Hellenic Accreditation System

Annex F2/21 to the Certificate No. **426**-7

SCOPE of ACCREDITATION

of the

Laboratory

of

TOTAL Q CALIBRATION LABORATORIES S.A.

for the performance of calibrations

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
Volume measurements			
Piston pipettes	[0,1 to 1) µL	10 %	Internal procedure tQ-VOLUME-01 Gravimetric method based on ISO 8655-6 (2022)
	[1 to 2] µL	2,0 %	Gravimetric method according to: ISO 8655-6 (2022)
	(2 to 50] µL	0,50 %	
	(50 to 500] µL	0,19 %	
	(0,5 to 2,0] mL	0,15 %	
	(2,0 to 10,0] mL	0,14 %	
Piston volumetric apparatus (dispensers, digital burettes, titrators	0,1 mL to 100 mL	0,05 %	Internal procedure tQ-VOLUME-01 Gravimetric method based on ISO 8655-6 (2022)
Volumetric flasks	[5 to 100] mL	0,05 %	Gravimetric method according to ISO 4787 (2021)
	(100 to 2000] mL	0,012 %	
Bulb pipettes	[1 to 10] mL	0,05 %	Gravimetric method according to

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
	(10 to 100] mL	0,02 %	ISO 4787 (2021)
Other volumetric apparatus of «In» and «Ex» type (one-mark and graduated volumetric glassware, plastic and metallic proving tanks)	[0,1 to 1) µL	5,0 %	Internal procedure tQ-VOLUME-01 Gravimetric method based on ISO 4787 (2021)
	[1 to 2] µL	2,0 %	
	(2 to 50] µL	0,50 %	
	(50 to 500] µL	0,15 %	
	(0,5 to 2,0] mL	0,10 %	
	(2 to 10,0] mL	0,07 %	
	(10,0 to 2500] mL	0,05 %	
Mass measurements			
Standard weights			According to OIML R111-1: 2004, class up to, including:
	[1 to 5] mg	2,0 µg	E2
	10 mg	2,5 µg	E2
	20 mg	3,3 µg	E2
	50 mg	4,0 µg	E2
	100 mg	5,0 µg	E2
	200 mg	6,5 µg	E2
	500 mg	8,0 µg	E2
	1 g	10 µg	E2
	2 g	13 µg	E2
	5 g	16 µg	E2
	10 g	20 µg	E2
	20 g	26 µg	E2
	50 g	33 µg	E2
	100 g	53 µg	E2
	200 g	0,10 mg	E2
	500 g	0,25 mg	E2
	1 kg	0,50 mg	E2
	2 kg	1,0 mg	E2
	5 kg	2,5 mg	E2
	10 kg	10 mg	F1
	20 kg	30 mg	F1
	50 kg	500 mg	M1
Non-automatic electronic	1 mg to 5 mg	0,0023 mg	Calibration according to guide

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
weighing instruments	10 mg	0,0025 mg	EURAMET /cg18/ v.03 (2015). Available standard weights OIML R 111-1:2004: Class E1 at range 1 mg to 200 g Max grouped load available 411,11 g Class E2 at range 1 mg to 1000 g Max grouped load available 2111,11 g Class F1 at range 1 g to 5000 g Max grouped load available 11110 g Class F2 at range 10 kg to 20 kg Max grouped load available 50 kg Class M1 at range 200 g to 20 kg Max grouped load available 803,7 kg Calibration is performed on site
	20 mg	0,0027 mg	
	50 mg	0,0030 mg	
	100 mg	0,0035 mg	
	200 mg	0,0043 mg	
	500 mg	0,0053 mg	
	1 g	0,0063 mg	
	2 g	0,0080 mg	
	5 g	0,010 mg	
	10 g	0,024 mg	
	20 g	0,026 mg	
	50 g	0,028 mg	
	100 g	0,036 mg	
	200 g	0,063 mg	
	(200 g to 1 kg]	$1,0 \cdot 10^{-6}$	
	(1 kg to 10 kg]	$2,0 \cdot 10^{-6}$	
	(10 kg to 60 kg]	$1,5 \cdot 10^{-5}$	
	(60 kg to 860 kg]	$2,0 \cdot 10^{-4}$	
Spectrophotometric Measurements			
Spectrophotometers in the range 200 nm to 900 nm / Visible and UV absorbance	to 0,5 AU	6,7 mAU**	ASTM E 275: 2008 (re 2022) European Pharmacopoeia Edition 11, 2023 §2.2.25. (photometric accuracy for all wavelengths in the 200nm-880nm range & repeatability). Calibration can be performed on site.
	(0,5 to 1,0] AU	7,6 mAU	
	(1,0 to 1,5] AU	8,4 mAU	
Density Measurements			
Digital density meters	600 kg/m^3 to 2000 kg/m^3	0,006 %	According to SIM MWG7/cg-02/v.00, 2016 για mpe > 0.05 kg/m^3 Calibration can be performed on site.
Digital alcoholmeters	0 % to 100 % vol. EtOH	0,012 % vol. EtOH	
Hydrometers, Areometers, Density Hydrometers,	600 kg/m^3 to 2000 kg/m^3	0,28 kg/m^3	Calibration according the Cuckow method.

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
Specific Gravity Hydrometers	0,6 to 2	$0{,}28 \cdot 10^{-3}$	
Alcoholmeters	0 % vol. EtOH to 100 % vol. EtOH	0,30 % vol. EtOH	
Light Baume Hydrometers	10 ºBė to 103,3 ºBė	0,08 ºBė	
Heavy Baume Hydrometers	0 ºBė to 72,5 ºBė	0,06 ºBė	
Density of liquids	600 kg/m^3 to 2000 kg/m^3	0,16 kg/m^3	Internal procedure tQ-DENSITY-01 Calibration using hydrostatic weighing in thermostatically controlled set-up.
Density of liquids	600 kg/m^3 to 2000 kg/m^3 +5 ºC to +80 ºC	0,0030 %	Internal procedure tQ-DENSITY-02 based on ASTM D1480-15 and ASTM D1217-20
Density of water – ethanol mixtures	998,2 kg/m^3 to 789,2 kg/m^3 respectively 0 to 100% (v/v) EtOH, at 20 ºC	0,010 %	
Frequency / Time measurements			
Centrifuges, Stirrers, Rotating Devices	[60 to 1.000] rpm	1,2 rpm	Internal procedure tQ-TACHO-02 Using standard tachometer. Calibration can be performed on site.
	(1.000 to 25.000] rpm	2,0 rpm	
	(25.000 to 60.000] rpm	5,0 rpm	
Optical Tachometers	[60 to 1.000) rpm	0,5 rpm	Internal procedure tQ-TACHO-01 Using standard multifunction calibrator and standard tachometer.
	[1.000 to 60.000] rpm	1,0 rpm	
Stopwatches, Timers	(0 s to 1 h]	0,06 s	Internal procedure tQ-TIME-01 Using standard stopwatch. Calibration can be performed on site.
	(1 h to 5 h]	0,24 s	
	(5 h to 10 h]	0,48 s	
Relative humidity measurements			
Analog and digital hygrometers, relative humidity data loggers	[25 to 50) %rh at 23 ºC, 30 ºC and 40 ºC	1,0 %rh	Internal procedure tQ-HYGRO-01 Comparative calibration using climatic chamber and standard hygrometer.
	[50 to 80) %rh at 23 ºC, 30 ºC and 40 ºC	1,2 %rh	
	[80 to 90] %rh at 23 ºC, 30 ºC and 40 ºC	1,7 %rh	

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
Environmental chambers	[25 to 50) %rh at 23 °C, 30 °C and 40 °C	1,2 %rh	According to guide DKD-R 5-7 09/2018, using standard relative humidity recorders. Calibration is carried out in the useful volume of the chamber or at selected points. Calibration can be performed on site.
	[50 to 80) %rh at 23 °C, 30 °C and 40 °C	1,4 %rh	
	(80 to 90] %rh at 23 °C, 30 °C and 40 °C	1,9 %rh	
Temperature Measurements			
Climatic and isothermal chambers, ovens of column chromatography, ovens and incubators, refrigerators, freezers, ultra freezers, of capacity up to 2000 l, with or without air circulation	[-80 to -20) °C	0,50 °C	According to guide DKD-R 5-7 09/2018, using Pt100 platinum resistance thermometer. Calibration is carried out in the useful volume of the chamber or at selected points. Calibration can be performed on site.
	[-20 to +60) °C	0,15 °C	
	[+60 to +250) °C	0,20 °C	
Climatic and isothermal chambers, ovens and incubators, refrigerators, freezers, ultra freezers, of capacity > 2000 l, with or without air circulation	[-40 to +85] °C	0,60 °C	According to guide DKD-R 5-7 09/2018, using air temperature data loggers. Calibration is carried out on the useful volume or at selected points in the chamber Calibration can also be performed on site
Autoclaves	[+100 to +150] °C	0,30 °C	According to guide DKD-R 5-7 09/2018, using Pt100 and Pt1000 platinum resistance thermometer. Calibration is carried out in the useful volume or at selected points in the chamber. Calibration can be performed on site.
Climatic and isothermal chambers, ovens of column chromatography, ovens and incubators, autoclaves, refrigerators, freezers of capacity up to 2000 l, with or without air circulation	[-20 to +150] °C	0,50 °C	According to guide DKD-R 5-7 09/2018, using type K thermocouples. Calibration is carried out at selected points in the chamber, according to method (C) described in the technical guide DKD-R 5-7. Calibration can be performed on site.
	(+150 to +350] °C	0,80 °C	
Climatic and isothermal chambers, ovens, of capacity up to 2000 L	(+350 to +650] °C	1,3 °C	Internal procedure tQ-CHAMBERS-01 Method based on guide

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
	(+650 to +1200] ºC	1,9 ºC	DKD-R 5-7 09/2018 (method C), using type K thermocouples. Calibration is carried out at selected points in the chamber. Calibration can be performed on site.
Polymerase chain reactions (PCRs)	[0 to +30] ºC	0,50 ºC	Internal procedure tQ-BLOCKS-01 Dynamic calibration throughout the plateau (16 measurements points) or at selected points, with the use of K type thermocouples. Heating/cooling and stabilized temperature uniformity, accuracy measurement. Overshoot/undershoot and ramp rate measurement. Calibration can be performed on site.
	(+30 to +100] ºC	0,25 ºC	
Isothermal blocks, thermoreactors, COD testing instruments	[-40 to +150] ºC	0,10 ºC	Εσωτερική μέθοδος tQ-BLOCKS-01 Με τη χρήση αισθητήρων αντίστασης πλατίνας Pt100. Η διακρίβωση διεξάγεται σε ολόκληρο το block ή σε επιλεγμένα σημεία. Η διακρίβωση μπορεί να γίνει και επί τόπου.
	(+150 to +250] ºC	0,15 ºC	
	[-40 to +150] ºC	0,20 ºC	Internal procedure tQ-BLOCKS-01 Using platinum resistance thermometers, Pt100. Calibration is carried out in the whole block or at selected points of the block. Calibration can be performed on site.
	(+150 to +250] ºC	0,30 ºC	
Isothermal plates	[-40 to 0) ºC	0,55 ºC	Internal procedure tQ-PLATES-01 Using type K thermocouples. Calibration is carried out on the whole plate or at selected points of the plate. Calibration can be performed on site.
	[0 to +40] ºC	0,37 ºC	
	(+40 to +80] ºC	0,59 ºC	
	(+80 to +150] ºC	1,8 ºC	
Baths up to 100 L	[-80 to +150] ºC	0,10 ºC	Internal procedure tQ-BATH-01 Using Pt100 platinum resistance thermometer. Calibration is carried out in the useful volume or at selected points in the bath. Calibration can also be performed on site.

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
	(+150 to +300] ºC	0,50 ºC	Internal procedure tQ-BATH-01 Using type K thermocouples. Calibration is carried out at selected points in the bath. Calibration can also be performed on site.
Digital / analogue direct reading thermometers, digital temperature data loggers	[-80 to -20) ºC	0,030 ºC	Internal procedure tQ-THERMO-01 Comparative method within isothermal bath using Pt100 platinum resistance thermometer
	[-20 to +150] ºC	0,020 ºC	
	[-35 to +80] ºC	0,17 ºC	Internal procedure tQ-THERMO-03 Comparative method with dry block calibrator using Pt100 platinum resistance thermometer. Calibration can also be performed on site.
	(+80 to +165] ºC	0,21 ºC	
	(+165 to +270] ºC	0,10 ºC	
	(+270 to +650] ºC	0,26 ºC	
	(+650 to +900] ºC	1,2 ºC	Internal procedure tQ-THERMO-03 Comparative method with dry block calibrator using type R thermocouples. Calibration can also be performed on site.
	(+900 to +1200] ºC	1,4 ºC	
	[-35 to 0) ºC	0,13 ºC	Internal procedure tQ-THERMO-01 Comparative method within portable isothermal bath using Pt100 platinum resistance thermometer. Calibration can also be performed on site.
	[0 to +80] ºC	0,06 ºC	
	(+80 to +155] ºC	0,15 ºC	
Partial/total immersion, liquid in glass thermometers	[-80 to -20) ºC	0,03 ºC	Internal procedure tQ-THERMO-01 Comparative method within isothermal bath with immersion depth 16cm using Pt100 platinum resistance thermometer.
	[-20 to +150] ºC	0,03 ºC	Internal procedure tQ-THERMO-01 Comparative method within isothermal bath with immersion depth 25cm using Pt100 platinum resistance thermometer.
Direct reading thermometers Digital/analogue temperature data loggers	[-40 to 0) ºC	0,20 ºC	Internal procedure tQ-THERMO-02 Comparative method within temperature chamber using Pt100 platinum resistance thermometer
	[0 to +45] ºC	0,10 ºC	
	(+45 to +65] ºC	0,25 ºC	
	(+65 to +100] ºC	0,50 ºC	

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
	(+100 to +150] °C	1,0 °C	
Direct reading optical thermometers (Infrared thermometers)	[-10 to +50] °C	0,30 °C	According to guide VDI/VDE 3511 part 4.4 : 2005 using black body source and Pt100 platinum resistance thermometer.
	(+50 to +80] °C	0,40 °C	
Pressure Measurements			
Relative pressure measuring equipment (gas medium) direct reading, analog – digital, pressure recorders	[-95 to +60] kPa	15 Pa	Calibration according to guide DKD-R 6-1 03/2014. Calibration can be performed on site.
	(+0,06 to +2,5] MPa	0,45 kPa	
	(+2,5 to 10] MPa	2 kPa	
Absolute pressure measuring equipment (gas medium) direct reading, analog – digital, pressure recorders	[+5 to +160] kPa	15 Pa	
	(+0,16 to +2,6] MPa	0,45 kPa	
	(+2,6 to 10,1] MPa	2 kPa	
Differential pressure measuring equipment (gas medium)	[-1 to +1] kPa	2,0 Pa	
	[-20 to -1) kPa & (+1 to +20] kPa	90 Pa	
Barometric pressure measuring equipment, direct reading, analog - digital, pressure recorders	[+800 to +1200] hPa	0,4 hPa	Calibration according to guide DKD-R 6-1 03/2014.
Electrical Measurements			
pH meters, Ion meters / DC voltage	-410 mV to +410 mV	0,035 mV	Internal procedure tQ-PH-01 Using a voltage simulator. Calibration can be performed on site.
DC Voltage (Generation) / DC Voltage Measuring Equipment	[0 to 200] mV	$4{,}2\ \mu V + 23 \cdot 10^{-6} \cdot V$	Calibration according to guide EURAMET cg-15 v.3.0 : 2015. Using standard multifunction calibrator.
	(0,2 to 2] V	$10{,}2\ \mu V + 22{,}9 \cdot 10^{-6} \cdot V$	
	(2 to 20] V	$92\ \mu V + 18{,}3 \cdot 10^{-6} \cdot V$	
	(20 to 200] V	$1{,}33\ mV + 21{,}2 \cdot 10^{-6} \cdot V$	
	(200 to 1025] V	$11{,}6\ mV + 21 \cdot 10^{-6} \cdot V$	
AC Voltage (Generation) / AC Voltage Measuring Equipment	(0 to 200] mV		Calibration according to guide EURAMET cg-15 v.3.0 : 2015. Using standard multifunction calibrator.
	[10 to 45) Hz	$90\ \mu V + 15{,}5 \cdot 10^{-4} \cdot V$	
	[45 to 1000) Hz	$74\ \mu V + 1{,}8 \cdot 10^{-4} \cdot V$	

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
	[1 to 20) kHz	81 µV + 4,97·10^{-4}·V	
	[20 to 100) kHz	2,6 mV	
	[100 to 500] kHz	3 mV	
	(0,2 to 2] V		
	[10 to 45) Hz	0,66 mV + 15,8·10^{-4}·V	
	[45 to 1000) Hz	0,68 mV + 1,4·10^{-4}·V	
	[1 to 20) kHz	0,67 mV + 3,8·10^{-4}·V	
	[20 to 100) kHz	26 mV	
	[100 to 500] kHz	28 mV	
	(2 to 20] V		
	[10 to 45) Hz	6,7 mV + 15,7·10^{-4}·V	
	[45 to 1000) Hz	7,65 mV + 1,18·10^{-4}·V	
	[1 to 20) kHz	7,63 mV + 2,7·10^{-4}·V	
	[20 to 100] kHz	45 mV + 15,1·10^{-4}·V	
	(20 to 200] V		
	[10 to 45) Hz	200 mV	
	[45 to 1000) Hz	180 mV	
	[1 to 20] kHz	174 mV + 3,3·10^{-4}·V	
	(200 to 1020] V		
	[10 to 45) Hz	518 mV + 1,6·10^{-4}·V	
	[45 to 1000) Hz	530 mV + 0,9·10^{-4}·V	
	[1 to 10] kHz	492 mV + 3,93·10^{-4}·V	
DC Current (Generation) / DC Current Measuring Equipment)	[0 to 200] µA	35 nA + 75·10^{-6}·I	Calibration according to guide EURAMET cg-15 v.3.0 : 2015. Using standard multifunction calibrator.
	(0,2 to 2] mA	57,2 nA + 60,9·10^{-6}·I	
	(2 to 20] mA	0,44 µA + 34,1·10^{-6}·I	
	(20 to 200] mA	6,5 µA + 37,5·10^{-6}·I	
	(0,2 to 2] A	0,108 mA + 56·10^{-6}·I	
	(2 to 30] A	5,04 mA + 172·10^{-6}·I	
DC Current (Generation) / DC Current Clamp Meters	[1 to 60] A	0,0082 A + 5,6·10^{-3}·I	Calibration according to guide EURAMET cg-15 v.3.0 : 2015. Using standard multifunction calibrator.
	(60 to 220] A	0,15 A + 6,7·10^{-3}·I	
	(220 to 1500] A	0,57 A + 5,3·10^{-3}·I	

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
AC Current (Generation) / AC Current Measuring Equipment)	[20 to 200] µA		Calibration according to guide EURAMET cg-15 v.3.0 : 2015. Using standard multifunction calibrator.
	[10 to 45) Hz	393 nA + 1,34·10^{-3}·I	
	[45 to 1000) Hz	460 nA	
	[1 to 10] kHz	0,36 µA + 10·10^{-3}·I	
	(0,2 to 2] mA		
	[10 to 45) Hz	2,7 µA + 0,95·10^{-3}·I	
	[45 to 1000) Hz	3 µA	
	[1 to 10] kHz	2,3 µA + 4,87·10^{-3}·I	
	(2 to 20] mA		
	[10 to 45) Hz	25,9 µA + 1,01·10^{-3}·I	
	[45 to 1000) Hz	29 µA	
	[1 to 10] kHz	24,6 µA + 3,08·10^{-3}·I	
	(20 to 200] mA		
	[10 to 45) Hz	260 µA + 1·10^{-3}·I	
	[45 to 1000) Hz	290 µA	
	[1 to 10] kHz	250 µA + 3,05·10^{-3}·I	
	(0,2 to 2] A		
	[10 to 45) Hz	2,6 mA + 0,95·10^{-3}·I	
	[45 to 1000) Hz	3 mA	
	[1 to 5] kHz	2,4 mA + 3,9·10^{-3}·I	
	(2 to 30] A		
	[10 to 45) Hz	26 mA + 0,97·10^{-3}·I	
	[45 to 99) Hz	23,1 mA + 1,87·10^{-3}·I	
	[100 to 1000] Hz	25,3 mA + 1,8·10^{-3}·I	
AC Current (Generation) / AC Current Clamp Meters (30 – 60Hz)	[1 to 60] A	0,0082 A + 5,7·10^{-3}·I	Calibration according to guide EURAMET cg-15 v.3.0 : 2015. Using standard multifunction calibrator.
	(60 to 220] A	0,21 A + 6,9·10^{-3}·I	
	(220 to 1500] A	1,2 A + 5·10^{-3}·I	
2-wire Resistance (Generation) / Resistance Measuring Equipment	0,2 Ω	5,9 mΩ	Calibration according to guide EURAMET cg-15 v.3.0 : 2015. Using standard multifunction calibrator.
	0,3 Ω	5,9 mΩ	
	1 Ω	5,9 mΩ	
	10 Ω	6,7 mΩ	
	100 Ω	10 mΩ	
	1 kΩ	0,079 Ω	

Measurand / Calibration item	Range of measurement	Calibration & Measurement Capability (k=2)*	Remarks
	10 kΩ	0,79 Ω	
	100 kΩ	7,4 Ω	
	1 MΩ	0,13 kΩ	
	10 MΩ	3,2 kΩ	
	100 MΩ	370 kΩ	
	1 GΩ	8,3 MΩ	
4-wire Resistance (Generation) / Resistance Measuring Equipment	100 mΩ	5,8 mΩ	Calibration according to guide EURAMET cg-15 v.3.0 : 2015. Using standard multifunction calibrator.
	1 Ω	5,9 mΩ	
	10 Ω	6,6 mΩ	
	100 Ω	9,9 mΩ	
	1 kΩ	0,079 Ω	
	10 kΩ	0,79 Ω	
	100 kΩ	7,4 Ω	

* *Where the expanded uncertainty (with coverage probability 95 %) is accompanied by the corresponding unit, it is absolute, while where it is not accompanied by a unit, it is relative.*

*** Uncertainty values were estimated assuming a spectrophotometer having a resolution of 0,1 mAU.*

The Calibration & Measurement Capability (CMC) includes the measurand, the measurement range and the measurement uncertainty and expresses the smallest measurement uncertainty that can be achieved in a calibration.

Site of assessment: **Permanent laboratory premises, 20, Korgialeniou Str., 115 26 Athens, Greece.**

Approved Signatories: **Konstantinos Chatzoudis, Georgios Chatzoudis. Dimitris Tentas, Eleni Chatzoudi, Chrisostomos Siope.**

This Scope of Accreditation replaces the previous one dated April 26th, 2024.

The Accreditation Certificate No. **426**-7, to ELOT EN ISO/IEC 17025:2017, is valid until 06.05.2029.

Athens, November 4th ,2024

Konstantinos Kourtalis
Chairman of ESYD