# Hellenic Accreditation System

Annex F1/22 to the Certificate No. **90**-7

# SCOPE of ACCREDITATION

of the

## Testing Laboratory

of the

## Innovation Hub (DKK) of PPC S.A.

| Materials/ Products to be tested | Types of test / Properties to be measured | Applied methods / Techniques to be used |
|---|---|---|
| Electrical tests | | |
| Category I power transformers | 1. Ability to withstand the dynamic effects of short-circuit /<br>- Current RMS value<br>- Current peak value<br>- Time<br>- Reactance and its variation | IEC 60076-5: 2006<br>(entire standard) |
| | 2. Measurement of voltage ratio and check of phase displacement /<br>- Voltage ratio<br>- Phase displacement | IEC 60076-1: 2011§ 11.3 |
| | 3. Measurement of winding resistance/ Winding ohmic resistance | IEC 60076-1: 2011§ 11.2 |
| | 4. Measurement of load losses. Measurements of AC voltage, current, power | IEC 60076-1: 2011 §11.4 |
| | 5. Measurement of no-load losses. Measurements of AC voltage, current, power | IEC 60076-1: 2011 §11.5 |
| AC metal-enclosed switchgear and controlgear for rated voltages from 1 kV to 52 kV | 1. Measurement of resistance of main circuit | IEC 62271-200: 2021 §6.4<br>IEC 62271-1: 2017+A1 §7.4 |
| | 2. Ability to withstand the effects of:<br>- Short time current<br>- Peak current | IEC 62271-200: 2021 §6.6<br>IEC 62271-1:2017+A1 §7.6 |
| | 3. Temperature rise test (continuous current test):<br>- For currents from 0 A up to 2000 A.<br>- For Temperature ranging from 10 °C to 150 °C | IEC 62271-200 2021 3 ed. §7.5<br><br>IEC 62271-1:2017-07 2 ed. §7.5 |
| Low voltage switchgear and controlgear assemblies | 1. Ability to withstand the effects of:<br>- Short time current<br>- Peak current | EN IEC 61439-1: 2021,<br>IEC 61439-1: 2020 §10.11 |
| | 2. Temperature rise test:<br>- For currents from 0 A up to 2000 A.<br>For Temperature ranging from 10 °C | EN IEC 61439-1: 2021<br>IEC 61439-1:2020 2 ed. § 9.2 & § 10.10 |

| Materials/ Products to be tested | Types of test / Properties to be measured | Applied methods / Techniques to be used |
|---|---|---|
| | to 150 °C | IEC 60269-1:2006 4 ed. § 8.3<br>IEC 60269-2:2013+AMD1:2016 5.1 ed. § 8.3<br>IEC 60269-3:2006 3 ed. § 8.3<br>IEC 60269-4:2006 3 ed. § 8.3 |
| AC Disconnectors: Single Pole Disconnector | Temperature rise test (Continuous current test):<br>- For currents from 0 A up to 2000 A. For Temperature ranging from 10 °C to 150 °C | IEC 62271-102 2022 CSV 2.1 ed. § 5.5, §7.5<br>IEC 62271-1:2017-07 2 ed. §7.5 |
| AC Disconnectors: Triple Pole Disconnector | Temperature rise test (Continuous current test):<br>- For currents from 0 A up to 2000 A. For Temperature ranging from 10 °C to 150 °C | IEC 62271-102 2022 CSV 2.1 ed. § 5.5, §7.5<br>IEC 62271-1:2017-07 2 ed. §7.5 |
| AC Disconnectors: Fuse Cutout | Temperature rise test (Continuous current test):<br>- For currents from 0 A up to 2000 A. For Temperature ranging from 10 °C to 150 °C | IEC 62271-102 2022 CSV 2.1 ed. § 5.5, §7.5<br>IEC 62271-1:2017-07 2 ed. §7.5 |
| Electric Vehicle Battery Charger / Charging Station | Dielectric Strength Test | EN IEC 61851-1:2019 §12.7.1 |
| | Insulation Resistance Test | EN IEC 61851-1:2019 §12.5 |
| Inductive Voltage Transformer | Power-frequency withstand test on primary windings | IEC 61869-1:2007 §7.3.1<br>IEC 61869-3:2011 §7.3.1 |
| | Power-frequency withstand test on secondary windings | IEC 61869-1:2007 §7.3.4<br>IEC 61869-3:2011 |
| LV or HV Current Transformer | Power-frequency withstand test on primary windings | IEC 61869-1:2007 §7.3.1<br>IEC 61869-2:2012 §7.3.1 |
| | Power-frequency withstand test on secondary windings | IEC 61869-1:2007 §7.3.4<br>IEC 61869-2:2012 |
| Low Voltage Power Cable | Insulation Resistance measurement test<br>- at ambient temperature<br>- at maximum conductor temperature | IEC 60502-1:2021 § 17.2, 17.3<br>ΔΕΗ Α.Ε. ΚΚ 03.02/13.07.1993 (GR - 104A) § 6.2.1.<br>GR - 269/17.09.1981 § 7.3. |
| | 4h Voltage test | IEC 60502-1:2021 § 17.4<br>ΔΕΗ Α.Ε. ΚΚ 03.02/13.07.1993 (GR-104A) § 6.2.2. |
| Mechanical tests | | |
| Bolts, screws and studs | Tensile test for the determination of<br>- Tensile strength (Rm)<br>- Elongation after fracture (Af) and stress at 0,0048d non-proportional elongation (Rpf)<br>- Proofload | ELOT EN ISO 898.01 E3: 2013, §9.2, 9.3 και 9.6 |
| Weldable steels for the reinforcement of concrete | Tensile test:<br>- Real section<br>- Elongation<br>- Strength at yield $R_{eH}$<br>- Strength at break $R_m$<br>- Ratio $R_m/R_{eH}$ | ELOT EN ISO 15630-1 E3: 2019, §5<br>ELOT EN ISO 15630-2 E3: 2019, §5<br>** ΕΛΟΤ ΕΝ 10080: 2005*<br>** ΕΛΟΤ 1421-2 Ε2: 2007*<br>** ΕΛΟΤ 1421-3 Ε2: 2007*<br>(*) they provide limit values and procedures for the conformity assessment against specifications. |

| Materials/ Products to be tested | Types of test / Properties to be measured | Applied methods / Techniques to be used |
|---|---|---|
| Metallic materials | Tensile test /<br>- Maximum force<br>- Elongation at break<br>- Upper and lower yield strength<br>- Tensile strength | ΕΛΟΤ EN ISO 6892.01: 2020<br>ELOT EN 10002-1: 2001<br>§3, 4, 6, 7, 8, 10, 11, 12, 20, 22<br>Annex A, D, H |
| Plastics and elastomers | Tensile test /<br>- Elongation at break<br>- Tensile strength at yield<br>- Tensile strength at break | ELOT EN ISO 527-1 E3: 2019<br>ELOT EN ISO 527-2 E2: 2012 |
| Metallic materials | Charpy impact test /<br>Energy absorbed by breakage | ELOT EN ISO 148.01 E2: 2017 |
| Metallic welded materials | Face bend test (FBB) and<br>Root bend test (RBB) | ΕΛΟΤ EN ISO 5173: 2011<br>+A1: 2012 |
| Welded metallic specimens<br>- Plates<br>- Pipes with diameter >18 mm | Transverse tensile test:<br>- Elongation<br>- Tensile strength $R_m$ | ELOT EN ISO 4136 E2: 2012<br>except § 5.5.3.2 and § 5.5.3.3<br>ELOT EN ISO 6892.01:2020<br>ELOT EN 10002-1: 2001<br>§3, 4, 6, 7, 8, 10, 11, 12, 20<br>Annex A, D, H |
| Concrete specimens with dimensions according to the Method "Ministry for the Environment, Physical Planning and Public Works SK-303":<br>1. Cubes:<br>- 150 X 150 X150 mm<br>- 200 X 200 X200 mm<br>2. Cylinders:<br>- 100 X 200 mm | Compressive strength test | Specification: HMEPPPW<br>SK-303, SK-304 |
| Concrete specimens with dimensions:<br>Cubes:<br>150 X 150 X 150 mm | Compressive strength test | ΕΛΟΤ EN 12390-3:2019 |
| Rectangular metallic<br>Weld specimens | Charpy impact test /<br>Absorbed energy from impact for absorbed energy level: low 20 Joule, medium 70 Joule, high 120 Joule | ELOT EN ISO 148.01 E2: 2017<br>ΕΛΟΤ EN ISO 9016 E3: 2022 |
| Elastomers | Tensile test/<br>- Elongation at break<br>- Tensile strength<br>- State of stress at 200% elongation | ISO 37: 2017 |
| Elastomers | Tear strength | ISO 34-1:2022 |
| Metallic materials | Bend test | ELOT EN ISO 7438:2020 |
| Chemical tests | | |
| Petroleum products<br>(liquid fuels and lubricants) | Determination of density,<br>with digital density meter | ASTM D4052: 2018a<br>ELOT EN ISO 12185: 1996 |
| | Determination of density,<br>with Stabinger viscometer | ASTM D 7042: 2021 |
| | Determination of dynamic and kinematic viscosity, with Stabinger viscometer | ASTM D7042: 2021 |
| | Calculation of viscosity index (VI) | ASTM D2270:2010 (2016) |

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|---|---|---|
| | Calculation of carbon aromaticity index (CCAI) | ISO 8217: 2017 |
| | Determination of Cleveland open cup flash point and fire point | ASTM D92: 2018<br>ELOT EN ISO 2592:2017 |
| | Determination of Pensky-Martens closed cup flash point | ASTM D93: 2020<br>ELOT EN ISO 2719: 2021 |
| | Determination of water, by distillation | ASTM D95: 2013 (2018) |
| | Determination of carbon, hydrogen and nitrogen | ASTM D5291: 2016 |
| | Determination of heat of combustion (gross and net) | ASTM D 240:19 |
| | Determination of carbon residue (micro method) | ASTM D4530: 2015 (2020) |
| | Determination of total base number (TBN) | ASTM D2896: 2015 |
| | Determination of Al, Si, Na, Ni, Fe, V, Ca, P, Zn, Catfines (Al+Si) | IP 501/2005 |
| Petroleum products (lubricants) | Determination of Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, Pb, Si, Sn, Ti, V, Zn | ASTM D 5185-18:2018 |
| Transformer oils and insulating oils | Determination of Al, Cd, Cu, Fe, Pb, Ni, Si, Ag, Na, Sn, Zn | ASTM D 7151-15:2016 |
| | Determination of polychlorinated biphenyls (PCBs) | IEC 61619:1997 |
| Solid fuels and ashes | Determination of Hg concentration | EPA 7473: 2007 |
| Drinking water, surface water, underground water | Determination of pH | ΕΛΟΤ ISO 10523: 2012 |
| | Determination of electrical conductivity | ΕΛΟΤ EN 27888: 1993 |
| | Determination of free (residual) and total chlorine | ISO 7393-2:2018 |
| | Determination of ammonium ($NH_4^+$) | HACH LCK 304<br>HACH LCK 305 |
| | Determination of Phenols | HACH LCK 345 |
| | Determination of free CN | HACH LCK 315 |
| | Determination of Li, Be, Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Sr, Mo, Cd, Ba, Hg, Tl, Pb | ΕΛΟΤ EN ISO 17294.01:2006<br>ΕΛΟΤ EN ISO 17294-2:2016 |
| | Determination of K, Na, Ca, Mg, B | ISO 11885:2009 |
| | Determination of $F^-$, $Cl^-$, $NO_2^-$, $Br^-$, $NO_3^-$, $SO_4^{--}$, $PO_4^{-3}$ | ΕΛΟΤ EN ISO 10304.01:2010 |

| Materials/ Products to be tested | Types of test / Properties to be measured | Applied methods / Techniques to be used |
|---|---|---|
| | Determination of hardness (computational) | APHA 2340 B |
| | Determination of total organic carbon (TOC) | APHA 5310 A, B |
| | Determination of odor | ΕΛΟΤ EN 1622:2006 |
| | Determination of taste | ΕΛΟΤ EN 1622:2006 |
| | Determination of turbidity | ΕΛΟΤ EN ISO 7027-1:2016 |
| | Determination of oxidability | ISO 8467:1993 |
| Wastewater | Determination of pH | ΕΛΟΤ ISO 10523: 2012 |
| | Determination of electrical conductivity | ΕΛΟΤ EN 27888: 1993 |
| | Determination of free (residual) and total chlorine | IN HOUSE METHOD BASED ON ISO 7393-2:2018 |
| | Determination of ammonium ($NH_4^+$) | HACH LCK 304<br>HACH LCK 305 |
| | Determination of Phenols | HACH LCK 345 |
| | Determination of free CN | HACH LCK 315 |
| | Determination of As, Cd, Cr, Ni, Pb, Cu, Se, Zn, Ag, Al, B, Ba, Be, Co, Fe, Mn, Mo, Sr, Tl, V, K, Na, Ca, Mg, B | EPA 6010D: 2018 |
| | Determination of dissolved As, Cd, Cr, Ni, Pb, Cu, Se, Zn, Ag, Al, B, Ba, Be, Co, Fe, Mn, Mo, Sr, Tl, V | EPA 6010D: 2018 |
| | Determination of Li, Be, Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Sr, Mo, Cd, Sn, Ba, Hg, Tl, Pb | ΕΛΟΤ EN ISO 17294.01:2006<br>ΕΛΟΤ EN ISO 17294-2:2016 |
| | Determination of $F^-$, $Cl^-$, $NO_2^-$, $Br^-$, $NO_3^-$, $SO_4^{--}$, $PO_4^{-3}$ | ΕΛΟΤ EN ISO 10304.01:2010 |
| | Determination of total organic carbon (TOC) | APHA 5310 A, B |
| | Determination of Hg | EPA:7473:2007 |
| | Determination of COD | HACH LCK 314 |
| | Determination of Total Petroleum Hydrocarbons (TPH) | ASTM D7066-04 |
| | Determination of Total Nitrogen (TN) | HACH LCK 138 |
| | Determination of Salinity | APHA 2520 B |

| Materials/ Products to be tested | Types of test / Properties to be measured | Applied methods / Techniques to be used |
|---|---|---|
| | Determination of Hexavalent Chromium (Cr VI) | HACH LCK 313 |
| | Determination of Total Suspended Solids (TSS) | APHA 2540 D |
| | Determination of Total Dissolved Solids (TDS) | APHA 2540 C |
| | Determination of Color | HACH 8025 |
| Water | Determination of Color | HACH 8025 |
| Saline water and sea water | Determination of COD | HACH LCK 1814 |
| Physical tests | | |
| Non cellular plastics - Determination of density | Measurement of relative density (specific gravity) and density / Density | ASTM D 792: 2020, Test method A<br>ISO 1183-1:2019 Test method A |
| Rubbers | Measurement of SHORE A & D hardness / SHORE hardness | DIN 53505: 2000<br>ISO 48-4: 2018 |
| Plastics and ebonite | Determination of indentation hardness - Shore hardness | ELOT EN ISO 868:2003 |
| Elastomers | Determination of abrasion resistance /<br>- Density<br>- Volume loss<br>- Abrasion resistance | ISO 4649: 2017 – Method A<br>ISO 2781: 2018– Method A |
| | Determination of rebound resilience: (pendulum method) | ISO 4662:2017 |
| Rubber having SHORE A or IRHD hardness from 30 up to 85 | Determination of rebound resilience:<br>- Ratio of returned to energy applied<br>- Rebound resilience | DIN 53512: 2000 |
| Soil samples | Dry preparation of soil samples | Specification: HMEPPPW*<br>E 105:1986, §1 |
| Soil samples (specimens) | 1. Determination of moisture of soil:<br>- Moisture | Specification: HMEPPPW<br>E 105:1986, §2 |
| | 2. Determination of moisture – density relation (PROCTOR standard method):<br>- Moisture<br>- Density | Specification: HMEPPPW<br>E 105:1986, §10 |
| Soils | 1. Specific gravity of soils/specific gravity | Specification: HMEPPPW<br>E105:1986 §4 |
| | 2. Liquid limit | Specification: HMEPPPW<br>E105:1986 §5 |
| | 3. Determination of plastic limit and plasticity index | Specification: HMEPPPW<br>E105:1986 §6 |
| | 4. Sieve analysis of fine and coarse soils (dry method) / Amount of passing material | Specification: HMEPPPW<br>E105:1986 §7 |

| Materials/ Products to be tested | Types of test / Properties to be measured | Applied methods / Techniques to be used |
|---|---|---|
| | 5. Determination of material of soils finer than the No 200 (75μm) sieve / Amount of passing material | Specification: HMEPPPW E105:1986 §8 |
| Aggregates | 1. Determination of materials finer than No 200 (75 μm) sieve in mineral aggregates by washing / Amount of material finer than 75 μm | ASTM C117:2017 |
| | 2. Resistance to degradation of coarse aggregates by abrasion and impact in the Los Angeles machine / Amount of loss of weight | ASTM C131/C131M : 2020<br>ASTM C535: 2016 |
| | 3. Reducing field samples of aggregate to testing size | ASTM C702/C702M:2018<br>ΕΛΟΤ EN 932-2: 2000<br>Except §7, 12 |
| | 4. Determination of particle size distribution - Sieving method | ELOT EN 933-1: 2012 |
| | 5. Assessment of fines – Methylene blue test | ELOT EN 933-9:2022 |
| | 6. Determination of resistance to fragmentation-Los Angeles Method | ELOT EN 1097-2:2020, except Annex A |
| | 7. Determination of particle density and water absorption of aggregates | ELOT EN 1097-6:2022, §8, 9 |
| Fine aggregates | 1. Sieve analysis of fine aggregates / Amount of passing material | ASTM C136/C136M: 2019, §7.3, 8, 9 |
| | 2. Determination of specific gravity of fine aggregates / Specific gravity | ASTM C128: 2015,<br>§8, 9, 10.2 |
| | 3. Determination of absorption of fine aggregates /Amount of absorbed moisture | ASTM C128: 2015,<br>§8, 9, 10.3 |
| Coarse aggregates | 1. Sieve analysis of coarse aggregates/ Amount of passing material | ASTM C136/C136M: 2019, §7.4, 8, 9 |
| | 2. Determination of specific gravity of coarse aggregates / Specific gravity | Specification: HMEPPPW<br>SK – 301: 1985 §5, 6, 7.1<br>ASTM C127: 2015 |
| | 3. Determination of absorption of coarse aggregates / Amount of absorbed moisture | Specification: HMEPPPW<br>SK – 301:1985 §5, 6, 7.3<br>ASTM C127: 2015 |
| Fresh concrete | 1. Slump of concrete / Measure of height of specimen | Specification: HMEPPPW<br>SK – 309:1986 |
| | 2. Determination of air content of freshly mixed concrete by the pressure method/air percent | ASTM C231/C231M: 2017a |
| | 3. Determination of density (unit weight) of concrete / Unit weight | ASTM C138/C138M: 2017a |
| | 4. Slump test | ΕΛΟΤ EN12350-2:2019 |
| Concrete specimens | 1. Preparation and curing of concrete specimens:<br>- Dimensions<br>- Density | Specification: HMEPPPW<br>SK-303:1985 |
| | 2. Making and curing specimens for strength test | ELOT EN 12390-2:2019 |

| Materials/ Products to be tested | Types of test / Properties to be measured | Applied methods / Techniques to be used |
|---|---|---|
| | 3. Density of hardened concrete | ELOT EN 12390-7:2020, except §6.5 |
| Road lighting installations | Road measurements of Illuminance & uniformity | ELOT EN 13201-3:2016 §7.2.6 - 7.2.9,<br>ELOT EN 13201-4: 2016 §7.1, 7.3, 8 |
| Lighting installations of indoor working areas Indoor luminaries – Lighting of work places | Measurements of illuminance & uniformity in indoor working areas | ΕΛΟΤ EN 12464-1: 2021 |
| Non-destructive tests | | |
| Metallic materials | Ultrasonic examination of fusion welds in ferrous plates and pipes (pulse-echo technique) | ELOT EN 17640:2019<br>Ultrasonic examination of welds |
| Ferromagnetic metallic materials | Inspection of weldings in steel plates and pipes with the method of magnetic particles and by using portable electromagnet (Yoke) | ELOT EN ISO 9934-1:2017<br>ELOT EN ISO 17638:2016 |
| Metallic and other materials in which ultrasound can propagate | Ultrasonic thickness measurement in mm (or inches) | ASTM E797/E797M: 2021<br>ELOT EN ISO 16809: 2018 |
| Metallic materials | Measurement of thickness of non-magnetic coatings over:<br>- magnetic base using the magnetic method<br>- non-magnetic base using the Eddy-current method<br>/ Coating thickness | Magnetic method:<br>ASTM B499:2009 (2021)E1<br>ISO 2178:2016<br>Eddy-current method:<br>ELOT EN ISO 2360 E3: 2017 |
| Metallurgical tests | | |
| Metallic materials (using speciments) | Metallografic inspection /<br>- Magnification<br>- Estimation of metallografic microstructure<br>- Determination of creep cavitation damage | VGB** – Technische Wishenshaftliche |
| Metallic materials & metallic materials welds | 1. Hardness test according to BRINELL: Hardness HBW: 2,5/187,5 & 2,5/31,75 | ELOT EN ISO 6506-1: 2014 |
| | 2. Hardness test according to VICKERS: Hardness HV10 & HV30 | ELOT EN ISO 6507-1: 2018 |
| | 3. Hardness test according to VICKERS: Hardness HV0.5, HV1 | ELOT EN ISO 6507-1: 2018<br>ELOT EN ISO 9015-2: 2016 |
| | 4. Hardness test according to ROCKWELLB&C: Hardness HRB, HRC | ELOT EN ISO 6508-1: 2016 |
| | 5. Portable Leeb Hardness Testing | ELOT EN ISO 16859-1: 2016<br>ASTM A956/A956M-17a |
| | 6. UCI Portable Hardness Testing | DIN 50159-1:2015<br>ASTM A1038-19 |
| Microbiological tests | | |

| Materials/ Products to be tested | Types of test / Properties to be measured | Applied methods / Techniques to be used |
|---|---|---|
| Wastewater, Sea water | Enumeration of total coliforms and *Escherichia coli* | ELOT EN ISO 9308-2:2014 |
| | Detection and enumeration of fecal coliforms | Method IDEXX COLILERT-18 |
| | Detection and enumeration of enterococci | Method 9230 D (APHA, STANDARD METHODS 23rd, 2017) |
| Sampling | | |
| Transformer oils and insulating oils | Sampling of transformer oils and insulating oils | EN 60475:2011<br>ASTM D 923-15 |
| Fresh concrete | Sampling of fresh concrete | ΕΛΟΤ EN12350-1:2019 |

Site of assessment: **Laboratory permanent premises, 9 Leondariou Str., Kantza, Pallini, Attiki, Greece.**

Approved signatories: M. Bomboulos, D. Kaimaras, A. Papathanasiou, M. Valsamakis, E. Panagiotidou, A. Kontou, N. Roussos, E. Thirios, G. Lytras, A. Petrakos, F. Saiti, E. Oikonomopoylos, N. Ntalaouti, F. Deligianni, K. Bourouti, E. Tsafos, C. Manoukian, K. Kourmetas, A. Zervas.

This Scope of Accreditation replaces the previous one dated 14.03.2023.
The Accreditation Certificate No. **90**-7, to ELOT EN ISO/IEC 17025: 2017, is valid until 02.07.2027.

Athens, 07.09.2023

Christos Nestoras
*CEO of ESYD*