

Laboratory Electrical Research and Development Association, R-336, TTC Industrial Area, MIDC Rabale, Thane-Belapur Road, Navi Mumbai, Maharashtra

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 1 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
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ELECTRICAL TESTING

AT LABORATORY

I. TRANSMISSION LINE EQUIPMENT AND ACCESSORIES				
1.	Insulators, Bushings, A. B. Switch, H. G. Fuse (Upto 33 kV Class)	Dry Power Frequency Voltage Withstand	Cl. 9.4 of IS 2544 Cl. 11.13 of IS 2099 Cl. 7.3.6 of IS 9385(Part 2) Cl. 3.3 of IS 5621 Cl. 9.3 of IS 9431 Cl. 8 of IS 2071 (Part 1) Cl. 3.2 of IS 2071(Part 3) Cl.3.1.8 of IS 9921(Part 1) Cl.3.1.8 of IS 9921(Part 2) Cl.3.1.8 of IS 9921(Part 4) Cl.3.1.8 of IS 9921(Part 5) Cl.6.2 of IS 9920 (Part 1) Cl. 6.2 of IS 9920(Part 2) Cl. 6.2 of IS 9920 (Part 3) Cl. 3.1.8 of IS 9920(Part 4) Cl. 4.7 of IEC 60168 IEC 60052 Cl. 6 of IEC 60060-1 Cl. 6 of IEC 60060-2 Cl. 6 of IEC 60060-3 Cl. 6 of IEC 60060-4 Cl. 9.2.1 of IEC 60099-4 Cl. 6.4 of IEC 60694 IEC 60298 Cl. 6.2 of IEC 60265-1 Cl. 9.2.7.4 of IEC 61109 Cl. 14 of IEC 60383	5 kV to 100 kV

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 2 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
			Cl. 9.2.7.4 of IEC 62217 Cl. 8.1 of IEC 60137 Cl. 6.2 of IEC 62271-1 Cl. 6.2 of IEC 62271-100 Cl. 6.2 of IEC 62271-102 Cl. 6.2 of IEC 62271-103 Cl. 6.2 of IEC 62271-203 Cl. 19.3.2 of IEC 60353	
2.	Insulators, Bushings, A. B. Switch, H. G. Fuse (Upto 33 kV Class)	Lightning Impulse Voltage Withstand	Cl. 9.3.6 of IS 2544 Cl. 11.4 of IS 2099 Cl. 10.3 of IS 731 Cl. 7.3.2 of IS 9385(Part 1) Cl. 3.3 of IS 5621 Cl. 9.2.3 of IS 9431 Cl. 20 of IS 2071(Part 1) Cl. 4.3 of IS 2071(Part 3) Cl 3.1.6 of IS 9921 (Part 1) Cl 3.1.6 of IS 9921 (Part 2) Cl.3.1.6 of IS 9921 (Part 4) Cl.3.1.6 of IS 9921 (Part 5) Cl.6.2 of IS 9920 (Part 1) Cl. 6.2 of IS 9920 (Part 2) Cl. 6.2 of IS 9920 (Part 3) Cl. 3.1.6 of IS 9920 (Part 4) Cl. 7.3.5 of IS 9385 (Part 2) Cl. 10.3 of IS 731 IEC 60052 Cl.4.5 of IEC 60168 Cl. 20 of IEC 60060-1 Cl. 4.3 of IEC 60060-2 Cl. 4.3 of IEC 60060-3 Cl. 4.3 of IEC 60060-4 Cl. 8.3.2 of IEC 60099-4	50 kV _p to 230kV _p 1.2/50 μs

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 3 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

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			Cl. 6.2 of IEC 60694 IEC 60298 Cl. of 6.2 of IEC 60265-1 Cl. 11.1 of IEC 61109	
			Cl. 13 of IEC 60383 Cl. 9.2.7.4 of IEC 62217 Cl. 8.3 of IEC 60137 Cl. 6.2 of IEC 62271-1	
			Cl. 6.2 of IEC 62271-100 Cl. 6.2 of IEC 62271-102 Cl. 6.2 of IEC 62271-103 Cl. 6.2 of IEC 62271-203 Cl. 19.3.2 of IEC 60353	
3.	Pin & Post Insulators (11 kV Class)	Lightning Impulse Voltage Flashover	Cl.4.5.2 of IEC 60168 Cl. 9.3.6 of IS 2544 Cl. 9.2.3 of IS 9431 IS 2071-1 Cl. 10.3.5 of IS 731 IEC 60060-1	50 kV _p to 230kV _p 1.2/50 μs
		Dry Power Frequency Voltage Flashover	Cl.4.7.3 of IEC 60168 Cl. 9.4.4 of IS 2544 Cl. 9.3 of IS9431 IS 2071-1-2016 IEC 60060-1	5 kV to 100 kV
4.	Voltage Transformer (Upto 33 kV Class)	Lightning Impulse Voltage Withstand	Cl. 9.6 of IS 3156-1 Cl. 7.2.3.2 of IEC 61869-1 Cl. 7.2.3.2 of IEC 61869-3 Cl. 7.2.3.2 of IEC 16227-3 Cl. 7.2.3 of IEC 16227-5 Cl. 7.3 of IEC 60044- 2 Cl. 8.3.2 of IEC 60044-3 IEEE Std.C.57.13	50 kV _p to 230 kV _p 1.2/50 μs
		Verification of terminal marking and polarity	Cl. 9.2 of IS 3156(Part 1) Cl. 7.3.6 of IEC 61869	Qualitative

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 4 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

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			(Part 1) Cl.7.3.6 of IS 16227-3 IS 16227-4	
		High Voltage Power Frequency dry withstand Test on secondary winding	Cl. 9.3 & 9.4 of IS 3156 (Part 1) Cl. 7.3.1, 7.3.3, 7.3.4 of IEC 61869- 1 Cl. 7.3.1, 7.3.3, 7.3.4 of IEC 61869-3 Cl. 7.3.1, 7.3.3, 7.3.4 of IS 16227-3 IS 16227-4 IEEE Std.C.57.13	1kV to 5kV@ 50 Hz
		Temperature rise	Cl. 9.5 of IS 3156 (Part 1) Cl. 7.2.2 of IEC 61869-1 Cl. 7.2.2 of IEC61869-3 IS 3156 IEC 61869 Cl. 7.2.2 of IS 16227-3 IS 16227-4	Ambient to 200 °C
		Accuracy	Cl. 8.1.1 & 8.2.1 of IS 3156 (Part 2) Cl. 10.1.1.2, 10.1.2.1 of IS 3156 (Part 3) Cl. 7.2.6 & 7.3.5 of IEC 61869-1 Cl. 7.2.6 & 7.3.5 of IEC 61869-3 Cl. 7.2.6 & 7.3.5 of IS 16227-3 IS 16227-4	11000/110V,6600V/110 V 5500/110 V, 11000/ $\sqrt{3}$ V /110/ $\sqrt{3}$ V 6600/ $\sqrt{3}$ V/110/ $\sqrt{3}$ V 5500/ $\sqrt{3}$ V/110/ $\sqrt{3}$ V 2200/110V,3300/110V 4400/110V, 2200/ $\sqrt{3}$ /110/ $\sqrt{3}$ V 3300/ $\sqrt{3}$ V/110/ $\sqrt{3}$ V 4400/ $\sqrt{3}$ V/110/ $\sqrt{3}$ V 22kV/110V 22kV/ $\sqrt{3}$ /110/ $\sqrt{3}$ V 33kV/110V 33 kV/ $\sqrt{3}$ /110/ $\sqrt{3}$ V

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Electrical Research and Development Association, R-336, TTC Industrial Area, MIDC Rabale, Thane-Belapur Road, Navi Mumbai, Maharashtra

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 5 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
				220/110 V, 330/110 V 440/110 V, 550/110 V 660/110 V, 770/110 V 880/110 V, 1100/110 V 220/ $\sqrt{3}$ /110/ $\sqrt{3}$ V 330/ $\sqrt{3}$ /110/ $\sqrt{3}$ V 440/ $\sqrt{3}$ /110/ $\sqrt{3}$ V 550/ $\sqrt{3}$ /110/ $\sqrt{3}$ V 660/ $\sqrt{3}$ /110/ $\sqrt{3}$ V 770/ $\sqrt{3}$ /110/ $\sqrt{3}$ V 880/ $\sqrt{3}$ /110/ $\sqrt{3}$ V 1100/ $\sqrt{3}$ /110/ $\sqrt{3}$ V
		High voltage Power Frequency test on Primary winding Induced Over voltage withstand	Cl. 9.3 & 9.4 of IS 3156 (Part 1) Cl. 7.3.1, 7.3.3, 7.3.4 of IEC 61869-1 Cl. 7.3.1, 7.3.3, 7.3.4 of IEC 61869-3 Cl. 7.3.1.302 of IS 16227 (Part 3) Cl. 9.3.2.2 of IS 3156 (Part 1) Cl. 7.3.1, 7.3.3, 7.3.4 of IEC 61869 -1, Cl. 7.3.1, 7.3.3, 7.3.4 of IEC 61869-3 Cl. 7.3.1.303 of IS 16227 (Part 3) IS 16227 (Part 4)	5kV to 100kV@ 50 Hz 5kV to 100kV@ 150 Hz
5.	Current Transformer (Upto 33 kV Class)	Lightning Impulse Voltage Withstand	Cl. 9.8 of IS 2705 (Part 1) Cl. 7.2.3.2 of IEC 61869-1 Cl. 7.2.3.2 of IEC 61869-2 Cl. 7.2.3 of IEC 16227-2 Cl. 7.3.2 of IEC 60044-1 Cl. 7.3 of IEC 60044-3 Cl. NO. 4.7 of IEEE Std.C.57.13	50 kV _p to 230 kV _p 1.2/50 μ s

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Accreditation Standard

ISO/IEC 17025: 2005

Certificate Number

TC-6093

Page 6 of 19

Validity

24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Verification of terminal marking and polarity	Cl. 9.2 of IS 2705 (Part 1) Cl. 7.1.2 & 7.3.6 of IEC 61869 (Part 1) IEC 61869-2 Cl. 7.3.6 IS 16227 (Part 2) IS 16227 (Part 4)	Qualitative
		High Voltage Power Frequency dry withstand Test on secondary winding	Cl. 9.4 & 9.3 of IS 2705 (Part 1) Cl. 7.3.1, 7.3.3 & 7.3.4 of IEC 61869-1 Cl. 7.3.1, 7.3.3 & 7.3.4 of IEC 61869 (Part 2) Cl. 7.3.1, 7.3.3 & 7.3.4 of IS 16227 (Part 2) IS 16227 (Part 4)	1kV to 5kV
		Over Voltage Inter-turn	Cl. 9.5 of IS 2705 (Part 1) Cl. 7.3.204 of IEC 61869-2 Cl. 7.3.204 of IS 16227 (Part 2) Cl. 7.3.204 of IS 16227 (Part 4)	0.1A to 5A, 10mV to 4.5 kV
		Knee-point Voltage & excitation current	Cl. 6.1 of IS 2705 (Part 4) Cl. 7.3.203 of IEC 61869-2 Cl. 7.3.203 of IS 16227 (Part 2) IS 16227 (Part 4)	0.1V to 8 kV
		Temperature rise	Cl. 9.7 of IS 2705 (Part 1) Cl. 7.2.2 of IEC 61869-1 Cl. 7.2.2 of IEC 61869-2 Cl. 7.2.2 of IS 16227 (Part 2) IS 16227 (Part 4)	1 A to 2000 A Ambient to 200 °C
		Turns ratio	Cl. 6.3 of IS 2705 (Part 4) Cl. 7.3.5.206 of IEC 61869	5 to 3200

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Certificate Number TC-6093

Page 7 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
			(Part 2) Cl. 7.2.6.202 & 7.5.2 of IS 16227 (Part 2) IS 16227 (Part 4)	
		Instrument Security factor	Cl. 7.1.2 of IS 2705 (Part 2) Cl. 7.2.6.202 & 7.5.2 of IEC 61869 (Part 2) Cl. 7.2.6.202 & 7.5.2 of IS 16227 (Part 2) IS 16227 (Part 4)	1V to 8 kV 10 mA to 10 A
		Accuracy Secondary Winding Resistance	Cl. 7.1.1 & 7.2.1 of IS 2705 (Part 2) & (Part 3) Cl. 7.2.6.203 & 7.3.5.203 of IEC 61869 (Part 2) Cl. 7.2.6 & 7.3.5 of IS 16227 (Part 2) Cl. 7.2.6 & 7.3.5 of IS 16227 (Part 4) Cl. 6.2 of IS 2705 Cl. 7.3.201 of IEC 61869-2 Cl. 7.3.201 of IS 16227 (Part 2) IS 16227 (Part 4)	5A to 3200A 100 $\mu\Omega$ to 100 Ω
		High voltage Power Frequency test on Primary winding	Cl. 9.3 of IS 2705 (Part 1) Cl. 7.3.1, 7.3.3 & 7.3.4 of IEC 61869-1 Cl. 7.3.1, 7.3.3 & 7.3.4 of IEC 61869-2 Cl. 7.3.1, 7.3.3 & 7.3.4 of IS 16227 (Part 2) IS 16227 (Part 4) IEEE Std.C.57.13	10 kV to 100 kV 50 Hz
		Composite error	Cl.7.1.2 & 7.2.2 of IS 2705 (Part 3)	0.1% to 15%

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Certificate Number TC-6093

Page 8 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
			Cl. 7.2.6.203 & 7.3.5.203 of IEC 61869-2 Cl. 7.2.6.203 & 7.3.5.203 of IS 16227 (Part 2) IS 16227 (Part 4)	
II.	TRANSFORMERS AND REACTORS			
1.	Oil Cooled / Dry type transformers (Upto 200 kVA 33 kV Class 1 Phase and 3 Phase)	Winding resistance	Cl. 10.1.1.a of IS 2026 (Part 1) Cl. 21.2.a of IS 1180 (Part 1) Cl. 13.2.a of IS 11171 Cl. 15 of IEC 60076-11 Cl.11.1.2.1.a of IEC: 60076 (Part 1)	100 $\mu\Omega$ to 20 k Ω
		Voltage ratio and check of phase displacement	Cl. 10.1.1.b of IS 2026 (Part 1) Cl. 21.2.b of IS 1180 (Part 1) Cl. 13.2.b of IS 11171 Cl. 16 of IEC 60076-11 Cl.11.1.2.1.b of IEC: 60076 (Part 1)	2 to 300
		short circuit impedance and load loss	Cl. 10.1.1.c of IS 2026 (Part 1) Cl. 21.2.c of IS 1180 (Part 1) Cl. 13.2.c of IS 11171 Cl. 17 of IEC 60076-11 Cl.11.1.2.1.c of IEC: 60076 (Part 1)	1.25 W to 11.5 kW 1V to 1000V 50mA to 30 A
		No load loss and current	Cl. 10.1.1.d of IS 2026 (Part 1) Cl. 21.2.d of IS 1180 (Part 1)	1.25 W to 11.5 kW 1V to 1000V 50 mA to 30 A

Laboratory Electrical Research and Development Association, R-336, TTC Industrial Area, MIDC Rabale, Thane-Belapur Road, Navi Mumbai, Maharashtra

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 9 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

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			Cl. 13.2 of IS 11171 Cl. 18 of IEC 60076 (Part 11) Cl.11.1.3.d of IEC: 60076 (Part 1)	
		Insulation resistance	Cl. 10.1.3.j of IS 2026 (Part 1) Cl. 21.2.e of IS 1180 (Part 1) Cl. 10.1.2.a of IS 2026 (Part 1) Cl. 21.3.b of IS 1180 (Part 1) Cl.11.1.4.h of IEC: 60076 (Part 1)	250 V _{dc} to 5kV _{dc} 10 kΩ to 100 GΩ
		Temperature rise	Cl. 10.1.2.a of IS 2026 (Part 1) Cl. 21.3.b of IS 1180 (Part 1) Cl. 13.1.h of IS 11171 Cl. 23 of IEC 60076-11 Cl.11.1.3.a of IEC: 60076 (Part 1) Cl.7 of IEC: 60076 (Part 2)	Ambient to 200 °C
		Induced Over voltage withstand	Cl. 10.1.1.e of IS 2026 (Part 1) Cl.12 of IS 2026 (Part 3) Cl. 21.2.f of IS 1180 (Part 1) Cl. 13.2.f of IS 11171 Cl. 20 of IEC 60076-11 Cl.11.1.2.1.e, 11.1.3.b of IEC: 60076 (Part 1) Cl.11.2 of IEC: 60076 (Part 3)	1V to 1000 V 150 Hz

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 10 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Lightning Impulse Voltage Withstand	Cl. 13 & 14 of IS 2026-3 Cl. 16 of IS 11171(Part 1) Cl. 21.3.a of IS 1180 (Part 1) Cl. 21 of IEC 60076-11 Cl. 10.5 of IEEE 57.12.90 Cl. 10.5 of IEEE 57.12.60 Cl. No. 11.1.2.1.e, 11.1.3.b of IEC: 60076 (Part 1) Cl.13 of IEC: 60076 (Part 3)	50 kV _p to 230 kV _p 1.2/50 μs
		Separate source Voltage withstand	Cl. 10.1.3.a of IS 2026 (Part 1) Cl. 21.2.g of IS 1180 (Part 1) Cl. 13.2.e of IS 11171 Cl. 19 of IEC 60076 (Part 11) Cl. No. 11.1.2.1.e, 11.1.3.b of IEC: 60076 (Part 1) Cl.10 of IEC: 60076 (Part 3)	10 kV to 100 kV 1 kV to 5kV
		Zero sequence impedance on 3Ø transformer	Cl. 10.7 of IS 2026 (Part 1) IS 11171 Cl. No. 11.1.4.f of IEC: 60076 (Part 1)	300 mV to 750V
		Unbalance current	CBIP publication no.:317	60 mA to 20 A
		Magnetic balance	CBIP publication no.:317	300 mV to 750 V
		Air pressure	Cl. 21.2.h & 21.3.d of IS1180 (Part 1) CBIP publication no.:317	(-)-100 kPa to 300 kPa
		Vacuum	CBIP publication no.:317	Upto (-)-100 kPa
		Oil leakage	Cl. 21.2.j of IS 1180(Part 1)	(-)-100 to 300 kPa
		Sound levels	Cl. 21.4.a of IS 1180(Part 1) IS 2026 (Part 10) IEC 60076 (Part 10)	40 dBA to 137 dBA

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 11 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

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		Paint Adhesion test	Cl. 21.4.d of IS 1180 (Part 1)	Qualitative
		No Load Current at 112.5 % Voltage	Cl. 21.4.c of IS 1180 (Part 1)	10 mA to 30 A
		Minimum clearances in air	Cl. 11 of IS 1180(Part 1)	Upto 5m
		Verification of Mounting Arrangements	Cl. 14 of IS 1180 (Part 1)	Upto 5m
		Conservator for non-sealed type transformers	Cl. 16 of IS 1180 (Part 1)	Upto 150 mm
		Fittings	Cl. 20 of IS 1180 (Part 1)	Qualitative
III.	SWITCHGEAR EQUIPMENT			
1.	Circuit Breakers, Vacuum Interrupter, H.T. Panels (upto 33 kV Class)	Dry Power Frequency Voltage Withstand	IS 2516 Cl. 8.3.3.4.2 of IEC 60947-1 Cl. 6.2 of IEC 62271-200 Cl. 6.2 of IEC 62271-100 Cl. 6.2 of IEC 62271-100 Cl. 6.2 of IEC 62271-1 Cl. 6.2 of IEC 62271-1 Cl. 6.2 of IEC 62271-1 Cl. 6.2 of IEC 62271-100 Cl. 6.2 of IEC 62271-102 Cl. 6.2 of IEC 62271-203 Cl.19.3.2 of IEC 60353	5kV to100 kV

Laboratory Electrical Research and Development Association, R-336, TTC Industrial Area, MIDC Rabale, Thane-Belapur Road, Navi Mumbai, Maharashtra

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 12 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Lightning Impulse Voltage Withstand	IS 2516 Cl. 8.3.3.4.2 of IEC 60947-1 Cl. 6.2 of IEC 62271-100 Cl. 6.2 of IEC 62271-1 Cl. 6.2 of IEC 62271-200 Cl. 6.2 of IEC 62271-100 Cl. 6.2 of IEC 62271-1 Cl. 6.2 of IEC:62271-1 Cl. 6.2 of IEC:62271-100 Cl. 6.2 of IEC 62271-102 Cl. 6.2 of IEC 62271-203 Cl. 19.3.1 of IEC 60353	50 kV _p to 230 kV _p 1.2/50 μs
IV.	MEASURING INSTRUMENTS - ELECTRICAL AND ELECTRONIC (STATIC) ENERGY METERS			
1.	Electrical and Electronic (Static) Energy meter and Electromechanical Energy meter	Dielectric strength or AC high voltage	Cl.12.7.6.3 of IS 13779 Cl. 12.7.6.3 of IS 14697 Cl. 5.4.6.3 of CBIP Report 325/Cl. 7.4 of IEC 62052-11 Cl. 7.4 of IEC 62053-11 Cl. 7.4 of IEC 62053-21 Cl. 7.4. of IEC 62053-22 Cl. 7.4. of IEC 62053-23	1000V _{ac} to 5000V _{ac}
		Insulation resistance	Cl. 12.7.6.4 of IS 13779 Cl .No 12.7.6.4 of IS 14697 Cl. 5.4.6.4 CBIP Report 325	10 MΩ to 1TΩ
		Impulse voltage	Cl. 12.7.6.2 of IS 13779 Cl .No 12.7.6.2 of IS 14697 Cl. 7.4 of IEC 62053-11 Cl. 7.4. of IEC 62053-21 Cl. 7.4. of IEC 62053-22 Cl. 7.4. of IEC 62053-23 IEC 60060-1999 IEC 61000-4-5	2kV _p to 12kV _p

Laboratory Electrical Research and Development Association, R-336, TTC Industrial Area, MIDC Rabale, Thane-Belapur Road, Navi Mumbai, Maharashtra

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 13 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Limits of errors / Accuracy	Cl. 11.11 of IS 13779 Cl .No 11.1 & 12.9 of IS 14697 Cl. 5.6.8 CBIP Report 325 Cl. 8.1 of IEC 62053-11 Cl. 8.1 of IEC 62053-21 Cl. 8.1 of IEC 62053-22 Cl. 8.1 of IEC 62053-23	55V to 480V 10mA to 120A
		Meter constant	Cl. 12.15 of IS 13779, Cl .No 12.14 of IS 14697- Cl. 5.6.6 CBIP Report 325 Cl. 8.4 of IEC 62053-11 Cl. 8.4 of IEC 62053-21 Cl. 8.4 of IEC 62053-22 Cl. 8.4 of IEC 62053-23	55V to 480V 10mA to 120A
		Starting	Cl. 12.14 of IS 13779 Cl .No 12.13 of IS 14697 Cl. 5.6.5 CBIP Report 325 Cl. 8.3 of IEC 62053-11 Cl. 8.3 of IEC 62053-21 Cl. 8.3 of IEC 62053-22 Cl. 8.3 of IEC 62053-23	5mA to 2000mA
		Running with no load / No-load condition	Cl. 12.13 of IS 13779 Cl .No 12.12 of IS 14697 Cl. 5.6.4 CBIP Report 325 Cl. 8.3 of IEC 62053-11 Cl. 8.3 of IEC 62053-21 Cl. 8.3 of IEC 62053-22 Cl. 8.3 of IEC 62053-23	55V to 480V
		Power loss / power consumption	Cl. 12.7.1 of IS 13779, Cl .No 12.7.1 of IS 14697 Cl. 5.4.1 CBIP Report 325 Cl. 7.1 of IEC 62053-11 Cl. 7.1 of IEC 62053-21	0.01W to 20W 0.1VA to 30VA

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 14 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

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			Cl. 7.1 of IEC 62053-22 Cl. 7.1 of IEC 62053-23	
		Repeatability of error	Cl. 12.17 of IS 13779 Cl. No 12.16 of IS 14697 Cl. 5.6.9 CBIP Report 325	55V to 480V 10mA to 120A
		Tamper and Fraud Monitoring	Cl.6.7.1(a), (b) & (f) of CBIP Research Publication No. 325 January 2015	Qualitative 55V to 480V 10mA to120A
		Effect of self-heating	Cl. 12.7.4 of IS 13779 Cl. No 12.7.4 of IS 14697 Cl. 5.4.4. CBIP Report 325 IEC 62052-11 Cl. 7.3 of IEC 62053-11 Cl. 7.3 of IEC 62053-21 Cl. 7.3 of IEC 62053-22 Cl. 7.3 of IEC 62053-23	55V to 480V 10mA to 120A
		Test of Influence Quantities -Frequency Variation -Reverse Ph Sequence -Waveform 10% of third harmonic in current -Voltage Variation -Voltage unbalance -Harmonic component in the voltage and current circuits	Cl. 12.11 of IS 13779 Cl. No 12.10 of IS 14697 CBIP Report Cl. 5.6.2 of CBIP Report 325 Cl. 8.2 of IEC 62053-11 Cl. 8.2 of IEC 62053-21 Cl. 8.2 of IEC 62053-22 Cl. 8.2 of IEC 62053-23	45 Hz to 55 Hz 55V to 480V 10mA to 120A 55V to 480V 55V to 480V 10mA to 120A
		Influence of supply voltage/ voltage dips and interruptions	Cl. 12.7.2 of IS 13779 Cl. No 12.7.2 of IS 14697 Cl. 5.4.2 of CBIP Report 325 Cl. 7.1.2 of IEC 62053-21 Cl. 7.1.2 of IEC 62053-22 Cl. 7.1.2 of IEC 62053-23	55V to 480V

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 15 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Immunity to earth fault/ Test of abnormal voltage condition	Cl. 12.8 of IS 13779 Cl .No 9.6 & 12.17 of IS 14697 Cl. 4.4.7of CBIP Report 325 Cl. 7.4 of IEC 62053-21 Cl. 7.4 of IEC 62053-22 Cl. 7.4 of IEC 62053-23	55V to 480V 10mA to120A
		Heating / test of influence of heating	Cl. 11.9 of IS 13010 Cl. 12.7.5 of IS 13779 Cl .No 12.7.5 of IS 14697 Cl. 5.4.5 of CBIP Report 325 Cl. 7.2 of IEC 62053-21 Cl. 7.2 of IEC 62053-22 Cl. 7.2 of IEC 62053-23	55V to 480V 10mA to120A 20°C to 200°C
V.	ELECTRICAL MATERIALS- LIQUID DIELECTRIC MATERIALS			
1.	Insulating Oil (Transformer Oil)	Appearance	Cl. 7.1 of IS 1866-2000 (Table 1 & 2)- Withdrawn standard IS:335-2018 IS: 1866-2017	Qualitative
		Density	IS 1448 (Part 16) Cl.7.11 of IS 1866-2000 (Table 1) – Withdrawn standard IS 335-2018/IS 1866-2017	0.800 g/cm ³ to 0.900 g/cm ³
		Interfacial Tension	IS 6104 Cl. 7.7 of IS 1866 -2000 (Table 1 & 2) – Withdrawn standard IS:335-2018 IS: 1866-2017	1 mN/m to 90 mN/m

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 16 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Flash Point	IS 1448 (Part 21) Cl. 7.9 of IS 1866-2000 (Table 1 & 2) – Withdrawn standard IS:335-2018 IS: 1866-2017 ISO 2719-2016	40°C to 400°C
		Neutralization Value	IS 1448 (Part 2) Cl. 7.4 of IS 1866-2000 (Table 1 & 2) – Withdrawn standard IS:335-2018 IS: 1866-2017	0.0001 mg KOH/g to 10 mg KOH/g
		Electric Strength	IS 6792 Cl. 7.2 of IS1866-2000 (Table 1 & 2) - Withdrawn standard Cl. 21.4.e 1180 (Part 1) IS:335-2018 IS: 1866-2017 IEC 60156-2018	10 kV to 100 kV
		Dielectric Dissipation Factor	IS 6262 Cl. 7.6.1 of IS 1866-2000 (Table 1 & 2) – Withdrawn standard IS:335-2018 IS: 1866-2017	0.5×10^{-3} to 0.5×10^{-2}
		Specific Resistance	IS 6103 Cl. 7.6.2 of IS 1866:2000 (Table1 & 2) – Withdrawn standard IS:335-2018 IS: 1866-2017	$1 \times 10^9 \Omega\text{cm}$ to $7.6812 \times 10^{14} \Omega\text{cm}$

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Page 17 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

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		Water Content	IS 13567 Cl. 7.3 of IS 1866-2000 (Table 1 & 2) - Withdrawn standard Cl. 21.4.e 1180 (Part 1) IS:335-2018 IS: 13567-2018 IS: 1866-2017	1 mg/kg to 2000 mg/kg
		Sediments & Sludge	Cl. 7.5 of IS 1866-2000 (Table 1 & 2) – Withdrawn standard IS:335-2018 IS: 1866-2017	0.001% to 5%
		Dissolved Gas Analysis - H ₂ - O ₂ - N ₂ - CH ₄ - C ₂ H ₄ - C ₂ H ₆ - C ₂ H ₂ - C ₃ H ₆ +C ₃ H ₈ - CO ₂ - CO	IS 9434 IS 10593 IS 1866-2000 (Table 1 & 2) – Withdrawn standard IEC 60567-2011 IEC 60599-2015 IS:1866-2017	Upto 10 ⁶ µl/l
		Furan Content - 5HMF - 2FOL - 2FAL - 2ACF - 5MEF	IEC 61198	Upto 50 mg/kg

Laboratory Electrical Research and Development Association, R-336, TTC Industrial Area, MIDC Rabale, Thane-Belapur Road, Navi Mumbai, Maharashtra

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6093

Page 18 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
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ELECTRICAL TESTING

AT SITE

I. TRANSFORMERS AND REACTORS				
1.	Power Transformers Dry Type Power Transformers Distribution Transformers (Non sealed type) Distribution transformers (sealed type) (Upto 100 MVA, 220 kV Class 1 Phase and 3 Phase)	Winding resistance	IS: 2026 (Part 1) (Cl. no.10.1.1.a) IS:1180(Part 1) (Cl.21.2.a) IS: 11171 (Cl.13.2.a) IEC: 60076 (Part 1) (Cl.11.1.2.1.a) IEC:60076 (Part 11) (Cl.15)	100 μΩ to 20 kΩ
		Impedance voltage/short Circuit impedance and load loss	IS: 2026 (Part 1) (Cl.10.1.1.c) IS:1180(Part 1) (Cl.21.2.c) IS: 11171 (Cl.13.2.c) IEC: 60076 (Part 1) (Cl.11.1.2.1.c) IEC:60076 (Part 11) (Cl.17)	Current : 1mA to 600 A Voltage : 1 V to 36 kV Power : 1 W to 500 kW Impedance : Upto 15%
		No load loss and current	IS: 2026 (Part 1)(Cl.10.1.1.d) IS:1180(Part 1) (Cl.21.2.d) IS: 11171 (Cl.13.2.d) IEC: 60076 (Part 1) (Cl.11.1.2.1.d) IEC:60076 (Part 11) (Cl.18)	Power:1 W to 500 kW Current:1 mA to 150 A
		Temperature rise	IS: 2026 (Part-1) (Cl.10.1.2.a), Cl. No. 5 of IS: 2026-Part 2-2010 IS:1180(Part 1) (Cl.21.3.b) IS: 11171 (Cl.13.1.h) IEC: 60076 (Part 1)	1 kVA to 100 MVA, HV - 3.3kV to 220kV & LV - 250V to 33 kV Ambient to 200 °C Impedance upto : 15%

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Page 19 of 19

Validity 24.02.2018 to 23.02.2020

Last Amended on 15.07.2019

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			(Cl.11.1.3.a), IEC-60076-2 : 2011 IEC:60076 (Part 11) (Cl.23)	
		Voltage ratio and check of voltage vector relationship / phase displacement	IS: 2026 (Part 1)Cl.10.1.1.b IS:1180 (Part 1) Cl.21.2.b IS: 11171 Cl.13.2.b IEC: 60076 (Part 1) Cl.11.1.2.1.b IEC:60076 (Part 11) Cl.16	2 to 300
		Insulation resistance	IS: 2026 (Part 1)Cl.10.1.3.j IS:1180(Part 1) Cl.21.2.e IEC: 60076 (Part 1) Cl.11.1.4.h	250V to 5kV DC 100 kΩ to 1 TΩ
		Oil Leakage test	IS:1180(Part 1) Cl.21.2.J CBIP Publication no:317	(-)100 to 300 kPa

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