+ is having 6 channels, so a primary & secondary connection at a time is possible

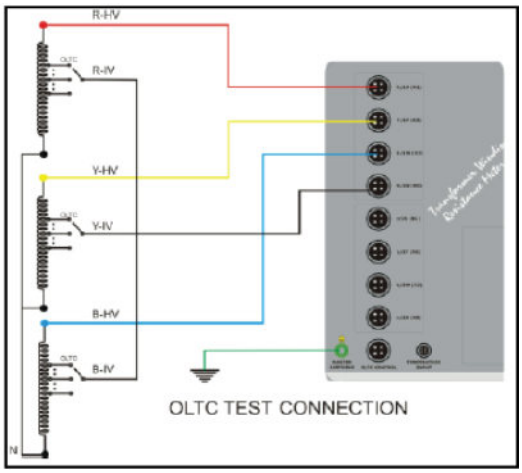

STAR-STAR CONNECTION


STAR-DELTA CONNECTION



AUTO TRANSFORMER CONNECTION

OLTC Test: Tap changer failures represents more than 30% out of all types failures on Power Transformer, caused by the degradation of OLTC contacts. 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 the healthiness of the mechanism. The drop in current during OLTC transition indicates a change in transition resistance. The test is very useful for assessing the health of OLTC.

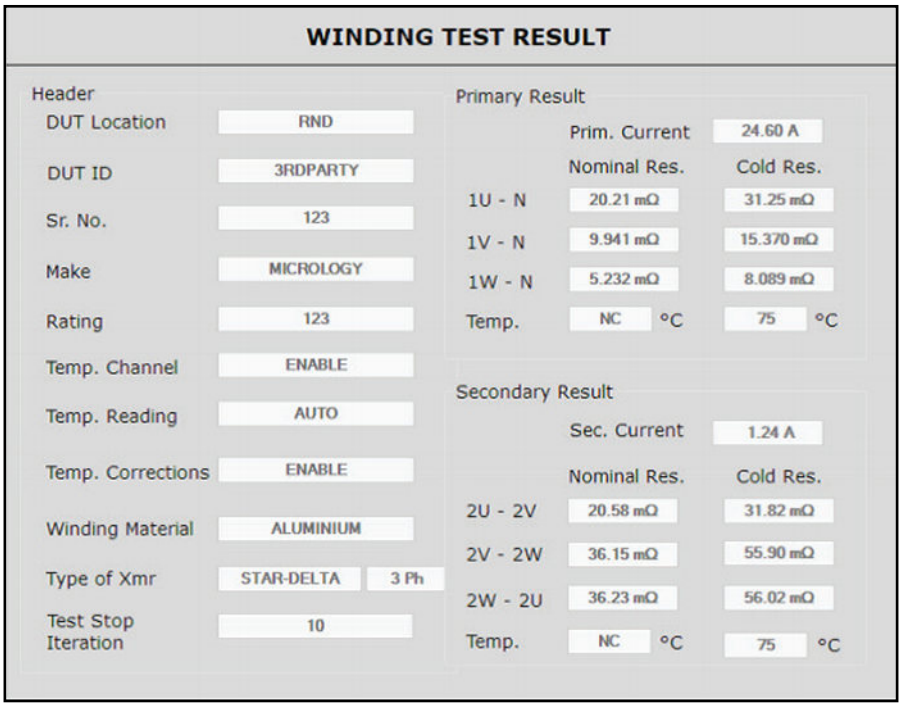


OLTC TEST CONNECTION

CTrans+ Software

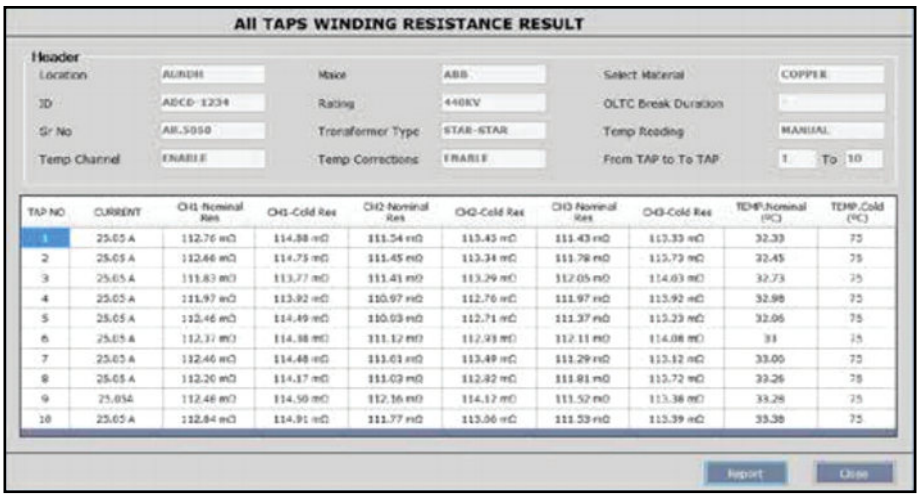
Powerful and user friendly CTrans+ software controls the Instrument when used in control through external PC/Laptop mode. With CTrans+ all the tests can be carried through a laptop.

WRT (Winding Resistance Test): This test can be selected to measure the resistance of connected phases. All phases of primary and secondary can be connected at a time. In this test, the current is stabilized in the winding and the instrument reads the resistance of each winding one by one. Resistances of all windings of all phases (6 phases) are displayed in one screen as follows. If the temperature channel is enabled, the temperature and temperature corrected values are also displayed.

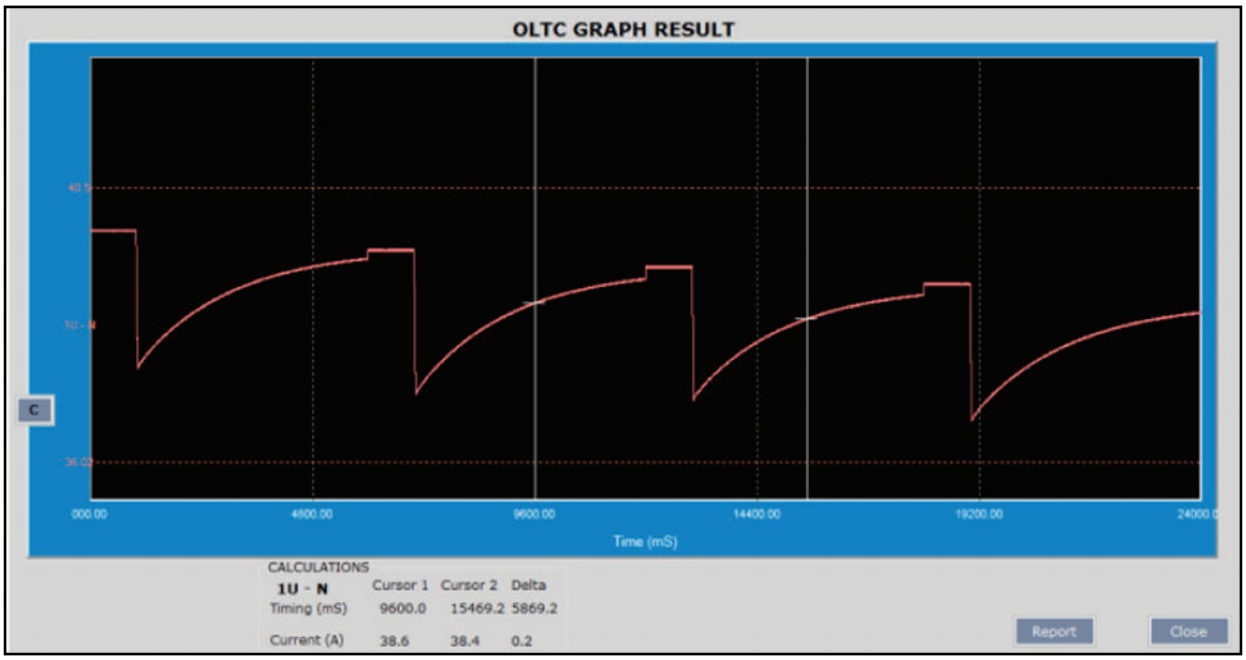


The result can be stored or detailed report with test header and results can be generated. The report can be further exported to other formats like PDF, MS Excel™.

ATWRT (All Taps Winding Resistance Test): The instrument has the facility to operate the OLTC. Special feature of measurement of winding resistance of all the taps, automatically recording the results and generating a single report is provided in this test. If the user selects the Raise cycle, the tap is brought to the first tap position. The current in the winding is stabilized and resistance of the first tap is measured and stored. Then the 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. This test is designed for testing the winding resistance of all the taps with a single click. The result is displayed as follows.



OLTC test: This is the laptop operated feature. In this test, the variation in the DC current flowing through the winding during a tap change is sampled and plotted against time. The graphs of the entire Raise or Lower cycle are captured and results of each operation are stored and presented in tabular form in the 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 triggered for sampling. TRM samples the data and a 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 changes are captured and also % decrease and transition time for each tap change is calculated and stored. Same test can be carried for a 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 a 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, MS Excel™.

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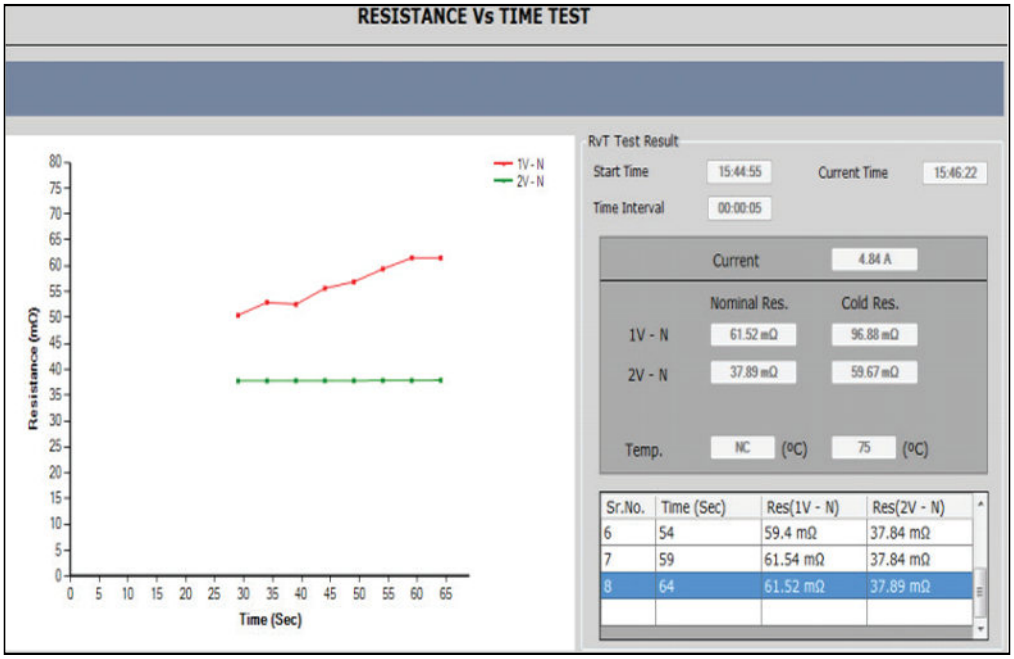
OLTC TEST REPORT

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	25.05 A	112.57 mΩ	10.01	35.4 ms	25.05 A	112.16 mΩ	10.34	35.4 ms	25.05 A	113.57 mΩ	10.34	34.4 ms
2	25.05 A	113.57 mΩ	10.20	36.4 ms	25.05 A	114.16 mΩ	12.30	33.4 ms	25.05 A	113.57 mΩ	10.22	35.4 ms
3	25.05 A	111.57 mΩ	10.32	37.4 ms	25.05 A	112.16 mΩ	11.30	34.4 ms	25.05 A	114.67 mΩ	10.54	35.4 ms
4	25.05 A	112.57 mΩ	10.01	38.4 ms	25.05 A	115.16 mΩ	10.40	37.4 ms	25.05 A	115.57 mΩ	10.20	36.4 ms
5	25.05 A	112.57 mΩ	10.14	35.4 ms	25.05 A	152.16 mΩ	10.30	35.4 ms	25.05 A	113.57 mΩ	10.15	35.4 ms
6	25.05 A	111.57 mΩ	10.01	33.4 ms	25.05 A	112.16 mΩ	10.70	35.4 ms	25.05 A	118.57 mΩ	10.18	37.4 ms
7	25.05 A	112.57 mΩ	10.13	35.4 ms	25.05 A	122.16 mΩ	14.30	35.4 ms	25.05 A	113.57 mΩ	10.20	35.4 ms
8	25.05 A	112.57 mΩ	10.01	35.4 ms	25.05 A	112.16 mΩ	10.30	38.4 ms	25.05 A	112.67 mΩ	10.24	38.4 ms
9	25.05 A	113.57 mΩ	10.16	35.4 ms	25.05 A	117.16 mΩ	13.30	33.4 ms	25.05 A	113.57 mΩ	10.20	35.4 ms
10	25.05 A	112.57 mΩ	10.01	37.4 ms	25.05 A	117.16 mΩ	10.30	35.4 ms	25.05 A	111.57 mΩ	10.23	33.4 ms
11	25.05 A	112.57 mΩ	10.01	35.4 ms	25.05 A	112.16 mΩ	10.30	33.4 ms	25.05 A	113.57 mΩ	10.20	35.4 ms

Resistance vs Time Test : CTrans+ software is used for graph of Res vs Time. In this laptop operated feature, the variation in the winding resistance sampled and plotted against time (sec). Test stop time is depending on user requirement. The result is displayed as follows.



Sr. No.	Time	Current	1V - N Nominal Res.	1V - N Cold Res. at 75 °C	2V - N Nominal Res.	2V - N Cold Res. at 75 °C	Nominal Temp. (° C)
1	04:28:44 pm	10.04 A	9.974 mΩ	15.707 mΩ	DISABLE	DISABLE	NC
2	04:28:49 pm	10.05 A	9.976 mΩ	15.710 mΩ	DISABLE	DISABLE	NC
3	04:28:55 pm	10.06 A	9.974 mΩ	15.707 mΩ	DISABLE	DISABLE	NC
4	04:29:00 pm	10.08 A	9.974 mΩ	15.707 mΩ	DISABLE	DISABLE	NC
5	04:29:05 pm	10.10 A	9.974 mΩ	15.707 mΩ	DISABLE	DISABLE	NC
6	04:29:10 pm	10.12 A	9.970 mΩ	15.701 mΩ	DISABLE	DISABLE	NC
7	04:29:15 pm	10.13 A	9.972 mΩ	15.704 mΩ	DISABLE	DISABLE	NC
8	04:29:21 pm	10.14 A	9.972 mΩ	15.704 mΩ	DISABLE	DISABLE	NC

Benefits

- Can measure DC winding resistance of large rotating machines, highly inductive test objects like Transformers, Generators and Motors etc.
- 25A DC current makes it possible to measure low resistances with high accuracy
- One time connection to All windings of primary and secondary. Six windings measurement in a single click reduces measurement time
- Uses Kelvin's 4 wire method for accurate resistance measurement
- 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 i.e.check discontinuity (while changing tap from one position to another)
- Complete OLTC performance test facility to know the condition of OLTC contacts, OLTC mechanism, transition resistor. Testing of either single or three phases in one test. Single report generation (Optional)
- Automatic discharges the object after the test or during accidental disconnection of current path
- Automatic demagnetization of the Transformer. The user can conduct demagnetization test as independent functions or at the end of every test
- Conduct Resistance Vs Time test facility, required during heat run test/equivalent application

Specifications

Parameter	TRM 25+
No of Measurement Channels	6 Current channels, 6 Voltage channels, 1 Temperature channel
Current Ranges	25A, 10A, 5A, 1A, 100mA, 10mA
Resistance Ranges	Up to 2000Ω (Auto ranging)
Resolution	4½ digit (20000 Count)
Accuracy	Value ± 0.5% ± 5 counts
Current & Resistance ranges	See Below Ranges & Resolution Table
Open Circuit Voltage	50V DC
Display & User Interface	5.7" Resistive TFT touch screen
Printer	58mm, Inbuilt thermal printer
Communication & Data Port	Ethernet for PC communication & USB for memory stick connection
Storage Memory	Non-volatile memory to store 50000 records
External Control	Possible via Notebook PC through Ethernet port and software
Temperature Measurement	Range 0 to 100°C, Accuracy ± 1°C, Resolution 0.1°C
Temperature Correction	Copper and Aluminum
Temperature Input Channel	Compatible to accept RTD input
Back EMF Protection	Current Injection Stop, Completion of Measurement / Test, Accidental Disconnection of Current Leads during Testing and Mains Supply Failure
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 Test Current Ranges	25A, 10A, 5A
OLTC Test Sampling Frequency	10kHz with resolution of 0.1ms
Protection	Back EMF, Mains supply failure, Shut down of power source on Over voltage, Over current, Over temperature
Indications	Polarity Reversal, Test Connection Continuity and Discharge
Diagnostics Check	Self-check during Power On & Error Message
Operating Temperature	-20°C to 55°C, 95% RH (non condensing)
Storage Temperature	- 40°C to 60°C
Input Supply	110V AC ±15% Or 220V AC ±15%, 50/60 Hz ±10%
Dimensions	630 x 500 x 302mm
Instrument Weight	22Kg approx.

Range & Resolution Table

		Current Ranges					
		25A	10A	5A	1A	100mA	10mA
Range #1	Resistance	800μΩ	2mΩ	4mΩ	20mΩ	200mΩ	2Ω
	Resolution	0.1μΩ	0.1μΩ	1μΩ	1μΩ	10μΩ	100μΩ
Range #2	Resistance	8mΩ	20mΩ	40mΩ	200mΩ	2Ω	20Ω
	Resolution	1μΩ	1μΩ	10μΩ	10μΩ	100μΩ	1mΩ
Range #3	Resistance	80mΩ	200mΩ	400mΩ	2Ω	20Ω	200Ω
	Resolution	10μΩ	10μΩ	100μΩ	100μΩ	1mΩ	10mΩ
Range #4	Resistance	800mΩ	2Ω	4Ω	20Ω	200Ω	2000Ω
	Resolution	100μΩ	100μΩ	1mΩ	1mΩ	10mΩ	100mΩ

Scope of Supply

Parameter	TRM 25+
Transformer Winding Resistance Meter, TRM 25+ with standard accessories	1 set
Standard Accessories	
Test Cables 20m long, with CK clamps, 75mm opening	1 Set
OLTC Control Cable, 15m long	1 No
Master Earthing Cable, 7m long	1 No
Mains Cord, 3m long	1 No
Tap Position Indicator (TPI) cable	1 No
RTD sensor with 10m long lead and connectors	1 No
Spare Fuses	1 Set
PC Communication Cable (Ethernet)	1 No
CTrans+ : 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 with CK clamps of 100/150mm opening or Crocodile Clip	1 Set

Ordering Code

Example: TRM 25+	**F**	**N**	**F**	**F**	**F**	**N**	**F**	**A**	**L**	**R**	**I**	**N**	#
TRM 25+			**F**	**F**	**F**		**F**						

F	Reserved												
N	**None ***												
1	1 Channel OLTC Test												
3	3 Channel OLTC Test												
		F	Reserved										
		F	Reserved										
		F	Reserved										
		N	**None ***										
		Z	Customised										
				F	Reserved								
				A	**75mm CK Clamp ***								
				B	100mm CK Clamp								

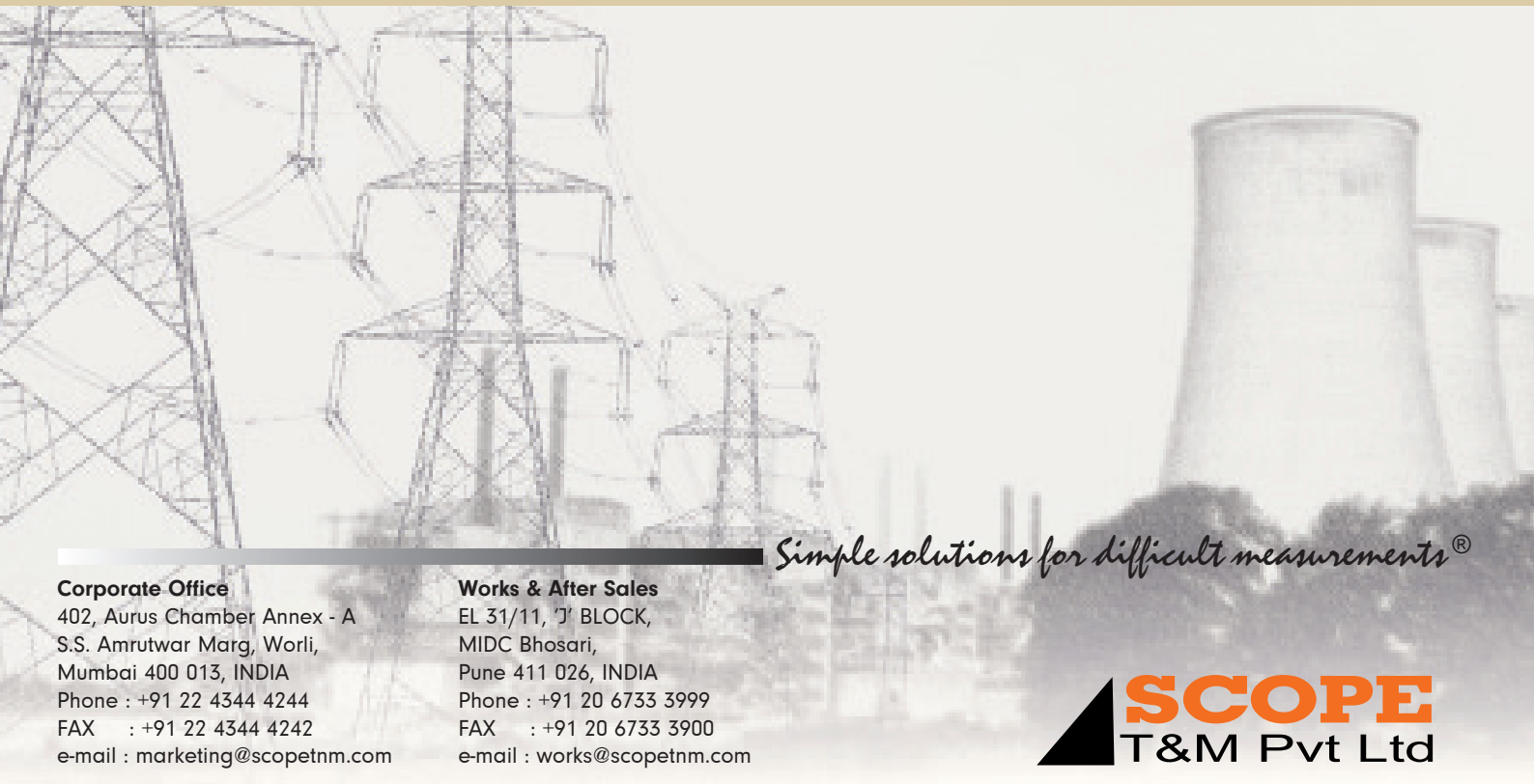
												Customised	Z
												None *	**N**
												Universal Plug	U
												Indian Plug *	**I**
											110V ± 15%, 50/60Hz AC Input	Q	
											230V ± 15%, 50/60Hz AC Input *	**R**	
										Customised Length of Test Lead Set	Z	
										20m Test Lead Set *	**L**	
									Customised	Z			
									Cu Crocodile Clip	E			
									150mm CK Clamp	C			

Note: *- Standard Feature/Accessory

#- TRM 25+ (ordering code : FNFFFNFALRIN) means Winding Resistance Meter with, 20m test lead set, 75mm CK Clamp, 230V ±15%, 50/60Hz AC input, Indian plug

Generation, Transmission,
Distribution, Industry ...

... there is **SCOPE** *always!*



Simple solutions for difficult measurements®

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