PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

Qual Tech Labs, Inc.

301 National Road, Suite #100, Exton, PA 19341

(Hereinafter called the Organization) and hereby declares that Organization is accredited in accordance with the recognized International Standard:

ISO/IEC 17025:2005

& Meets the Requirements of ANSI/NCSI Z540.3-2006 sub clause 5.3

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system
(as outlined by the joint ISO-ILAC-IAF Communiqué dated April 2017):

Laboratory and Field Calibration of Dimensional, Torque, Pressure, Thermodynamic, Electrical and Weighing Devices
(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Initial Accreditation Date:	*Issue Date:*	*Expiration Date:*
May 25, 2007	August 28, 2019	October 31, 2021

Accreditation No.:	*Certificate No.:*
59337	L19-420

Tracy Szerszen
President/Operations Manager

Perry Johnson Laboratory Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

Certificate of Accreditation: Supplement

Qual Tech Labs, Inc.
301 National Road Suite #100, Exton, PA 19341
Contact Name: Tracy Williams Phone: 610-524-7870

Accreditation is granted to the facility to perform the following calibrations:

Dimensional

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Gage Blocks[F]	1.27 mm to 101.6 mm (0.05 in to 4 in)	(0.08 + 0.000 9L) µm [(3.1 + 0.9L) µin]	Gage Block Comparator and Master Gage Block set
	101.6 mm to 304.8 mm (4 in to 12 in)	(0.127 + 0.001 1L) µm [(5 + 1.1L) µin]	
Length Standards[F]	1.27 mm to 609.6 mm (1 in to 24 in)	(0.584 + 0.000 7L) µm [(23 + 0.7L) µin]	Comparison to Gage Blocks
Micrometers[FO]	1.27 mm to 609.6 mm (0.05 in to 24 in)	(1.753 + 0.002 55L) µm [(69 + 2.55L) µin]	
Plain Ring Gages[F]	6.35 mm to 25.4 mm (0.25 in to 1 in)	0.533 µm (21 µin)	Universal Measuring Machine P & W Lab-Master
	25.4 mm to 76.2 mm (1 in to 3 in)	0.584 µm (23 µin)	
	76.2 mm to 177.8 mm (3 in to 7 in)	0.711 µm (28 µin)	
	177.8 mm to 254 mm (7 in to 10 in)	1.219 µm (48 µin)	
	254 mm to 330.2 mm (10 in to 13 in)	1.727 µm (68 µin)	
Dial / Vernier Calipers[FO]	1.27 mm to 609.6 mm (0.05 in to 24 in)	(37.08 + 0.017 1L) µm [(1 460 + 17.1L) µin]	Comparison to Gage Blocks
Digital Calipers[FO]	1.27 mm to 609.6 mm (0.05 in to 24 in)	(17.526 + 0.018 41L) µm [(690 +18.4L) µin]	
Thread Plugs Pitch Diameter[F]	0-96 in to 4-4 in	(131.4 + 55.9D) µin	Super Micrometer
Thread Plugs Major Diameter[F]	0-96 in to 4-4 in	63 µin	Super Micrometer
Pin Gauges[F]	0.006 in to 1.0 in	89 µin	Super Micrometer Class ZZ
Plug Gauges[F]	0.05 in to 10 in	(4.3 + 3.9L) µin	Lab Master – Class XXX
Indicators[F]	Up to 1 in	90 µin	Lab Master
Surface Plate Repeat reading[FO]	0.051 mm	0.863 6 µm	Repeat-O-Meter w/Mahr indicator Fed. Surface Plate Spec. GGG-P-463C
	0.002 in	34 µin	
Surface Plate Unilateral Flatness[FO]	254 mm to 1 778 mm	(0.974 + .000467D) (38.3 + 0.47D) µin	Planakator w/Mahr indicator Fed. Surface Plate Spec. GGG-P-463C
	10 in to 70 in Diagonal	(40 + 0.6D) µin	
Surface Plate Unilateral Flatness[FO]	1 219 mm to 6 096 mm	0.889µm	Federal Electronic Level Fed. Surface Plate Spec. GGG-P-463C
	48 in to 240 in Diagonal	35 µin	

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Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type E[FO]	-196 °C to -100 °C	0.5 °C	Electrical Simulation of Thermocouple Output Fluke 5500A
	-100 °C to -25 °C	0.16 °C	
	-25 °C to 350 °C	0.14 °C	
	350 °C to 650 °C	0.16 °C	
	650 °C to 1 000 °C	0.21 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type J[FO]	-196 °C to -100 °C	0.27 °C	
	-100 °C to -30 °C	0.16 °C	
	-30 °C to 150 °C	0.14 °C	
	150 °C to 760 °C	0.17 °C	
	760 °C to 1 200 °C	0.23 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type K[FO]	-196 °C to -100 °C	0.33 °C	
	-100 °C to -25 °C	0.18 °C	
	-25 °C to 120 °C	0.16 °C	
	120 °C to 1 000 °C	0.26 °C	
	1 000 °C to 1 372 °C	0.4 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type S[FO]	0 °C to 250 °C	0.47 °C	
	250 °C to 1 000 °C	0.36 °C	
	1 000 °C to 1 400 °C	0.37 °C	
	1 400 °C to 1 767 °C	0.46 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type T[FO]	-196 °C to -150 °C	0.63 °C	
	-150 °C to 0 °C	0.24 °C	
	0 °C to 120 °C	0.16 °C	
	120 °C to 400 °C	0.14 °C	
Equipment to Measure DC Voltage[FO]	10 µV to 329.999 mV	0.006 % of output + 3 µV	Fluke 5500A
	10 µV to 3.299 V	0.005 % of output + 5 µV	
	0.16 mV to 32.999 V	0.005 % of output + 50 µV	
	30 V to 329.999 9 V	0.005 5 % of output + 500 µV	
	100 V to 1 020 V	0.005 5 % of output + 1 500 µV	

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Equipment to Measure DC Voltage[FO]	0.15 µA to 3.299 99 mA	0.013 % of output + 0.05 µA	Fluke 5500A
	0.76 µA to 32.999 9 mA	0.01 % of output + 0.25 µA	
	0.1 µA to 329.999 mA	0.01 % of output + 3.3 µA	
	0.14 mA to 2.199 99 A	0.03 % of output + 44 µA	
	1 mA to 11 A	0.06 % of output + 330 µA	
Equipment to Measure AC Voltage (At the listed frequencies)[FO]			
45 Hz to 10 kHz	1 mV to 32.999 mV	0.15 % of output + 20 µV	
10 kHz to 20 kHz	1 mV to 32.999 mV	0.2 % of output + 20 µV	
20 kHz to 50 kHz	1 mV to 32.999 mV	0.25 % of output + 20 µV	
50 kHz to 100 kHz	1 mV to 32.999 mV	0.35 % of output + 33 µV	
Equipment to Measure AC Voltage (At the listed frequencies)[FO]			
45 Hz to 10 kHz	33 mV to 329.999 mV	0.05 % of output + 20 µV	
10 kHz to 20 kHz	33 mV to 329.999 mV	0.1 % of output + 20 µV	
20 kHz to 50 kHz	33 mV to 329.999 mV	0.16 % of output + 40 µV	
50 kHz to 100 kHz	33 mV to 329.999 mV	0.24 % of output + 170 µV	
Equipment to Measure AC Voltage (At the listed frequencies)[FO]			
45Hz to 10 kHz	0.33 V to 3.299 99 V	0.03 % of output + 60 µV	
10 kHz to 20 kHz	0.33 V to 3.299 99 V	0.08 % of output + 60 µV	
20 kHz to 50 kHz	0.33 V to 3.299 99 V	0.14 % of output + 300 µV	
50 kHz to 100 kHz	0.33 V to 3.299 99 V	0.24 % of output + 1 700 µV	
Equipment to Measure AC Voltage (At the listed frequencies)[FO]			
45 Hz to 10 kHz	3.3 V to 32.999 9 V	0.04 % of output + 600 µV	
10 kHz to 20 kHz	3.3 V to 32.999 9 V	0.08 % of output + 2 600 µV	
20 kHz to 50 kHz	3.3 V to 32.999 9 V	0.19 % of output + 5 000 µV	
50 kHz to 100 kHz	3.3 V to 32.999 9 V	0.24 % of output + 17 000 µV	
Equipment to Measure AC Voltage (At the listed frequencies)[FO]			
45 Hz to 1 kHz	33 V to 329.999 V	0.05 % of output + 6.6 mV	
1 kHz to 10 kHz	33 V to 329.999 V	0.08 % of output + 15 mV	
10 kHz to 20 kHz	33 V to 329.999 V	0.09 % of output + 33 mV	

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Equipment to Measure AC Voltage (At the listed frequencies)[FO]			Fluke 5500A
45 Hz to 1 kHz	330 V to 1 020 V	0.05 % of output + 80 mV	
1 kHz to 5 kHz	330 V to 1 020 V	0.2 % of output + 100 mV	
5 kHz to 10 kHz	330 V to 1 020 V	0.2 % of output + 500 mV	
Equipment to Measure AC Current (At the listed frequencies)[FO]			
45 Hz to 1 kHz	0.029 mA to 0.329 99 mA	0.13 % of output + 0.25 µA	
1 kHz to 5 kHz	0.029 mA to 0.329 99 mA	0.4 % of output + 0.15 µA	
Equipment to Measure AC Current (At the listed frequencies)[FO]			
20 Hz to 45 Hz	0.33 mA to 3.299 9 mA	0.1 % of output + 0.3 µA	
45 Hz to 1 kHz	0.33 mA to 3.299 9 mA	0.1 % of output + 0.3 µA	
1 kHz to 5 kHz	0.33 mA to 3.299 9 mA	0.2 % of output + 0.3 µA	
5 kHz to 10 kHz	0.33 mA to 3.299 9 mA	0.6 % of output + 0.3 µA	
Equipment to Measure AC Current (At the listed frequencies)[FO]			
20 Hz to 45 Hz	3.3 mA to 32.999 mA	0.1 % of output + 3 µA	
45 Hz to 1 kHz	3.3 mA to 32.999 mA	0.09 % of output + 3 µA	
1 kHz to 5 kHz	3.3 mA to 32.999 mA	0.2 % of output + 3 µA	
5 kHz to 10 kHz	3.3 mA to 32.999 mA	0.6 % of output + 3 µA	
Equipment to Measure AC Current (At the listed frequencies)[FO]			
20 Hz to 45 Hz	33 mA to 329.99 mA	0.1 % of output + 30 µA	
45 Hz to 1 kHz	33 mA to 329.99 mA	0.09 % of output + 30 µA	
1 kHz to 5 kHz	33 mA to 329.99 mA	0.2 % of output + 30 µA	
5 kHz to 10 kHz	33 mA to 329.99 mA	0.6 % of output + 30 µA	
Equipment to Measure AC Current (At the listed frequencies)[FO]			
45 Hz to 1 kHz	0.33 A to 2.199 99 A	0.2 % of output + 300 µA	
1 kHz to 5 kHz	0.33 A to 2.199 99 A	0.75 % of output + 300 µA	

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Equipment to Measure AC Current (At the listed frequencies)[FO]			Fluke 5500A
45 Hz to 65 Hz	2.2 A to 11 A	0.06 % of output + 2 000 µA	
65 Hz to 500 Hz	2.2 A to 11 A	0.10 % of output + 2 000 µA	
500 Hz to 1 kHz	2.2 A to 11 A	0.33 % of output + 2 000 µA	
Equipment to Measure Resistance[FO]	24 mΩ to 10.99 Ω	0.012 % of output + 0.008 Ω	
	11 Ω to 32.99 Ω	0.012 % of output + 0.015 Ω	
	33 Ω to 109.999 Ω	0.009 % of output + 0.015 Ω	
	110 Ω to 329.999 Ω	0.009 % of output + 0.015 Ω	
	330 Ω to 1.099 99 kΩ	0.009 % of output + 0.06 Ω	
	1.1 kΩ to 3.299 99 kΩ	0.009 % of output + 0.06 Ω	
	3.3 kΩ to 10.999 9 kΩ	0.009 % of output + 0.6 Ω	
	11 kΩ to 32.999 9 kΩ	0.009 % of output + 0.6 Ω	
	33 kΩ to 109.999 kΩ	0.011 % of output + 6 Ω	
	110 kΩ to 329.999 kΩ	0.012 % of output + 6 Ω	
	330 kΩ to 1.099 99 MΩ	0.015 % of output + 55 Ω	
	1.1 MΩ to 3.299 99 MΩ	0.015 % of output + 55 Ω	
	3.3 MΩ to 10.999 9 MΩ	0.06 % of output + 550 Ω	
	11 MΩ to 32.999 9 MΩ	0.1 % of output + 550 Ω	
	33 MΩ to 109.999 MΩ	0.5 % of output + 5.5 kΩ	
	110 MΩ to 330 MΩ	0.5 % of output + 16.5 kΩ	
Oscilloscope At the listed frequencies[FO]			Fluke 5500A/SC600
Leveled Sine Amplitude 50 kHz Reference[FO]	5 mV to 5.5 V p-p	2.3 % of reading + 320 µV	
Leveled Sine Flatness Relative to 50 kHz[FO]	50 kHz to 100 MHz	1.9 % of reading + 100 µV	
	100 MHz to 300 MHz	2.0 % of reading + 120 µV	
	300 MHz to 600 MHz	4.3 % of reading + 98 µV	
Square 50 Ω at 1 kHz Source[FO]	1 mV to 6.6 V p-p	1.5 % of reading + 80 µV	
Square 1 MΩ at 1 kHz Source[FO]	1 mV to 6.6 V p-p	1.2 % of reading + 80 µV	
Time Marker 50 Ω[FO]	2 ns to 20 ms	3 µs/s	
	50 ms to 5 s	(25 + t* 1 000) µs/s	
Rise Time[FO]	1 kHz to 2 MHz	100 ps	

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Accreditation is granted to the facility to perform the following calibrations:

Mass, Force, and Weighing Devices

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Weighing Devices[FO]	1 g to 3 000 g (Res = 0.001 g)	$(1.2 \times 10^{-3} + 2.53 \times 10^{-6}\,Wt)$ g	Class 1 Weights
	1 lb to 500 lb (Res = 0.001 lb)	$(1.1 \times 10^{-3} + 1.13 \times 10^{-4}\,Wt)$ lb	Class F Weights

Mechanical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Torque Wrenches[F]	2.576 N·m to 338.954 N·m (1.9 lbf·ft to 250 lbf·ft)	0.841 N·m (0.62 lbf·ft)	CDI Torque Tester
Pressure Gages and Transducers[FO]	10 psi to 10 000 psi	0.1 % of reading	Ametek Deadweight Tester

1. The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represent the smallest measurement uncertainties attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is expressed at a confidence level of 95 % using a coverage factor *k* (usually equal to 2). The actual measurement uncertainty associated with a specific calibration performed by the laboratory will typically be larger than the CMC for the same calibration since capability and performance of the device being calibrated and the conditions related to the calibration may reasonably be expected to deviate from ideal to some degree.
2. The laboratories range of calibration capability for all disciplines for which they are accredited is the interval from the smallest calibrated standard to the largest calibrated standard used in performing the calibration. The low end of this range must be an attainable value for which the laboratory has or has access to the standard referenced. Verification of an indicated value of zero in the absence of a standard is common practice in the procedure for many calibrations but by its definition it does not constitute calibration of zero capacity.
3. The term L represents length in inches or millimeters appropriate to the uncertainty statement.
4. The term D represents the diameter of the device being measured in inches or millimeters appropriate to the uncertainty statement.
5. The term Wt represents weight in pounds or grams (including SI multiple and submultiple units) appropriate to the uncertainty statement.
6. The presence of a superscript FO means that the laboratory performs calibration of the indicated parameter both at its Fixed location and Onsite at customer locations. Example: Outside Micrometer[FO] would mean that the laboratory performs this calibration at its Fixed location and/or Onsite at customer locations.
7. The presence of a superscript F means that the laboratory performs calibration of the indicated parameter at its fixed location. Example: Outside Micrometer[F] would mean that the laboratory performs this calibration at its fixed location.

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8. Measurement uncertainties obtained for calibrations performed at customer sites can be expected to be larger than the measurement uncertainties obtained at the laboratories fixed location for similar calibrations. This is due to the effects of transportation of the standards and equipment and upon environmental conditions at the customer site which are typically not controlled as closely as at the laboratories fixed location.