CERTIFICATE OF ACCREDITATION

This is to attest that

PETROSCIENTIFIC MIDDLE EAST CALIBRATION LABORATORY

P.O. BOX 31862, UNIT 12 – 14 HAIL CENTER
AL KHOBAR 31952, KINGDOM OF SAUDI ARABIA

Calibration Laboratory CL-159

has met the requirements of AC204, *IAS Accreditation Criteria for Calibration Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories.* This organization is accredited to provide the services specified in the scope of accreditation.

Effective Date April 16, 2022

Expiration Date July 1, 2024

President

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SCOPE OF ACCREDITATION

International Accreditation Service, Inc.

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PETROSCIENTIFIC MIDDLE EAST CALIBRATION LABORATORY

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Accredited to ISO/IEC 17025:2017 *Effective Date April 16, 2022*

CALIBRATION AND MEASUREMENT CAPABILITY (CMC)*

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Dimensional			
Calipers (Dial, Digital & Vernier)	Up to 150 mm 150 mm to 600 mm Up to 1000 mm	8 µm 10 µm 20 µm	Caliper Checker and Grade 0 Gauge Blocks NAVAIR 17-20MD-07 and NAVAIR 17-20MD-85
Micrometer – Outside and Inside	Up to 25 mm 25 mm to 150 mm	0.9 µm 1.1 µm	Grade 0 Gauge Blocks NAVAIR 17-20MD-06
Extension & Setting Rods	Up to 100 mm 100 mm to 600 mm	2 µm 10 µm	Grade 0 Gauge Blocks, Caliper Checker and Height Gauge NAVAIR 17-20MD-76
Dial Indicators (Plunger)	Up to 100 mm	0.7 µm	Grade 0 Gauge Blocks NAVAIR 17-20MD-11
Height Gauge (Dial, Digital and Vernier)	Up to 600 mm	6 µm	Caliper Checker and Grade 0 Gauge Blocks NAVAIR 17-20MD-17
Plain Plug Gauge	1 mm to 100 mm 100 mm to 500 mm	2.2 µm 8.5 µm	Caliper Checker, Grade 0 Gauge Block and Height Gauge NAVAIR 17-20MD-21
Plain Ring Gauge	3 mm to 100 mm 100 mm to 500 mm	2.1 µm 8.6 µm	Caliper Checker, Grade 0 Gauge Block and Height Gauge NAVAIR 17-20MD-21
Mechanical			
Weighing Scale[5]	1 mg to 82 mg 82 mg to 500 mg 500 mg to 2g 2 g to 200g	0.02 mg 0.06 mg 0.06 mg 0.67 mg	Standard weight of E2 /F1 /M1 class by comparison method ASTM E898-20

** If information in this CMC is presented in non-SI units, the conversion factors stated in NIST Special Publication 811 "Guide for the Use of the International System of Units (SI)" apply.*

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Weighing Scale[5] continued	200 g to 1 kg 1 kg to 10 kg 10 kg to 100 kg 100 kg to 1000 kg	1.3 mg 9.3 mg 87 mg 770 mg	Standard weight of E2 /F1 /M1 class by comparison method ASTM E898-20
Weights	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	0.013 mg 0.013 mg 0.013 mg 0.013 mg 0.013 mg 0.013 mg 0.013 mg 0.013 mg 0.02 mg 0.02 mg 0.03 mg 0.03 mg 0.06 mg 0.06 mg 0.06 mg 0.16 mg 0.16 mg 1.4 mg 1.4 mg 13 mg 13 mg 13 mg 120 mg	Standard Weight E2/F1 Class and Balance as per ABA Method OIML R111-1:2004-E, Annex C
Torque	150 N·m to 300 N·m 300 N·m to 1000 N·m 1000 N·m to 2700 N·m	0.75 %FS 1.0 %FS 1.1 %FS	Torque Tool Tester, direct method BS EN 6789
Pneumatic Pressure Gauge / Switch / Transmitter / Transducer[5]	-14.5 psi to -0.001 psi 0.001 psi to 500 psi	0.085 % 0.085 %	Pressure Calibrator by comparison Method EURAMET CG-17
Hydraulic Pressure Gauge / Switch / Transmitter / Transducer[5]	10 psi to 15000 psi	0.03 %	Dead Weight Tester by comparison method BS EN 837-1:1998
Liquid Flow Meters[5]	1 LPM to 50 LPM	0.1 %	Volumetric Prover (at site) NIST, Special Publication 250
	1 LPM to 50 LPM	0.015 %	Gravimetric (at lab) NIST, SOP 19
Volume (Pipette, Burette, etc.)	10 µL to 10 mL 10 mL to 200 mL 200 mL to 1000 mL	0.015 % 0.02 % 0.028 %	Weighing balance and distilled water by gravimetric method ASTM E1154

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Rotational Speed[5]	10 rpm to 99999 rpm	0.01 %	Fluke 5520A & Digital Tachometer NAVAIR 17-20MA-03
Fume Hood- Face Velocity[5]	0.1 m/s to 4 m/s	0.07 m/s	Anemometer/ ASHRAE 110
Force – Compression / Tension[5]	0.001 kN to 50 kN 50 kN to 100 kN 100 kN to 2000 kN	0.19 % 0.33 % 0.74 %	Load Cells, Digital Indicator & Standard Weights BS EN ISO 7500-1
Hardness Testers - Rockwell Scale[5]	20 HRC to 65 HRC	0.3 HRC	Rockwell Hardness Test Block ASTM E18
Hardness Testers - Vickers Scale[5]	50 HV to 750 HV	2.7 HV	Vickers Hardness Test Block ASTM E384
Thermal			
RTD / Thermocouple, Temp Gauges, Glass Type Thermometer	-20 °C to 100 °C 100 °C to 285 °C	0.06 °C 0.03 °C	SPRT and oil bath, using comparison method NAVAIR 17-20ST-03
Infrared Thermometers[5]	50 °C to 500 °C	0.37 °C	Infrared Calibrator (Black-Body) ASTM E2847
Ovens & Furnaces[5]	25 °C to 300 °C 300 °C to 1200 °C	0.15 °C 0.86 °C	Thermocouples & Data Logger USBR 1020-89 and AMS 2750F
Controller/Indicator of Refrigerator, Dry Well Block, Liquid Bath	-80 °C to 600 °C	0.032 °C	SPRT, single-position calibration T.O. 33K5-4-330-1, EURAMET CG-13 and ASTM E2488-09
Humidity (Measure)	20 %RH to 70 %RH @ 20 °C, 30 °C, 40 °C	1.2 %RH	Precision Hygrometer NAVAIR 17-20MH-09
Electrical – DC/LF			
Temperature Simulation - RTD Generate	-200 °C to 850 °C	0.035 °C	Fluke 5520A by direct method T.O. 33K5-4-384-1
Temperature Simulation - RTD Measure	-200 °C to 850 °C	0.004 °C	Precision Multimeter Fluke 8846A by direct method EURAMET CG-11
Temperature Simulation - Thermocouple Generate “K” Type “J” Type “T” Type “R” Type “S” Type	 -200 °C to 1372 °C -210 °C to 1200 °C -270 °C to 400 °C -50 °C to 1768 °C -50 °C to 1768 °C	 0.23 °C 0.21 °C 0.22 °C 0.28 °C 0.21 °C	Fluke 5520A by direct method NAVAIR 17-20SR-183

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Temperature Simulation - Thermocouple Measure			Fluke 5520A by direct Method EURAMET CG-11
"K" Type	-200 °C to 1372 °C	0.24 °C	
"J" Type	-210 °C to 1200 °C	0.23 °C	
"T" Type	-270 °C to 400 °C	0.24 °C	
"R" Type	-50 °C to 1768 °C	0.24 °C	
"S" Type	-50 °C to 1768 °C	0.24 °C	
DC Voltage – Generate[3]	0 mV to 330 mV	0.007 mV	Fluke 5520A by direct method NAVAIR 17-20AQ-299 and NAVAIR 17-20AN-61
	0.33 V to 3.3 V	0.43 mV	
	3.3 V to 33 V	1.1 mV	
	33 V to 330 V	55 mV	
	330 V to 1000 V	1.5 V	
DC Voltage – Measure[4]	0.5 kV to 100 kV	0.10 %	HV Probe, Fluke 8846A NAVAIR 17-20AR-130, NAVAIR 17-20AR-134, NAVAIR 17-20AR-57 and NAVAIR 17-20AR-66
AC Voltage – Generate[3]	1 mV to 32.999 mV		Fluke 5520A, direct method NAVAIR 17-20AQ-299 and NAVAIR 17-20AN-61
	(10 Hz to 45 Hz)	0.026 mV	
	(45 Hz to 10 kHz)	0.005 mV	
	(10 kHz to 20 kHz)	0.007 mV	
	(20 kHz to 50 kHz)	0.003 mV	
	(50 kHz to 100 kHz)	0.12 mV	
	(100 kHz to 500 kHz)	0.27 mV	
	33 mV to 3.29999 V		
	(10 Hz to 45 Hz)	0.001 V	
	(45 Hz to 10 kHz)	0.0005 V	
	(10 kHz to 20 kHz)	0.0005 V	
	33 mV to 3.29999 V		
	(20 kHz to 50 kHz)	0.0011 V	
	(50 kHz to 100 kHz)	0.0027 V	
	(100 kHz to 500 kHz)	0.0068 V	
	3.3 V to 32.9999 V		
	(10 Hz to 45 Hz)	0.011 V	
	(45 Hz to 10 kHz)	0.0055 V	
	(10 kHz to 20 kHz)	0.0085 V	
	(20 kHz to 50 kHz)	0.012 V	
	(50 kHz to 100 kHz)	0.031 V	
	33 V to 329.999 V		
	(10 Hz to 45 Hz)	0.064 V	
	(45 Hz to 10 kHz)	0.072 V	
	(10 kHz to 20 kHz)	0.088 V	
	(20 kHz to 50 kHz)	0.11 V	
	(50 kHz to 100 kHz)	0.71 V	

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC Voltage – Generate[3] continued	330 V to 1020 V (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz)	0.32 V 0.27 V 0.32 V	Fluke 5520A, direct method NAVAIR 17-20AQ-299 and NAVAIR 17-20AN-61
AC Voltage – Measure[4] (60 Hz)	0 kV to 30 kV 30 kV to 100 kV	0.03 kV 0.25 kV	HV Probe, Fluke 8846A NAVAIR 17-20AR-130, NAVAIR 17-20AR-134, NAVAIR 17-20AR-57 and NAVAIR 17-20AR-66
DC Current – Generate[3]	0 µA to 329.999 µA 0.33 mA to 3.29999 mA 3.3 mA to 32.9999 mA 33 mA to 329.999 mA 0.33 A to 1.09999 A 1.1 A to 2.99999 A 3 A to 20 A 20 A to 1000 A	0.042 µA 0.0065 mA 0.0083 mA 0.021 mA 0.24 mA 1.5 mA 62 mA 460 mA	Fluke 5520A, direct method NAVAIR 17-20AQ-299 and NAVAIR 17-20AQ-32 Fluke 5520A and 50-turn coil
DC Current Measure[4]	0 µA to 100 µA 100 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 400 mA 400 mA to 1 A 1 A to 10 A	0.64 µA 0.018 µA 0.004 mA 0.02 mA 0.11 mA 0.00022 A 0.0045 A	Precision Multimeter Fluke 8846A by direct method NAVAIR 17-20AR-130, NAVAIR 17-20AR-134 and NAVAIR 17-20AR-57
AC Current – Generate[3]	30 µA to 329.99 µA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) (10 kHz to 30 kHz) 0.33 mA to 3.2999 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) (10 kHz to 30 kHz) 3.3 mA to 32.999 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz)	 0.26 µA 0.19 µA 0.16 µA 0.39 µA 1.0 µA 2.1 µA 0.006 mA 0.0042 mA 0.0034 mA 0.0068 mA 0.016 mA 0.033 mA 0.061 mA 0.031 mA	Fluke 5520A, direct method NAVAIR 17-20AQ-299 and NAVAIR 17-20AQ-32

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC Current – Generate[3] continued	3.3 mA to 32.999 mA (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) (10 kHz to 30 kHz) 0.33 A to 1.09999 A (10 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) 1.1 A to 2.99999 A (10 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) 3 A to 10.9999 A (45 Hz to 100 Hz) (100 Hz to 1 kHz) (1 kHz to 5 kHz) 11 A to 20.5 A (45 Hz to 100 Hz) (100 Hz to 1 kHz) (1 kHz to 5 kHz) 20 A to 1000 A (60 Hz)	 0.015 mA 0.020 mA 0.069 mA 0.13 mA 0.002 A 0.0006 A 0.0076 A 0.032 A 0.0055 A 0.0018 A 0.019 A 0.08 A 0.008 A 0.013 A 0.33 A 0.029 A 0.036 A 0.62 A 0.86 A	Fluke 5520A, direct method NAVAIR 17-20AQ-299 and NAVAIR 17-20AQ-32 Fluke 5520A and 50-Turns Coil
AC Current Measure[4] @ 60 Hz to 1 kHz	30 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 400 mA 400 mA to 3 A 3 A to 10 A	1.1 µA 0.007 mA 0.0024 mA 0.050 mA 0.002 A 0.028 A	Precision Multimeter Fluke 8846A by direct method NAVAIR 17-20AR-130, NAVAIR 17-20AR-134 and NAVAIR 17-20AR-57
DC Resistance – Generate[3]/Measure[4]	0 Ω to 11 Ω 11 Ω to 33 Ω 33 Ω to 110 Ω 110 Ω to 1.1 kΩ 1.1 kΩ to 11 kΩ 11 kΩ to 110 kΩ 110 kΩ to 1.1 MΩ 1.1 MΩ to 3.3 MΩ 3.3 MΩ to 11 MΩ 11 MΩ to 33 MΩ	0.0014 Ω 0.0024 Ω 0.0045 Ω 0.0021 kΩ 0.020 kΩ 0.20 kΩ 0.03 kΩ 0.23 kΩ 1.5 kΩ 11 kΩ	Fluke 5520A, Fluke 8846A NAVAIR 17-20AQ-299 and NAVAIR 17-20AR-27

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
DC Resistance – Generate[3]/Measure[4] continued	33 MΩ to 110 MΩ 110 MΩ to 330 MΩ 330 MΩ to 1100 MΩ	0.06 MΩ 0.6 MΩ 1.7 MΩ	Fluke 5520A, Fluke 8846A NAVAIR 17-20AQ-299 and NAVAIR 17-20AR-27
Capacitance – Generate[3,6]	0.19 nF to 11 nF 11 nF to 110 nF 110 nF to 330 nF 0.33 nF to 1.1 µF 1.1 µF to 3.3 µF 3.3 µF to 11 µF 11 µF to 33 µF 33 µF to 110 µF 110 µF to 330 µF 0.33 mF to 1.1 mF 1.1 mF to 3.3 mF	0.065 nF 0.29 nF 1.1 nF 0.004 µF 0.011 µF 0.036 µF 0.16 µF 0.59 µF 1.8 µF 0.006 mF 0.018 mF	Fluke 5520A, direct method NAVAIR 17-20AQ-299
Time and Frequency			
Timer / Stop Watch	1 s to 3 h 3 h to 10 h	0.002 s 0.02 s	Frequency Counter and Stop Watch by comparison method NIST, Special Publication 960-12
Chemical/Gas			
pH Meters	0 pH to 14 pH	0.035 pH	pH Buffer Solution, NIST Cert. NAVAIR 17-20SC-42
Conductivity Meters	1 µS/cm to 200 mS/cm	1.0 %	Standard Solution, NIST Cert. NAVAIR 17-20SC-40
Viscosity Meter	50 cP to 5000 cP	1.5 %	Standard Oil, NIST Cert. NAVAIR 17-20MV-01

[1]The uncertainty covered by the Calibration and Measurement Capability (CMC) is expressed as the expanded uncertainty having a coverage probability of approximately 95 %. It is the smallest measurement uncertainty that a laboratory can achieve within its scope of accreditation when performing calibrations of a best existing device. The measurement uncertainty reported on a calibration certificate may be greater than that provided in the CMC due to the behavior of the calibration item and other factors that may contribute to the uncertainty of a specific calibration.

[2]When uncertainty is stated in relative terms (such as percent, a multiplier expressed as a decimal fraction or in scientific notation), it is in relation to instrument reading or instrument output, as appropriate, unless otherwise indicated.

[3]Capability is suitable for the calibration of measuring devices in the stated ranges.

[4]Capability is suitable for the calibration of devices intended to generate the indicated quantity in the stated ranges.

[5]Also available as site calibration. Note that actual measurement uncertainties achievable at a customer's site can normally be expected to be larger than the uncertainties listed on this Scope of Accreditation.

[6]The actual frequency applied by the calibrator cannot be selected and may be dependent on the measurement device under calibration. Approximate frequency ranges for a given capacitance or capacitance range may be found in the Fluke 5520A's published specifications.

NOTE:

Changes based on demonstrations and recalibrated reference standards (Refer to Point #18 in Lead Assessor's report).