

International Accreditation Service
CERTIFICATE OF ACCREDITATION

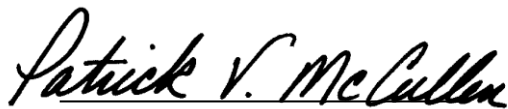
This is to signify that

AL HOTY ANALYTICAL SERVICES CALIBRATION DEPARTMENT

YARD NO. 304, ROAD 4306, BLOCK 343
MINA SULMAN
INDUSTRIAL AREA
KINGDOM OF BAHRAIN

Calibration Laboratory CL-132

has met the requirements of the IAS Accreditation Criteria for Calibration Laboratories (AC204), has demonstrated compliance with the ISO/IEC Standard 17025:2005, *General requirements for the competence of testing and calibration laboratories*, and has been accredited commencing June 3, 2015, for the calibration discipline(s) listed in the approved scope of accreditation. The laboratory meets IAS program requirements in the field of calibration.



Patrick V. McCullen
Vice President, Chief Technical Officer



C. P. Ramani, P.E.
President



(see attached scope of accreditation for fields of calibration and accredited calibration methods)

Print Date: 6/15/2015

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SCOPE OF ACCREDITATION

Al Hoty Analytical Services Calibration Department CL-132

Al Hoty Analytical Services Calibration Department
Yard No. 304, Road 4306, Block 343
Mina Sulman, Industrial Area
Kingdom of Bahrain

Marcelino Arevalo
Quality Manager
973 17727450

MEASUREMENT AREA	RANGE & RESOLUTION	CALIBRATION & MEASUREMENT CAPABILITY ¹ (CMC) (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
<i>Dimensional</i>			
Calipers	0 to 300mm/0.01 >300mm to 1M/0.01	16.4µm 19 µm	Gauge blocks, caliper checker
Micrometers	0 to 25mm/0.001 >25 to 50mm/0.001 >50 to 100mm/0.001	1.1 µm 1.8 µm 2.5 µm	Gauge blocks
Dial indicators	0 to 10mm/0.002 >10 to 100/0.01	3.1 µm 5.8 µm	Dial indicator calibrator
<i>Mechanical</i>			
Scales and balances	0 to 220g /0.0001g 0 to 500g / 0.001g 0 to 2kg/0.01g 0 to 40kg/0.1g 0 to 200 kg / 50g	0.15mg 1.2mg 9.8mg 0.81g 40g	Class E2 Standard Weights Class E2 Standard Weights Class E2 and F1 Standard Weights
Torque wrenches	0 to 100Nm >100 to 1000Nm	1.62% 1.2%	Torque wrench analyzer
Pressure gages and Pressure indicators	10 to 10,000psi (-1 to 700 bar)	0.27% of Reading	Dead Weight Tester
Force, Compression and Tension	Up to 3000kN	0.29% of reading	Master load cells
Rotational Speed	Up to 10000 rpm / 0.1 rpm & 1 rpm	0.022 %	Tachometer / Stroboscope

June 3, 2015
Commencement Date



C. P. Ramani
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<i>Thermal</i>			
Thermometers			
Digital	-20 to 150°C/0.01°C	0.08°C	SPRT and calibration bath
Liquid-in-glass	-20 to 150°C/1°C	0.13°C	
Dial	-20 to 150°C/1°C	0.68°C	
Thermocouple – Generate/Measure Type B	600°C to 800°C >800°C to 1000°C >1000°C to 1550°C >1550°C to 1820°C	0.44°C 0.34°C 0.30°C 0.33°C	Fluke 5520A Calibrator
Type C	0 to 150°C >150°C to 650°C >650°C to 1000°C >1000°C to 1800°C >1800°C to 2316°C	0.30°C 0.26°C 0.31°C 0.50°C 0.84°C	Fluke 5520A Calibrator
Thermocouple – Generate/Measure Type E	-250°C to -100°C >-100°C to -25°C >-25°C to 350°C >350°C to 650°C >650°C to 1000°C	0.50°C 0.16°C 0.14°C 0.16°C 0.21°C	Fluke 5520A Calibrator
Type J	-210°C to -100°C >-100°C to -30°C >-30°C to 150°C >150°C to 760°C >760°C to 1200°C	0.27°C 0.16°C 0.14°C 0.17°C 0.23°C	Fluke 5520A Calibrator

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<i>Thermal (continued)</i> Thermocouple – Generate/Measure Type K	-200°C to -100°C >-100°C to -25°C >-25°C to 120°C >120°C to 1000°C >1000°C to 1372°C	0.33°C 0.28°C 0.22°C 0.16°C 0.08°C	Fluke 5520A Calibrator
Type L	-200°C to -100°C >-100°C to 800°C >800°C to 900°C	0.37°C 0.26°C 0.17°C	Fluke 5520A Calibrator
Type N	-200°C to -100°C >-100°C to -25°C >-25°C to 120°C >120°C to 410°C >410°C to 1300°C	0.40°C 0.22°C 0.19°C 0.18°C 0.27°C	Fluke 5520A Calibrator
Type R	0°C to 250°C >250°C to 400°C >400°C to 1000°C >1000°C to 1767°C	0.57°C 0.35°C 0.33°C 0.40°C	Fluke 5520A Calibrator
Type S	0°C to 250°C >250°C to 1000°C >1000°C to 1400°C >1400°C to 1767°C	0.47°C 0.36°C 0.37°C 0.46°C	Fluke 5520A Calibrator
Type T	-250°C to -150°C >-150°C to 0°C >0°C to 120°C >120°C to 400°C	0.63°C 0.24°C 0.16°C 0.14°C	Fluke 5520A Calibrator

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<i>Thermal(continued)</i> Thermocouple – Generate/Measure Type U	-200°C to 0°C >0°C to 600°C	0.56°C 0.27°C	Fluke 5520A Calibrator
RTD – Generate (PT-395, 100Ω)	-200 to 800°C	0.09°C	Fluke 5520A Calibrator
<i>Electrical – DC/LF</i> DC Voltage – Generate	0 to 329.9999 mV 0 to 3.299999 V 0 to 32.99999 V 30 to 329.9999 V 100 to 1000.000 V >1000V to 100kV	ppm of output + μV 20 + 1 11 + 2 12 + 20 18 + 150 18 + 1500 0.09%	Fluke 5520A Calibrator High Voltage Divider
DC Voltage - Measure	1.0 to 32.999 mV (10 to 45 Hz) (45 Hz to 10 kHz) (10 to 20 kHz) (20 to 50 kHz) (50 to 100 kHz) (100 to 500 kHz)	ppm of output + μV 800 + 6 150 + 6 200 + 6 1000 + 6 3500 + 12 8000 + 50	Fluke 5520A Calibrator
	0.33 to 3.29999 V 10 to 45 Hz 45 Hz to 10 kHz 10 to 20 kHz 20 to 50 kHz 50 to 100 kHz 100 to 500 kHz	300 + 50 150 + 60 190 + 60 300 + 50 700 + 125 2400 + 600	Fluke 5520A Calibrator

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<i>Electrical – DC/LF(continued)</i> AC Voltage – Generate	3.3 to 32.9999 V (10 to 45 Hz)	190 + 2000	Fluke 5520A Calibrator
	(45 Hz to 10 kHz)	200 + 6000	
	(10 to 20 kHz)	250 + 6000	
	(20 to 50 kHz)	300 + 6000	
	(50 to 100 kHz)	2000 + 50000	
	330 to 1020 V (45 Hz to 1 kHz)	300 + 10000	High Voltage Divider
	(1 to 5 kHz)	250 + 10000	
	(5 to 10 kHz)	300 + 10000	
	>1000V to 100 kV	0.2%	
DC Current – Generate	(0 to 329.999 µA)	ppm of output + µA 150 + 0.02	Fluke 5520A Calibrator
	(0 to 3.29999 mA)	100 + 0.05	
	(0 to 32.9999 mA)	100 + 0.25	
	(0 to 329.999 mA)	100 + 2.5	
	(0 to 1.09999 A)	200 + 40	
	(1.1 to 2.99999 A)	380 + 40	
	(0 to 10.9999 A on 20 A Range)	500 + 500	
	(11 to 20.5 A)	1000 + 750	
	0 to 330 µA	0.015% + 0.02µA	
	0.33 to 3.3 mA	0.010% + 0.05 µA	
	3.3 to 33 mA	0.010% + 0.25 µA	
	33 to 330 mA	0.010% + 2.5 µA	
	0.33 to 1.1 A	0.020% + 40 µA	
	1.1 to 3 A	0.038% + 40 µA	
3 to 11 A	0.05% + 0.5 mA		
11 to 20.5 A	0.1% + 0.75 mA		
20.5 to 1000A	0.5%		

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<i>Electrical – DC/LF(continued)</i> AC Current – Generate	29.00 to 329.99 µA	% of output + µA	Fluke 5520A Calibrator & 50 turn Coil
	(10 to 20 Hz)	0.2 + 0.1	
	(20 to 45 Hz)	0.15 + 0.1	
	(45 Hz to 1 kHz)	0.125 + 0.1	
	(1 to 5 kHz)	0.3 + 0.15	
	(5 to 10 kHz)	0.8 + 0.2	
	(10 to 30 kHz)	1.6 + 0.4	
	0.33 to 3.2999 mA		Fluke 5520A Calibrator
	(10 to 20 Hz)	0.2 + 0.15	
	(20 to 45 Hz)	0.125 + 0.15	
	(45 Hz to 1 kHz)	0.1 + 0.15	
	(1 to 5 kHz)	0.2 + 0.2	
	(5 to 10 kHz)	0.5 + 0.3	
	(10 to 30 kHz)	1.0 + 0.6	

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<i>Electrical – DC/LF(continued)</i> AC Current – Generate	3.3 to 32.999 mA (10 to 20 Hz)	0.18 + 2	Fluke 5520A Calibrator
	(20 to 45 Hz)	0.09 + 2	
	(45 Hz to 1 kHz)	0.04 + 2	
	(1 to 5 kHz)	0.08 + 2	
	(5 to 10 kHz)	0.2 + 3	
	(10 to 30 kHz)	0.4 + 4	
	33 to 329.99 mA (10 to 20 Hz)	0.18 + 20	Fluke 5520A Calibrator
	(20 to 45 Hz)	0.09 + 20	
	(45 Hz to 1 kHz)	0.04 + 20	
	(1 to 5 kHz)	0.10 + 50	
	(5 to 10 kHz)	0.2 + 100	
	(10 to 30 kHz)	0.4 + 200	
	0.33 to 1.09999 A (10 to 45 Hz)	0.18 + 100	Fluke 5520A Calibrator
	(45 Hz to 1 kHz)	0.05 + 100	
	(1 to 5 kHz)	0.6 + 1000	
	(5 to 10 kHz)	2.5 + 5000	
	1.1 to 2.99999 A (10 to 45 Hz)	0.18 + 100	Fluke 5520A Calibrator
	(45 Hz to 1 kHz)	0.06 + 100	
	(1 to 5 kHz)	0.6 + 1000	
	(5 to 10 kHz)	2.5 + 5000	
3 to 10.9999 A (45 to 100 Hz)	0.06 + 2000		
(100 Hz to 1 kHz)	0.10 + 2000		
(1 to 5 kHz)	3.0 + 2000		

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<i>Electrical – DC/LF(continued)</i> Capacitance – Generate	330 nF to 1.09999 uF 1.1 to 3.29999 uF 3.3 to 10.9999 uF 11 to 32.9999 uF 33 to 109.999 uF 110 to 329.999 uF 330 ΦF to 1.09999 mF 1.1 to 3.2999 mF 3.3 to 10.9999 mF 11 to 32.9999 mF 33 to 110 mF	0.25% + 1 nF 0.25% + 3 nF 0.25% + 10 nF 0.4% + 30 nF 0.45% + 100 nF 0.45% + 300 nF 0.45% + 1 ΦF 0.45% + 3 ΦF 0.45% + 10 ΦF 0.75% + 30 ΦF 1.1% + 100 ΦF	Fluke 5520A Calibrator
Weights	1 mg to 100 mg >100 mg to 10 g >10 g to 50 g >50 g to 200 g >200 g to 1000 g 2, 5 & 10 kg 20 kg	0.014 mg 0.03 mg 0.08mg 0.22 mg 1.75 mg 15.2 mg 0.13g	Class E2 Weights & Balances Class E2 Weights & Balances Class E2 Weights & Balances Class E2 Weights & Balances Class E2 Weights & Balances Class F1 Weights & Balances Class F1 Weights & Balances
Volume – Laboratory Volumetric Apparatus Stop Watch	10 µl to 10 ml >10 ml to 1000 ml 24 Hrs / 0.01 sec	0.3µl 0.3 ml 1 sec per 2 hours	Gravimetric – Precision Balance Direct Comparison
<i>Thermal</i> Ovens & Furnaces Temperature Bath	Up to 300°C / 0.1°C >300 to 1200°C / 1°C	0.8°C 4.5°C	Data Logger & Thermocouples Data Logger & Thermocouples
Temperature – Measure Relative Humidity- Measure	Up to 300°C / 0.1°C -100 to 500°C / 0.001°C 20 to 70% RH / 0.01% RH	0.02°C 0.028°C 1.0 %	Data Logger & Thermocouples/SPRT SPRT & Readout Precision Hygrometer
Rotational speed	Up to 10000 RPM/0.1 RPM	0.022 %	Tachometer / Stroboscope

¹ "Calibration Measurement Capability" is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or of nearly ideal measuring instruments. "Calibration Measurement Capability" are expressed as uncertainties at approximately the 95% level of confidence, usually using a coverage factor of $k=2$. The measurement uncertainty of a specific calibration performed by the laboratory may be greater than the least uncertainty due to the behavior of the customer's device, to the environment (if the calibration is performed in the field), and to influences from the circumstances of the specific calibration.

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