GWS Metrology Services

CBRE - GWS LLC
Metrology Services
9410 Bunsen Parkway
Suite 100B
Louisville, KY 40220
502-495-5700

Cert# L1117-1

Certificate Number:
CBRE-44110-CET

Calibration Certificate

Date of Cal:
09-Jun-2023

Customer :
GE APPLIANCES - A HAIER COMPANY
GE APPLIANCE PARK
LOUISVILLE, KY 40225

PO Number
46417112

Work Order
MAY 2023 AP TECH

Asset Number : **MY49001167**
Manufacturer : **AGILENT**
Description : **UNIT, DAQ/SWITCH**
Department : **AP2**
Location : **WATER HEATER LAB**

Serial Number : **MY49002819**
Model Number : **34972A**
Cal. Location : **ON-SITE**

Environmental Data

Temp : **23 °C**
Humidity : **46 %**

Calibration Information

***Calibration Due Date : **06/09/2024**
Condition As Received : **Meets Listed Specifications**
Condition As Returned : **Passed**

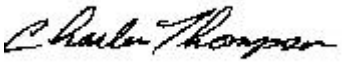
Procedures used for this Calibration:

Procedure #	Procedure Description	Rev #	Rev Date
CP-0511	FLUKE 34972A DATA AQUISITION / SWITCH UNIT	00	2/11/2014

Traceability Information

Asset Number	Description	Cal. Due Date	Reference Number
MET-0001	CALIBRATOR, MULTIFUNCTION	2/17/2024	CBRE-2733-TSM
MET-0731	SENSOR, TEMP/HUMIDITY	9/6/2023	CBRE-7120-TLB

Traceability to NIST or other national metrology institutes for secondary measurement standards is established through laboratories aproved by the CBRE-GWS, LLC Metrology Services quality assurance program. Test reports and calibration certificates maintained by CBRE - GWS are available upon request to the reciepient of this calibration report.



Calibrated By: CHARLES THOMPSON - Metrologist

This is to certify that the above listed instrument/gage was inspected by CBRE GWS Metrology Services using a procedure(s) developed from the manufacturer specifications, accepted industry practices and/or customer requirements. The CBRE GWS Metrology Services Quality System conforms to ISO/IEC-17025:2017. It is hereby further certified that the inspection described herein was performed using standards whose values are traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other National Metrology Institute (NMI), or have been derived from accepted values of natural constants, or have been derived by the ratio type of self calibration techniques. Uncertainties are estimated at a 95% confidence level. (k=2). The results indicated in this certificate relate only to the item(s) listed above. CBRE GWS Metrology Services responsibility shall in no event nor for any reason whatsoever exceed the purchase price of this calibration.

*** Calibration due dates are only issued if requested by the customer and are based upon customer dictated recall intervals.

CALIBRATION TEST POINTS

*** Not accredited for this parameter**

VERDICT- (P)=Passed, (A)=Adjusted, (L)=Limited, (F)=Failed, (R)=Report of Value only

Description	Nominal	Tol -	Tol +	As Found	As Left	Units	Verdict	Comment
Open Zero 10mA Range	0.00000	-0.00200	0.00200	-0.00004	-0.00004	mA	P	
100mA Range	0.0000	-0.0050	0.0050	0.0000	0.0000	mA	P	
1A Range	0.000000	-0.000100	0.000100	0.000000	0.000000	A	P	
Short Zero 100mV Range	0.0000	-0.0040	0.0040	0.0009	0.0009	mV	P	
1V Range	0.000000	-0.000007	0.000007	0.000000	0.000000	V	P	
10V Range	0.00000	-0.00005	0.00005	0.00000	0.00000	V	P	
100 Range	0.0000	-0.0006	0.0006	0.0000	0.0000	V	P	
300V Range	0.000	-0.009	0.009	0.000	0.000	V	P	
Zero 2-Wire 100Ohm Range	0.0000	-4.0040	4.0040	0.0700	0.0700	ohm	P	
1kOhm Range	0.000000	-0.004010	0.004010	0.000071	0.000071	kOhm	P	
10kOhm Range	0.00000	-0.00410	0.00410	0.00007	0.00007	kOhm	P	
100kOhm Range	0.0000	-0.0050	0.0050	0.0000	0.0000	kOhm	P	
1MOhm Range	0.000000	-0.000014	0.000014	0.000000	0.000000	kOhm	P	
10MOhm Range	0.00000	-0.00010	0.00010	0.00000	0.00000	MOhm	P	
100MOhm Range	0.0000	-0.0100	0.0100	0.0000	0.0000	MOhm	P	
Zero 4-Wire 100Ohm Range	0.0000	-0.0040	0.0040	0.0040	0.0040	ohm	P	
1kOhm Range	0.000000	-0.000010	0.000010	0.000004	0.000004	kOhm	P	
10kOhm Range	0.00000	-0.00010	0.00010	0.00003	0.00003	kOhm	P	
100kOhm Range	0.0000	-0.0010	0.0010	0.0002	0.0002	kOhm	P	
1MOhm Range	0.000000	-0.000010	0.000010	0.000000	0.000000	MOhm	P	
10MOhm Range	0.00000	-0.00010	0.00010	0.00000	0.00000	MOhm	P	
100MOhm Range	0.0000	-0.0100	0.0100	0.0000	0.0000	MOhm	P	
DC V 100mV Range	100.0000	99.9910	100.0090	99.9974	99.9974	mV	P	
100mV Range	-100.0000	-100.0090	-99.9910	-99.9953	-99.9953	mV	P	
1V Range	1.000000	0.999953	1.000047	0.999984	0.999984	V	P	
1V Range	-1.000000	-1.000047	-0.999953	-0.999983	-0.999983	V	P	
10V Range	10.00000	9.99960	10.00040	10.00001	10.00001	V	P	
10V Range	-10.00000	-10.00040	-9.99960	-10.00000	-10.00000	V	P	
100V Range	100.0000	99.9949	100.0051	99.9990	99.9990	V	P	
100V Range	-100.0000	-100.0051	-99.9949	-99.9988	-99.9988	V	P	
300V Range	300.000	299.978	300.022	300.000	300.000	V	P	
2-Wire 100Ohm Range	100.0000	98.9860	101.0140	100.0730	100.0730	ohm	P	
1kOhm Range	1.000000	0.998890	1.001110	1.000070	1.000070	kOhm	P	
10kOhm Range	10.00000	9.99790	10.00210	10.00040	10.00040	kOhm	P	
100kOhm Range	100.0000	99.9880	100.0120	100.0018	100.0018	kOhm	P	
1MOhm Range	1.000000	0.999889	1.000111	1.000026	1.000026	MOhm	P	
10MOhm Range	10.00000	9.99590	10.00410	9.99926	9.99926	MOhm	P	
100MOhm Range	100.0000	99.0000	101.0000	100.0605	100.0605	MOhm	P	
4-Wire 100Ohm Range	100.0000	99.9860	100.0140	99.9951	99.9951	ohm	P	
1kOhm Range	1.000000	0.999890	1.000110	1.000025	1.000025	kOhm	P	
10kOhm Range	10.00000	9.99890	10.00110	10.00025	10.00025	kOhm	P	
100kOhm Range	100.0000	99.9890	100.0110	100.0008	100.0008	kOhm	P	
1MOhm Range	1.000000	0.999890	1.000110	1.000044	1.000044	MOhm	P	
10MOhm Range	10.00000	9.99590	10.00410	9.99920	9.99920	MOhm	P	
100MOhm Range	100.0000	99.0000	101.0000	100.1342	100.1342	MOhm	P	
DC A 10mA Range	10.00000	9.99300	10.00700	9.99862	9.99862	mA	P	
10mA Range	-10.00000	-10.00700	-9.99300	-9.99846	-9.99846	mA	P	
100mA Range	100.0000	99.9450	100.0550	99.9864	99.9864	mA	P	
100mA Range	-100.0000	-100.0550	-99.9450	-99.9850	-99.9850	mA	P	
1A Range	1.000000	0.998900	1.001100	0.999490	0.999490	A	P	
1A Range	-1.000000	-1.001100	-0.998900	-0.999536	-0.999536	A	P	
AC V 100mV Range @ 1 kHz	10.0000	9.9540	10.0460	9.9984	9.9984	mV	P	
100mV Range @ 1 kHz	100.0000	99.9000	100.1000	99.9821	99.9821	mV	P	
100mV Range @ 50 kHz	100.0000	99.8300	100.1700	99.8490	99.8490	mV	P	
1V Range @ 20 Hz	1.000000	0.999000	1.001000	0.999679	0.999679	V	P	
1V Range @ 1 kHz	1.000000	0.999000	1.001000	0.999887	0.999887	V	P	
1V Range @ 20 kHz	1.000000	0.999000	1.001000	0.999839	0.999839	V	P	
1V Range @ 50 kHz	1.000000	0.998300	1.001700	0.999471	0.999471	V	P	

CALIBRATION TEST POINTS

*** Not accredited for this parameter**

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Description	Nominal	Tol -	Tol +	As Found	As Left	Units	Verdict	Comment
1V Range @ 100 kHz	1.000000	0.993200	1.006800	0.998819	0.998819	V	P	
1V Range @ 200 kHz	1.000000	0.955000	1.045000	0.999151	0.999151	V	P	
1V Range @ 250 kHz	1.000000	0.955000	1.045000	0.999340	0.999340	V	P	
1V Range @ 300 kHz	1.000000	0.955000	1.045000	0.998894	0.998894	V	P	
10V Range @ 1 kHz	0.10000	0.08594	0.11406	0.10000	0.10000	V	P	
10V Range @ 1 kHz	1.00000	0.99540	1.00460	0.99989	0.99989	V	P	
10V Range @ 10 Hz	10.00000	9.99000	10.01000	9.99645	9.99645	V	P	
10V Range @ 1 kHz	10.00000	9.99000	10.01000	9.99821	9.99821	V	P	
10V Range @ 50 kHz	10.00000	9.98300	10.01700	9.98742	9.98742	V	P	
100V Range @ 1 kHz	100.0000	99.9000	100.1000	100.0124	100.0124	V	P	
100V Range @ 50 kHz	100.0000	99.8300	100.1700	99.9535	99.9535	V	P	
300V Range @ 1 kHz	300.000	299.580	300.420	300.033	300.033	V	P	
300V Range @ 50 kHz	200.000	199.400	200.600	199.873	199.873	V	P	
AC A 10mA Range @ 1 kHz	10.00000	9.98600	10.01400	9.99407	9.99407	mA	P	
100mA Range @ 1 kHz	100.0000	99.4000	100.6000	99.9607	99.9607	mA	P	
1A Range @ 1 kHz	0.010000	0.008590	0.011410	0.009994	0.009994	A	P	
1A Range @ 1 kHz	1.000000	0.998600	1.001400	0.999488	0.999488	A	P	
Frequency @ 10mV	100.0000	99.9000	100.1000	100.0000	100.0000	Hz	P	
@ 1 V	100.0000	99.9900	100.0100	100.0000	100.0000	kHz	P	

The verdicts above are based upon a direct comparison of the measured value at the time of calibration, to a published or customer supplied tolerance for the specification listed. CBRE-GWS does not include the measurement uncertainty in making these determinations unless specifically requested. It is the responsibility of the user of this equipment to determine if the accept / reject tolerances meet the requirements of the intended measurement process.

Certificate Comments :

No Additional Comments

Expanded measurement uncertainty at an approximate 95% confidence level (k=2)

DC Voltage

0 to 200 mV ±0.1 µV+4.5µV/V+0.6R

200 mV to 2 V ±0.4 µV+3µV/V+0.6R

(2 to 20) V ±4 µV 3µV/V+0.6R

(20 to 200) V ±40 µV+4.5µV/V+0.6R

(200 to 1 000) V ±0.5mV+4.5µV/V+0.6R

AC Voltage

1 mV to 200 mV

(10 to 40) Hz ±4 µV+130µV/V +0.6R
(40 to 100) Hz ±4 µV+110µV/V + 0.6R
100 Hz to 2 kHz ±2µV+105µV/V+ 0.6R
(2 to 10) kHz ±4µV+105µV/V+0.6R
(10 to 30) kHz ±8µV+305µV/V+ 0.6R
(30 to 100) kHz ±20µV+705µV/V+0.6R
(100 to 300) kHz ±0.3%iv+0.2 mV+ 0.6R
(300 to 500) kHz ±1 %iv + 2 mV + 0.6R

200 mV to 2 V

(10 to 40) Hz ±20µV+105µV/V+0.6R
(40 to 100) Hz ±20µV+ 85µV/V+0.6R
100 Hz to 2 kHz ±20µV+ 65 µV/V +0.6R
(2 to 10) kHz ±22µV+ 85 µV/V +0.6R
(10 to 30) kHz ±40µV+205µV/V +0.6R
(30 to 100) kHz ±0.2mV+505µV/V+0.6R
(100 to 300) kHz ±0.3 % iv + 2 mV +0.6R
(300 to 500) kHz ±1 % iv + 2 mV +0.6R

2 V to 20 V

(10 to 40) Hz ±0.2mV+105µV/V+0.6R
(40 to 100) Hz ±0.2mV+85 µV/V+0.6R
100 Hz to 2 kHz ±0.2mV+65 µV/V+0.6R
(2 to 10) kHz ±0.2mV+ 85 µV/V+0.6R
(10 to 30) kHz ±0.4mV+205µV/V+0.6R

(30 to 100) kHz ±2 mV + 505µV/V+0.6R

20 V to 200 V
(10 to 40) Hz ±2 mV+ 105µV/V+0.6R
(40 to 100) Hz ±2 mV+ 85 µV/V+0.6R
100 Hz to 2 kHz ±2 mV+ 65 µV/V+0.6R
(2 to 10) kHz ±2 mV+ 85 µV/V+0.6R
(10 to 20) kHz ±4 mV+ 205 µV/V+0.6R

200 V to 1 000 V
(10 to 40) Hz ±20 mV+110µV/V+0.6R
(40 to 10) kHz ±20 mV+95 µV/V+0.6R

Resistance – Source
0 to 11Ohm ±0.009%iv+0.006Ohm+0.6
(11 to 33)Ohm ±0.009 4%iv+0.01Ohm+0.6R
(33 to 330)Ohm ±0.007%iv + 0.01Ohm+0.6R
330Ohm to 3.3 kOhm ±0.007%iv + 0.06Ohm+0.6R
(3.3 to 33) kOhm ±0.007%iv + 0.6Ohm+0.6R
(33 to 110) kOhm ±0.008 6%iv+ 6Ohm+0.6R
(110 to 330) kOhm ±0.009 3%iv + 6Ohm+0.6R
330 kOhm to 3.3 MOhm ±0.012%iv+ 55Ohm+0.6R
(3.3 to 11) MOhm ±0.047%iv+ 550Ohm+0.6R
(11 to 33) MOhm ±0.078%iv+ 550Ohm+0.6R
(33 to 110) MOhm ±0.39%iv+ 5.55kOhm+0.6R
(110 to 330) MOhm ±0.39%iv+ 16.5kOhm+0.6R

DC Current
0 to 200 µA ±0.4 nA +12 µA/A +0.6R
200 µA to 2 mA ±4 nA +12 µA/A +0.6R
(2 to 20) mA ±40 nA +13 µA/A +0.6R
(20 to 200) mA ±8 µA +36 µA/A +0.6R
(200 to 2) A ±16 µA +170 µA/A +0.6R

AC Current
29 µA to 200 µA
10 Hz to 10 kHz ±20 nA + 280 µA/A + 0.6R

200 µA to 2 mA
10 Hz to 10 kHz ±200 nA +280 µA/A +0.6R

2 mA to 20 mA
10 Hz to 10 kHz ±2 µA+ 280 µA/A+0.6R

20 mA to 200 mA
10 Hz to 10 kHz ±20 µA+ 250 µA/A +0.6R

200 mA to 2 A
10 Hz to 2 kHz ±0.2 mA +600 µA/A+ 0.6R
2 kHz to 5 kHz ±0.2 mA +700 µA/A+ 0.6R