

# **ACCREDITATION CERTIFICATE**

As a Testing Laboratory

## ASTOR ENERJİ A.Ş. Test Laboratuvarı

Central Address: ASO 2. ve 3. OSB Alcı OSB Mah. 2001 Cad. No.3 Sincan - ANKARA Ankara/Türkiye

is accredited in accordance with TS EN ISO/IEC 17025:2017 standard within the scope given in Annex following the assessment conducted by TURKAK.

Accreditation Number: AB-0650-T

Accreditation Date: 12.06.2013

Revision Date / Number : 27.04.2022 / 12

This certificate shall remain in force until **08.08.2025**, subject to continuing compliance with the standard **TS EN ISO/IEC 17025:2017**, related regulations and requirements.

Gülden Banu Müderrisoğlu Secretary General



Turkish Accreditation Agency (TURKAK) is a signatory to the European co-operation for Accreditation (EA) Multilateral Agreement (MLA) and International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Agreement (MRA) in the scope of ISO/IEC 17025.

This document has been signed by Gülden Banu Müderrisoğlu on {1} with a secure electronic signature in accordance with the electronic signature law numbered 5070. Use the QR code to verify the e-signed document.

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#### Annex of the Certificate ( Page 1/5) Accreditation Scope



# ASTOR ENERJİ A.Ş. Test Laboratuvarı

Accreditation Nr. AB-0650-T Revision Nr. 12 Date: 27.04.2022

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#### Electrical, Electronic and IT Products and Devices

Tested Materials / Products	Name of Test	Testing Method (National, International Standards, In-house Methods)
Power Transformers	Measurement of winding resistance Measurement of voltage ratio and check of phase displacement Measurement of short-circuit impedance and load loss Measurement of no-load loss and current (at rated voltage, at 90% and 110% of rated voltage) Measurement of D.C. insulation resisance between each winding to earth and between windings Measurement of zero-sequence impedance(s) on three-phase transformers Determination of capacitances windings-to-earth and between windings. Measurement of dissipation factor (tan i) of the insulation system capacitances. Tests on on-load tap-changers — Operation test Leak testing with pressure for liquid immersed transformers (tightness test) Check of core and frame insulation Check of external coating Check of the ratio and polarity of built-in current transformers Measurement of the power taken by the fan and liquid pump motors Winding hot-spot temperature-rise measurements Determination of transient voltage transfer characteristics	TS EN 60076-1 IEC 60076-1 IEC 60076-1 Clause 11.2 Clause 11.3 Clause 11.4 Clause 11.5 Clause 11.12.2b, 11.1.4h Clause 11.6 Clause 11.12.2a, 11.12.2c, 11.1.4.c, 11.1.4.d Clause 11.7 Clause 11.8 Clause 11.12 Clause 11.14 Clause 11.1.4 Clause 11.1.4 Clause 11.1.4.b Clause 11.1.4.b Clause 11.1.4.b
Power Transformers	Power transformers – Part 2: Temperature rise for liquid-immersed transformers	TS EN 60076-2 IEC 60076-2
Power Transformers	Power transformers - Part 3: Insulation levels, dielectric tests and external clearances in air  Applied voltage test (AV) Induced voltage withstand test (IVW) Induced voltage test with partial discharge measurement (IVPD) Lightning impulse tests (LI, LIC, LIN, LIMT) Line terminal AC withstand test (LTAC) Switching impulse test (SI) Overvoltage transferred from the high-voltage winding to a low-voltage winding Induced voltage tests (IVW and IVPD) Partial discharge (PD) measurement Insulation of auxiliary wiring (AuxW)	TS EN 60076-3 IEC 60076-3 Clause 10 Clause 11.2 Clause 11.3 Clause 13 Clause 12 Clause 14 Annex B Clause 11 Clause 11 Clause 11 Clause 9
Power Transformers	Power transformers - Part 10: Determination of sound levels	TS EN 60076-10 IEC 60076-10
Power Transformers	Power transformers - Part 11: Dry-type transformers  Measurement of winding resistance Measurement of voltage ratio and check of phase displacement Measurement of no-load loss and current Applied voltage test (AV) Induced voltage withstand test(IVW) Measurement of sound level Temperature-rise test Partial discharge measurement for transformers operated under a single phase line-to-earth fault condition Full wave lightning impulse test (LI)	TS EN 60076-11 IEC 60076-11 Clause 14.21 Clause 14.2.2 Clause 14.2.3 Clause 14.2.4 Clause 14.2.5 Clause 14.2.6 Clause 14.4.2 Clause 14.4.2 Clause 14.4.1 Clause 14.3.1
Insulating Liquids	Insulating liquids - Determination of the breakdown voltage at power frequency - Test method	TS 3989 EN 60156 IEC 60156
Insulating Liquids	Insulating liquids -Measurement of relative permittivity, dielectric dissipation factor (tan d) and d.c. resistivity	ASTM D924 TS EN 60247 IEC 60247



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Insulating Liquids	Fluids for electrotechnical applications - Mineral insulating oils for electrical equipment  Colour and appearance	TS EN 60296 IEC 60296 Clause 6.7
Insulating Liquids	Insulating liquids - Oil-impregnated paper and pressboard - Determination of water by automatic coulometric Karl Fischer titration	TS EN 60814 IEC 60814 ASTM DI533
Insulating Liquids	Insulating liquids - Determination of acidity - Part 1: Automatic potentiometric titration	TS EN 62021-1 IEC 62021-1
High-voltage switchgear and controlgear	High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear  Power-frequency voltage tests Lightning impulse voltage tests Dielectric tests on auxiliary and control circuits Continuous current tests Resistance measurement of contacts and connections in the main circuit as a condition check Dielectric test on the main circuit Tests on auxiliary and control circuits Measurement of the resistance of the main circuit Design and visual checks	TS EN 62271-1 IEC 62271-1 Clause 7.27.2 Clause 7.27.3 Clause 7.21 Clause 7.5 Clause 7.4.4 Clause 8.2 Clause 8.3 Clause 8.4 Clause 8.6
High-voltage switchgear and controlgear	High-voltage switchgear and controlgear - Part 100: Alternating-current circuit-breakers  Power-frequency voltage tests Lightning impulse voltage tests Dielectric tests on auxiliary and control circuits Continuous current tests Resistance measurement of contacts and connections in the main circuit as a condition check Dielectric test on the main circuit Tests on auxiliary and control circuits Measurement of the resistance of the main circuit Design and visual checks	TS EN 6227I-100 IEC 6227I-100 Clause 6.2.6.1 Clause 6.2.6.2 Clause 6.2.10 Clause 6.5 Clause 6.4 Clause 7.1 Clause 7.2 Clause 7.3 Clause 7.5
High-voltage switchgear and controlgear	High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV  Power-frequency voltage tests Lightning impulse voltage tests Dielectric tests on auxiliary and control circuits Continuous current tests Resistance measurement of contacts and connections in the main circuit as a condition check Dielectric test on the main circuit Tests on auxiliary and control circuits Measurement of the resistance of the main circuit Design and visual checks	TS EN 62271-200 IEC 62271-200 Clause 62.6.1 Clause 62.6.2 Clause 62.10 Clause 6.5 Clause 6.4.1 Clause 6.102 Clause 7.1 Clause 7.2 Clause 7.3 Clause 7.5 Clause 7.5 Clause 7.102
Non-magnetic coatings on magnetic metals	Paint and varnishes - Determination of film thickness	TS EN ISO 2178 EN ISO 2178 TS EN ISO 2808 EN ISO 2808
Power Transformers	Power Transformers – Part 1: General  Measurement of the harmonics of the no-load current	TS 267 EN 60076-1:1998 Clause10.6 (*)  IEC 60076-1:2000 Clause 10.6 (*)  (* This standard was withdrawn on 12.04.2012, however, it is given temporarily in this accreditation scope upon the request of the laboratory)
Power transformers	Power transformers - Part 18: Measurement of frequency response	TS EN ISO 60076-18 IEC 60076-18



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Power Transformers	Medium power transformers 50 Hz, with highest voltage for equipment not exceeding 36 kV - Part 1: General requirements  Special Test for Corrugated Tank (Endurance Test)	TS EN 50588-1 (*) EN 50588-1(*) Clause 9.4  TS EN 50464-4:2007/A1 (**) EN 50464-4:2007/A1 (**)  (* This standard was withdrawn on 09.11.2020, however, it is given temporarily in this accreditation scope upon the request of the laboratory) (** This standard was withdrawn on 18.12.2017, however, it is given temporarily in this accreditation scope upon the request of the laboratory)
Power Transformers	Dielectric Frequency Response Test	IEEE Std. C57.152 Annex G IEEE Std. C57.161
Transformers	IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers  Measurement of Winding Resistance Measurement of Voltage Ratio and Check of Phase Displacement Measurement of No-Load Loss and Current Applied Voltage Test (AV) Induced Voltage Withstand Test (IVW) Determination of Sound Levels Measurement of D.C. Insulation Resistance Between Each Winding to Earth and Between Windings Zero-phase-sequence impedance Determination of Capacitances Windings-to-Earth and Between Windings. Measurement of Dissipation Factor (tan §) of the Insulation System Capacitances. Partial Discharge Measurement (IVPD, PD) Lightning Impulse Tests (LI, UC, LIN, LIMT) Switching Impulse Test (SI)	IEEE C57.12.90  Clause 5 Clause 6 - 7 Clause 9 Clause 8 Clause 10.6 Clause 10.7 Clause 13 Clause 10.11 Clause 10.10 Clause 10.10 Clause 10.10 Clause 10.00 Clause 10.3 Clause 10.3 Clause 10.3
Shunt Reactors	Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA  Measurement of winding resistance Determination of reactance and linearity of reactance Impedance Test Measurement of Loss in Ambient Temperature Loss Measurements Applied Voltage Test (AV) (Separate Source A.C. Withstand Voltage Test) Lightning impulse test (IJ, IJC, LIN, LIMT) Switching impulse test (IJ, IJC, LIN, LIMT) Switching impulse test (SI) Induced Voltage Tests (IW and IVPD) Partial discharge measurements (PD) Measurement of Insulation Resistance and/or Capacitance and Dissipation Factor (tano) of the Winding Insulation to Earth for Liquid-Immersed Reactors Insulation Power Factor Test Vibration Tests on Oil-Immersed Shunt Reactors Temperature Rise Test Measurement of Zero-Sequence Reactance on Three-Phase Reactors Measurement of Magnetic Characteristic of Magnetically Shielded Air Core Reactor with Intermittent Iron Core Reactors	Clause 10.2 Clause 10.4.2 Clause 10.4.2 Clause 10.3.2 Clause 10.3.4, 10.3.6 Clause 10.3.3, 10.3.3.2 Clause 10.3.3, 10.3.3.2 Clause 10.3.3.2 Clause 10.3.10 Clause 10.7 Clause 10.5 Clause 10.5 Clause 10.4.2.5 Clause 10.9 Clause 10.6



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Power Transformers	Power transformers - Part 6: Reactors  Determination of Reactance and Linearity of Reactance Impedance Test Measurement of Loss in Ambient Temperature Loss Measurements Applied Voltage Test (AV) (Separate Source A.C. Withstand Voltage Test) Lightning Impulse Test (I, IC, LIN, LIMT) Switching Impulse Test (I, IC, LIN, LIMT) Switching Impulse Test (SI) Induced Voltage Tests (IWW and IVPD) Measurement of Insulation Resistance and/or Capacitance and Dissipation Factor (tano) of the Winding Insulation to Earth for Liquid-Immersed Reactors Insulation Power Factor Test Vibration Tests on Oil-Immersed Shunt Reactors Temperature Rise Test Measurement of Zero-Sequence Reactance on Three-Phase Reactors Measurement of Mutual Reactance on Three-Phase Reactors Measurement of Harmonics of the Current Measurement of Magnetic Characteristic of Magnetically Shielded Air Core Reactor with Intermittent Iron Core Reactors Measurement of Acoustic Sound Level Audible-Sound Level Test Measurement of Loss Close to Reference Temperature in the Case of Liquid-Immersed Reactors Measurement of Power Consumption of Fans and Oil Pumps, if any Measurement of No-Load Loss and Current Measurement of No-Load Loss and Current Measurement of Short-Circuit Impedance and Load Loss Applied Voltage Tests (IV) Lightning Impulse Tests (I, LIC, LIN, LIMT) Induced Voltage Tests (IVW) Measurement of Loss at Rated Continuous Neutral Current Temperature Rise Test Measurement of Acoustic Sound Level Audible-Sound Level Test	TS EN 60076-6 EN 60076-6 IEC 60076-6 IEC 60076-6 Clause 7.8.5 Clause 7.8.10.2 Clause 7.8.10.4 Clause 7.8.10.3 Clause 7.8.10.3 Clause 7.8.13 Clause 7.8.14 Clause 7.8.14 Clause 7.8.8 Clause 7.8.9 Clause 7.8.9 Clause 7.8.1 Clause 7.8.1 Clause 7.8.1 Clause 7.8.1 Clause 7.8.2 Clause 7.8.3 Clause 7.8.7 Clause 7.8.8 Clause 7.8.1 Clause 7.8.1 Clause 7.8.1 Clause 7.8.1 Clause 10.9.2 Clause 10.9.2 Clause 10.9.2 Clause 10.9.7 Clause 10.9.7 Clause 10.9.7 Clause 10.9.9 Clause 10.9.9 Clause 10.9.9 Clause 10.9.9 Clause 10.9.9 Clause 10.9.9 Clause 10.9.9 Clause 10.9.9 Clause 10.9.9 Clause 10.9.9 Clause 10.9.9
Power Transformers	The measurement of Frequency Response Analysis (FRA) of oil-immersed power transformers	IEEE C57.152 Annex F IEEE C57.149

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# Annex of the Certificate ( Page 5/5) Accreditation Scope



# ASTOR ENERJİ A.Ş. Test Laboratuvarı

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#### Lubricants

Tested Materials / Products	Name of Test	Testing Method (National, International Standards, In-house Methods)
Insulating Liquids	Dissolved Gas Analysis (DGA) (H2,CH4,CO,C02,C2H4,C2H6,C2H2, N2, 02) Gas Chromatography Method	TS EN 60567 ASTM D3612 IEC 60567
Insulating Liquids	Determination of Total Acid Number by Potentiometric Titration	ASTM D664
Insulating Liquids	Determination of ASTM Color	ASTM DI500 TS 1713 ISO 2049 ISO 2049
Insulating Liquids	Determination of DBPC (2,6-di-tert-Butyl- p-Cresol) Content by FT-IR Method	ASTM D2668 TS EN 60666 IEC 60666
Insulating Liquids	Determination of Interfacial Tension	ASTM D97I
Insulating Liquids	Determination of Density and Relative Density by Oscillating U-tube Method	TS EN ISO 12185 ASTM D4052 ISO 12185
Insulating Liquids	Determination of Kinematic Viscosity and Calculation of Dynamic Viscosity	ASTM D445 TS 1451 EN ISO 3104 ISO 3104
Insulating Liquids	Determination of Flash Point by Cleveland Open Cup Tester	ASTM D92 TS EN ISO 2592 ISO 2592
Insulating Liquids	Determination of Aniline Point	ASTM D611 TS 1615 ISO 2977 ISO 2977
Insulating Liquids	Determination of Pour Point by Automatic Tilt Method	ASTM D5950

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