



# PERRY JOHNSON LABORATORY ACCREDITATION, INC.

## Certificate of Accreditation

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

***Rays Precision Calibration, Inc***  
***126 Springview Dr., Stamping Ground, KY 40379***

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

**ISO/IEC 17025:2005**

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):

***Calibration of Dimensional, Electrical, Mechanical, Weighing Device, Acoustic, Time & Frequency and Chemical Measuring Equipment***  
***(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:*

August 28, 2002

*Issue Date:*

April 28, 2018

*Expiration Date:*

August 31, 2020

*Accreditation No.:*

59170

*Certificate No.:*

L18-206

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.pjllabs.com](http://www.pjllabs.com)*



# Certificate of Accreditation: Supplement

**Rays Precision Calibration, Inc.**  
 126 Springview Dr., Stamping Ground, KY 40379  
 Contact Name: Darlene Lavoie Phone: 502-535-0015

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

## Acoustic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Sound Meter <sup>FO</sup>	94 dB	1 dB	Simpson Sound Calibrator 890-2
Output <sup>FO</sup>	114 dB		

## Chemical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
pH Meter <sup>FO</sup>	4.01 pH	0.1 pH	Buffer Solutions
	7.01 pH		
	10.01 pH		

## Time & Frequency

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Timers & Stop Watches <sup>FO</sup>	60 sec to 86 400 sec	0.5 sec	Calibrated Stop Watch, USNO Master Clock

## Dimensional

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Height Gages <sup>FO</sup>	Up to 1 200 mm	(4.3 + 0.38L) $\mu$ m	Gage Blocks and Height Master
Dial or Digital Indicators <sup>FO</sup>	0.01 mm to 50 mm	(2.5 + 0.13L) $\mu$ m	P&W Super Mic.
Calipers (dial or digital) <sup>FO</sup>	Up to 600 mm	(26 + 0.38L) $\mu$ m	Caliper Checker Gage Blocks
	600 mm to 1 200 mm	(51 + 0.5L) $\mu$ m	
Micrometers (outside) <sup>FO</sup>	Up to 100 mm	(2.2 + 0.23L) $\mu$ m	Gage Block
	100 mm to 600 mm	(3.5 + 0.23L) $\mu$ m	
Thickness Gage <sup>FO</sup>	0.01 mm to 25 mm	(2.2 + 0.23L) $\mu$ m	Gage Block/Master shims
Test Indicators <sup>FO</sup>	0.01 mm to 1.5 mm	(2.5 + 0.13L) $\mu$ m	P&W Super Mic.
Pin/ Plug Gages <sup>FO</sup>	0.02 mm to 200 mm	(2 + 0.05D) $\mu$ m	P&W Super Mic.
Depth Micrometers <sup>FO</sup>	Up to 300 mm	(2.5 + 0.25L) $\mu$ m	Gage Blocks
Thread Plugs Pitch Diameter <sup>F</sup>	0-80 to 4-10	(120 + 2D) $\mu$ in	Measuring over wires with P&W Super Mic.
Thread Plugs Major Diameter <sup>F</sup>	0-80 to 4-10	(66 + 2D) $\mu$ in	P&W Super Mic.
Thread Ring Gages Major Diameter <sup>F</sup>	1.6 mm to 200 mm	(3.1 + 0.05D) $\mu$ m	Thread Setting Plugs



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## Dimensional

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Height Masters (Cadillac Gage) <sup>FO</sup>	1 mm to 300 mm	(3 + 0.25L) $\mu$ m	Gage Blocks and Electronic Dimensional Comparator
Plain Ring Gages <sup>FO</sup>	2 mm to 150 mm	(1.1 + 0.05D) $\mu$ m	Universal Measuring Machine & Gage blocks
Bore Gages <sup>FO</sup>	1 mm to 200 mm	(26 + 0.35L) $\mu$ m	P&W Super Mic and/or Master Ring Gages
Length Standards (Spherical end) <sup>F</sup>	10 mm to 200 mm	(2 + 0.05L) $\mu$ m	P&W Super Mic., Gage Blocks and Electronic Dimensional Comparator
	200 mm to 1 200 mm	(30 + 0.25L) $\mu$ m	
Length Standards (Flat End) <sup>F</sup>	10 mm to 200 mm	(0.76 + 0.13L) $\mu$ m	Blocks and Electronic Dimensional Comparator
	200 mm to 1 200 mm	(1.1 + 0.13) $\mu$ m	
Dial or Digital Indicators <sup>FO</sup>	0.01 mm to 50 mm	(2.5 + 0.13L) $\mu$ m	P&W Super Mic.
Calipers <sup>FO</sup> (dial or digital)	Up to 600 mm	(26 + 0.38L) $\mu$ m	Caliper Checker
Surface Finish (Profilometers) <sup>FO</sup>	0.4 $\mu$ m	0.15 $\mu$ m	Master surface
	3.05 $\mu$ m	0.4 $\mu$ m	Finish standards
Angle Blocks <sup>F</sup>	2° to 90°	0.05°	Gage blocks, Optical Comparator
Surface Plate Repeat Measurement <sup>FO</sup>	0.002 in	60 $\mu$ in	Repeat O Meter
Surface Plate Flatness <sup>FO</sup>	12 in x 18 in to 6 ft x 8 ft	32 $\mu$ in/ft	Autocollimator
Optical Comparators X and Y linearity <sup>FO</sup>	6 in to 40 in	(150 + 2L) $\mu$ in	Glass Standard
Radius Gages <sup>F</sup>	0.5 mm to 25 mm	(0.5 + 0.5L) $\mu$ m	Optical Comparator
Levels <sup>F</sup>	2° to 90°	0.05°	Direct Comparison & Gage blocks
Vision System X and Y Axis <sup>FO</sup>	0.125 in to 12 in	(240 + 2L) $\mu$ in	Glass Standards, Gage Blocks
Diameter of Sphere <sup>FO</sup>	1 mm to 75 mm	(3.5 + 0.05D) $\mu$ m	P&W Supermicrometer
Dimensional (Fixture) Measurement Inspection <sup>FO</sup>	1 mm to 1 200 mm	(177.8 + 0.005L) $\mu$ m	Faro Measuring Machine (CMM)
Steel Rules <sup>FO</sup>	0.05 in to 72 in	0.002 5 in	Master Steel Rule, Gage Blocks



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MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Output Resistance <sup>FO</sup>	1 $\Omega$ to 10.999 9 $\Omega$	0.012 % of output + 0.008 $\Omega$	Fluke 5520A (4 wire method)
	11 $\Omega$ to 32.999 9 $\Omega$	0.012 7 % of output + 0.015 $\Omega$	
	33 $\Omega$ to 109.999 9 $\Omega$	0.009 % of output + 0.015 $\Omega$	
	110 $\Omega$ to 329.999 9 $\Omega$	0.009 % of output + 0.015 $\Omega$	
	330 $\Omega$ to 1.099 999 k $\Omega$	0.009 % of output + 0.06 $\Omega$	
	1.1 k $\Omega$ to 3.299 999 k $\Omega$	0.009 % of output + 0.06 $\Omega$	
	3.3 k $\Omega$ to 10.999 99 k $\Omega$	0.009 % of output + 0.6 $\Omega$	
	11 k $\Omega$ to 32.999 99 k $\Omega$	0.009 % of output + 0.6 $\Omega$	
	33 k $\Omega$ to 109.999 9 k $\Omega$	0.011 % of output + 0.6 $\Omega$	
	110 k $\Omega$ to 329.999 9 k $\Omega$	0.012 % of output + 0.6 $\Omega$	
	330 k $\Omega$ to 1.099 999 M $\Omega$	0.015 % of output + 6 $\Omega$	
	1.1 M $\Omega$ to 3.299 999 M $\Omega$	0.015 % of output + 55 k $\Omega$	
	3.3 M $\Omega$ to 10.999 99 M $\Omega$	0.5 % of output + 55 k $\Omega$	
Equipment to Output Resistance <sup>FO</sup>	11 M $\Omega$ to 32.9999 9 M $\Omega$	0.1 % of output + 550 k $\Omega$	Fluke 5520A (4 wire method)
	33 M $\Omega$ to 109.999 9 M $\Omega$	0.5 % of output + 1 M $\Omega$	
	110 M $\Omega$ to 329.999 9 M $\Omega$	0.5 % of output + 1 M $\Omega$	
	330 M $\Omega$ to 1 100 M $\Omega$	1.5 % of output + 2 M $\Omega$	
Equipment to Generate Capacitance <sup>FO</sup>	0.19 nF to 3.299 9 nF	0.5 % reading + 0.01 nF	Fluke 5520A
	3.3 nF to 10.999 9 nF	0.25 % reading + 0.01 nF	
	11 nF to 32.999 9 nF	0.25 % reading + 0.1 nF	
	33 nF to 109.999 nF	0.25 % reading + 0.1 nF	
	110 nF to 329.999 nF	0.25 % reading + 0.3 nF	
	0.33 $\mu$ F to 1.099 99 $\mu$ F	0.25 % reading + 1 nF	
	1.1 $\mu$ F to 3.299 99 $\mu$ F	0.25 % reading + 3 nF	
	3.3 $\mu$ F to 10.999 9 $\mu$ F	0.25 % reading + 10 nF	
	11 $\mu$ F to 32.999 9 $\mu$ F	0.4 % reading + 30 nF	
	33 $\mu$ F to 109.999 $\mu$ F	0.45 % reading + 100 nF	
	110 $\mu$ F to 329.999 $\mu$ F	0.45 % reading + 300 nF	
	0.33 mF to 1.099 99 mF	0.45 % reading + 1 $\mu$ F	
	1.1 mF to 3.299 9 mF	0.45 % reading + 3 $\mu$ F	
	3.3 mF to 10.999 9 mF	0.45 % reading + 10 $\mu$ F	
	11 mF to 32.999 9 mF	0.75 % reading + 30 $\mu$ F	
33 mF to 110 mF	1.1 % reading + 100 $\mu$ F		



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Temperature, Indication, and Control Equipment used with Thermocouple Type B <sup>FO</sup>	600 °C to 800 °C	0.44 °C	Electrical Simulation of Thermocouple Output Fluke 5520A
	800 °C to 1 000 °C	0.34 °C	
	1 000 °C to 1 550 °C	0.3 °C	
	1 550 °C to 1 800 °C	0.33 °C	
Temperature, Indication, and Control Equipment used with Thermocouple Type C <sup>FO</sup>	0 °C to 150 °C	0.3 °C	
	150 °C to 650 °C	0.26 °C	
	650 °C to 1 000 °C	0.31 °C	
	1 000 °C to 1 800 °C	0.5 °C	
	1 800 °C to 2 316 °C	0.84 °C	
Temperature, Indication, and Control Equipment used with Thermocouple Type E <sup>FO</sup>	-250 °C to -100 °C	0.5 °C	
	-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	
	-250 °C to -100 °C	0.5 °C	
Temperature, Indication, and Control Equipment used with Thermocouple Type J <sup>FO</sup>	-210 °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, Indication, and Control Equipment used with Thermocouple Type K <sup>FO</sup>	-200 °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, Indication, and Control Equipment used with Thermocouple Type L <sup>FO</sup>	-200 °C to 100 °C	0.37 °C	
	-100 °C to 800 °C	0.26 °C	
	800 °C to 900 °C	0.17 °C	
Temperature, Indication, and Control Equipment used with Thermocouple Type N <sup>FO</sup>	-200 °C to 100 °C	0.4 °C	
	-100 °C to -25 °C	0.22 °C	
	-25 °C to 120 °C	0.19 °C	
	120 °C to 410 °C	0.18 °C	
	410 °C to 1 300 °C	0.27 °C	



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Temperature, Indication, and Control Equipment used with Thermocouple Type R <sup>FO</sup>	0 °C to 250 °C	0.57 °C	Electrical Simulation of Thermocouple Output Fluke 5520A
	250 °C to 400 °C	0.35 °C	
	400 °C to 1 000 °C	0.33 °C	
	1 000 °C to 1 767 °C	0.4 °C	
	-200 °C to 0 °C	0.56 °C	
Temperature, Indication, and Control Equipment used with Thermocouple Type U <sup>FO</sup>	0 °C to 600 °C	0.27 °C	
Temperature, Indication, and Control Equipment used with Thermocouple Type S <sup>FO</sup>	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, Indication, and Control Equipment used with Thermocouple Type T <sup>FO</sup>	-250 °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	
Temperature Calibration, Indication and Control Equipment used with RTD Pt 385, 1 000 $\Omega$ <sup>FO</sup>	-200 °C to -80 °C	0.05 °C	
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.07 °C	
	100 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.1 °C	
	400 °C to 630 °C	0.12 °C	
	630 °C to 800 °C	0.23 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Pt 3926, 100 $\Omega$ <sup>FO</sup>	-200 °C to -80 °C	0.05 °C	
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.07 °C	
	100 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.1 °C	
	400 °C to 630 °C	0.12 °C	



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Temperature Calibration, Indication and Control Equipment used with RTD Pt 3916, 100 $\Omega^{FO}$	-200 °C to -190 °C	0.25 °C	Electrical Simulation of RTD Output Fluke 5520A
	-190 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.06 °C	
	100 °C to 260 °C	0.07 °C	
	260 °C to 300 °C	0.08 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Pt 3916, 100 $\Omega^{FO}$	300 °C to 400 °C	0.09 °C	
	400 °C to 600 °C	0.1 °C	
	600 °C to 630 °C	0.23 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Pt 385, 200 $\Omega^{FO}$	-200 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.04 °C	
	0 °C to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	
	260 °C to 300 °C	0.12 °C	
	300 °C to 400 °C	0.13 °C	
	400 °C to 600 °C	0.14 °C	
	600 °C to 630 °C	0.16 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Pt 385, 500 $\Omega^{FO}$	-200 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.05 °C	
	100 °C to 260 °C	0.06 °C	
	260 °C to 300 °C	0.08 °C	
	300 °C to 400 °C	0.08 °C	
	400 °C to 600 °C	0.09 °C	
	600 °C to 630 °C	0.11 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Pt 385, 1000 $\Omega^{FO}$	-200 °C to -80 °C	0.03 °C	
	-80 °C to 0 °C	0.03 °C	
	0 °C to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	
	260 °C to 300 °C	0.06 °C	
	300 °C to 400 °C	0.07 °C	
	400 °C to 600 °C	0.07 °C	
	600 °C to 630 °C	0.23 °C	



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Temperature Calibration, Indication and Control Equipment used with RTD Pt 3916, 100 $\Omega^{FO}$	300 °C to 400 °C	0.09 °C	Electrical Simulation of RTD output Fluke 5520A
Temperature Calibration, Indication and Control Equipment used with RTD PtNi 385, 120 $\Omega^{FO}$	-80 °C to 0 °C	0.08 °C	
	0 °C to 100 °C	0.08 °C	
	100 °C to 260 °C	0.14 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Cu 427, 10 $\Omega$	-100 °C to 260 °C	0.3 °C	
Equipment to Output AC Voltage At the listed Frequencies <sup>FO</sup>			Fluke 5520A
10 Hz to 45 Hz	1 mV to 32.999 mV	0.08 % reading + 6 mV	
45 Hz to 10 kHz	1 mV to 32.999 mV	0.015 % reading + 6 mV	
10 kHz to 20 kHz	1 mV to 32.999 mV	0.02 % reading + 6 mV	
20 kHz to 50 kHz	1 mV to 32.999 mV	0.1 % reading + 6 mV	
50 kHz to 100 kHz	1 mV to 32.999 mV	0.35 % reading + 12 mV	
100 kHz to 500 kHz	1 mV to 32.999 mV	0.8 % reading + 50 mV	
Equipment to Output AC Voltage At the listed Frequencies <sup>FO</sup>			
10 Hz to 45 Hz	33 mV to 329.999 mV	0.03 % reading + 8 mV	
45 Hz to 10 kHz	33 mV to 329.999 mV	0.014 5 % reading + 8 mV	
10 kHz to 20 kHz	33 mV to 329.999 mV	0.016 % reading + 8 mV	
20 kHz to 50 kHz	33 mV to 329.999 mV	0.035 % reading + 8 mV	
50 kHz to 100 kHz	33 mV to 329.999 mV	0.08 % reading + 32 mV	
100 kHz to 500 kHz	33 mV to 329.999 mV	0.2% reading + 70 mV	
Equipment to Output AC Voltage At the listed Frequencies <sup>FO</sup>			
10 Hz to 45 Hz	0.33 V to 3.299 99 V	0.03 % reading + 50 mV	
45 Hz to 10 kHz	0.33 V to 3.299 99 V	0.015 % reading + 60 mV	
10 kHz to 20 kHz	0.33 V to 3.299 99 V	0.019 % reading + 60 mV	
20 kHz to 50 kHz	0.33 V to 3.299 99 V	0.03 % reading + 50 mV	
50 kHz to 100 kHz	0.33 V to 3.299 99 V	0.07 % reading + 125 mV	





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Equipment to Output AC Voltage At the listed Frequencies <sup>FO</sup>			Fluke 5520A
100 kHz to 500 kHz	0.33 V to 3.299 99 V	0.24 % reading + 600 mV	
Equipment to Output AC Voltage At the listed Frequencies <sup>FO</sup>			
10 Hz to 45 Hz	3.3 V to 32.999 9 V	0.03 % reading + 650 mV	
45 Hz to 10 kHz	3.3 V to 32.999 9 V	0.015 % reading + 600 mV	
10 kHz to 20 kHz	3.3 V to 32.999 9 V	0.024 % reading + 600 mV	
20 kHz to 50 kHz	3.3 V to 32.999 9 V	0.035 % reading + 600 mV	
50 kHz to 100 kHz	3.3V to 32.999 9 V	0.09 % reading + 1 600 mV	
Equipment to Output AC Voltage At the listed Frequencies <sup>FO</sup>			
45 Hz to 1 kHz	33 V to 329.999V	0.019 % reading + 2 000 mV	
1 kHz to 10 kHz	33 V to 329.999V	0.02 % reading + 6 000 mV	
10 kHz to 20 kHz	33 V to 329.999V	0.025 % reading + 6 000 mV	
20 kHz to 50 kHz	33 V to 329.999V	0.03 % reading + 6 000 mV	
50 kHz to 100 kHz	33 V to 329.999V	0.2 % reading + 50 000 mV	
Equipment to Output AC Voltage At the listed Frequencies <sup>FO</sup>			
45 Hz to 1 kHz	330 V to 1 020 V	0.03 % reading + 10 000 mV	
1 kHz to 5 kHz	330 V to 1 020 V	0.025 % reading + 10 000 mV	
5 kHz to 10 kHz	330 V to 1 020 V	0.03 % reading + 10 000 mV	
Equipment to Output AC Voltage At the listed Frequencies <sup>FO</sup>			
10 Hz to 20 Hz	10 mV to 329.999 mV	0.2 % reading + 370 mV	
20 Hz to 45 Hz	10 mV to 329.999 mV	0.1 % reading + 370 mV	
45 Hz to 1 kHz	10 mV to 329.999 mV	0.1 % reading + 370 mV	
1 kHz to 5 kHz	10 mV to 329.999 mV	0.2 % reading + 450 mV	
5 kHz to 10 kHz	10 mV to 329.999 mV	0.4 % reading + 450 mV	
10 kHz to 30 kHz	10 mV to 329.999 mV	5 % reading + 900 mV	



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Equipment to Output AC Voltage At the listed Frequencies <sup>FO</sup>			Fluke 5520A
10 Hz to 20 Hz	0.33 V to 3.299 99 V	0.2 % reading + 450 mV	
20 Hz to 45 Hz	0.33 V to 3.299 99 V	0.1 % reading + 450 mV	
45 Hz to 1 kHz	0.33 V to 3.299 99 V	0.09 % reading + 450 mV	
1 kHz to 5 kHz	0.33 V to 3.299 99 V	0.2 % reading + 1 400 mV	
5 kHz to 10 kHz	0.33 V to 3.299 99 V	0.4 % reading + 1 400 mV	
10 kHz to 30 kHz	0.33 V to 3.299 99 V	5 % reading + 2 800 mV	
Equipment to Output AC Voltage At the listed Frequencies <sup>FO</sup>			
10 Hz to 20 Hz	3.3 V to 5 V	0.2% reading + 450 mV	
20 Hz to 45 Hz	3.3 V to 5 V	0.1 % reading + 450 mV	
45 Hz to 1 kHz	3.3 V to 5 V	0.09 % reading + 450 mV	
1 kHz to 5 kHz	3.3 V to 5 V	0.2 % reading + 1 400 mV	
5 kHz to 10 kHz	3.3 V to 5 V	0.4 % reading + 1 400 mV	
Equipment to Output Frequency <sup>FO</sup>	0.01Hz to 119.99 Hz	0.000 25 % + 5 $\mu$ Hz	Fluke 5520A HP5334B Universal Counter
	120 Hz to 1 199.9 Hz	0.000 25 % + 5 $\mu$ Hz	
	1.2 kHz to 11.999 9kHz	0.000 25 % + 5 $\mu$ Hz	
	12 kHz to 119.99 kHz	0.000 25 % + 5 $\mu$ Hz	
	120 kHz to 1 199.9 kHz	0.000 25 % + 5 $\mu$ Hz	
	1.2 MHz to 2 MHz	0.000 25 % + 5 $\mu$ Hz	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			Fluke 5520A
10 Hz to 20Hz	29 $\mu$ A to 329.99 $\mu$ A	0.2 % reading + 0.1 mA	
20 Hz to 45 Hz	29 $\mu$ A to 329.99 $\mu$ A	0.15 % reading + 0.1 mA	
45 Hz to 1 kHz	29 $\mu$ A to 329.99 $\mu$ A	0.125 % reading + 0.1 mA	
1 kHz to 5 kHz	29 $\mu$ A to 329.99 $\mu$ A	0.3 % reading + 0.15 mA	
5 kHz to 10 kHz	29 $\mu$ A to 329.99 $\mu$ A	0.8 % reading + 0.2 mA	
10 kHz t 30 kHz	29 $\mu$ A to 329.99 $\mu$ A	1.6 % reading + 0.4 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
10 Hz to 20 Hz	0.33 mA to 3.299 9 mA	0.2 % reading + 0.15 mA	
20 Hz to 45 Hz	0.33 mA to 3.299 9 mA	0.125 % reading + 0.15 mA	



# Certificate of Accreditation: Supplement

**Rays Precision Calibration, Inc.**  
 126 Springview Dr., Stamping Ground, KY 40379  
 Contact Name: Darlene Lavoie Phone: 502-535-0015

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

## Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			Fluke 5520A
45 Hz to 1 kHz	0.33 mA to 3.299 9 mA	0.1 % reading + 0.15 mA	
1 kHz to 5 kHz	0.33 mA to 3.299 9 mA	0.2 % reading + 0.2 mA	
5 kHz to 10 kHz	0.33 mA to 3.299 9 mA	0.5 % reading + 0.3 mA	
10 kHz t 30 kHz	0.33 mA to 3.299 9 mA	1 % reading + 0.6 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
10 Hz to 20 Hz	3.3 mA to 32.999 mA	0.18 % reading + 2 mA	
20 Hz to 45 Hz	3.3 mA to 32.999 mA	0.09 % reading + 2 mA	
45 Hz to 1 kHz	3.3 mA to 32.999 mA	0.04 % reading + 2 mA	
1 kHz to 5 kHz	3.3 mA to 32.999 mA	0.08 % reading + 2 mA	
5 kHz to 10 kHz	3.3 mA to 32.999 mA	0.2 % reading + 3 mA	
10 kHz t 30 kHz	3.3 mA to 32.999 mA	0.4 % reading + 4 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
10 Hz to 20 Hz	33 mA to 329.99 mA	0.18 % reading + 20 mA	
20 Hz to 45 Hz	33 mA to 329.99 mA	0.09 % reading + 20 mA	
45 Hz to 1 kHz	33 mA to 329.99 mA	0.04 % reading + 20 mA	
1 kHz to 5 kHz	33 mA to 329.99 mA	0.1 % reading + 50 mA	
5 kHz to 10 kHz	33 mA to 329.99 mA	0.2 % reading + 100 mA	
10 kHz to 30 kHz	33 mA to 329.99 mA	0.4 % reading + 200 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
10 Hz to 45 Hz	0.33 A to 1.099 99 A	0.18 % reading + 100 mA	
45 Hz to 1 kHz	0.33 A to 1.099 99 A	0.05 % reading + 100 mA	
1 kHz to 5 kHz	0.33 A to 1.099 99 A	0.06 % reading + 1 000 mA	
5 kHz to 10 kHz	0.33 A to 1.099 99 A	2.5 % reading + 5 000 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
10 Hz to 45 Hz	1.1 A to 2.999 99 A	0.18 % reading + 100 mA	
45 Hz to 1 kHz	1.1 A to 2.999 99 A	0.06 % reading + 100 mA	
1 kHz to 5 kHz	1.1 A to 2.999 99 A	0.6 % reading + 1 000 mA	
5 kHz to 10 kHz	1.1 A to 2.999 99 A	2.5 % reading + 5 000 mA	



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## Electrical

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Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			Fluke 5520A
45 Hz to 100 Hz	3 A to 10.999 9 A	0.06 % reading + 2 000 mA	
100 Hz to 1 kHz	3 A to 10.999 9 A	0.1 % reading + 2 000 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
1 kHz to 5 kHz	3 A to 10.999 9 A	3 % reading + 2 000 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
45 Hz to 100 Hz	11 A to 20.5 A	0.12 % reading + 5 000 mA	
100 Hz to 1 kHz	11 A to 20.5 A	0.15 % reading + 5 000 mA	
1 kHz to 5 kHz	11 A to 20.5 A	3 % reading + 5 000 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
10 Hz to 100 Hz	29 $\mu$ A to 329.99 $\mu$ A	0.25 % reading + 0.2 mA	
100 Hz to 1 kHz	29 $\mu$ A to 329.99 $\mu$ A	0.6 % reading + 0.5 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
10 Hz to 100 Hz	0.33 mA to 3.299 9 mA	0.25 % reading + 0.3 mA	
100 Hz to 1 kHz	0.33 mA to 3.299 9 mA	0.6 % reading + 0.8 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
10 Hz to 100 Hz	3.3 mA to 32.999 mA	0.08 % reading + 4 mA	
100 Hz to 1 kHz	3.3 mA to 32.999 mA	0.2 % reading + 10 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
10Hz to 100Hz	33 mA to 329.99 mA	0.08 % reading + 40 mA	
100Hz to 1kHz	33mA to 329.99 mA	0.2 % reading + 100 mA	
Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			
10 Hz to 100 Hz	0.33 A to 2.999 99 A	0.12 % reading + 200 mA	
100 Hz to 440 Hz	0.33 A to 2.999 99 A	0.3 % reading + 1 000 mA	



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Equipment to Output AC Current At the listed Frequencies <sup>FO</sup>			Fluke 5520A
10 Hz to 100 Hz	3 A to 20.5 A	0.12 % reading + 2 000 mA	
100 Hz to 1 kHz	3 A to 20.5 A	1 % reading + 5 000 mA	
Equipment to Output DC Current <sup>FO</sup>	Up to 329.999 mA	0.015 % reading + 0.05 $\mu$ A	
	Up to 3.299 99 mA	0.01 % reading + 0.25 $\mu$ A	
	Up to 32.999 9 mA	0.01 % reading + 3.3 $\mu$ A	
	Up to 1.099 99 A	0.03 % reading + 44 $\mu$ A	
	1.1 A to 2.999 99 A	0.038 % reading + 40 $\mu$ A	
	Up to 10.999 9 A (20 A range)	0.06 % reading + 330 $\mu$ A	
Equipment to Output DC Volts <sup>FO</sup>	11 A to 20.5 A	0.1 % reading + 750 $\mu$ A	
	Up to 329.999 mV	0.006 % reading + 3 $\mu$ V	
	Up to 3.299 99 V	0.005 % reading + 5 $\mu$ V	
	Up to 32.999 9 V	0.005 % reading + 50 $\mu$ V	
	30 V to 329.999 V	0.005 5 % reading + 500 $\mu$ V	
	100 V to 1 000 V	0.005 % reading + 1 500 $\mu$ V	

## Mechanical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Compression <sup>FO</sup>	10 kg to 90 kg	0.1 % of reading	Class F weights or Direct Comparison With Load Cells
	90 kg to 4 500 kg	0.3 % of reading	
Tension <sup>FO</sup>	10 kg to 90 kg	0.1 % of reading	
	90 kg to 4 500 kg	0.3 % of reading	
Torque Wrench <sup>O</sup>	0.5 N•m to 176.6 N•m	0.25 % of reading	Dead Weights & arm Torque Analyzer
Torque Wrench <sup>FO</sup>	110 lbf•ft to 1 100 lbf•ft	1.6 % of reading	Tohnichi TCF 2000N
Torque Analyzer <sup>F</sup>	1 N•m to 294.3 N•m	0.3 % of reading	Dead Weights, master arms & wheels
Tachometers <sup>F</sup>	500 rpm to 5 000 rpm (Resolution = 1 rpm)	2 rpm	Comparison with Variable Speed Motor and HT4100 Tachometer



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## 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
Pressure <sup>FO</sup>	Up to 2 000 kPa	0.05 % of reading	Fluke 725 and 700P27 Module Transcat Pressure Gage Dead Weights and Pump
	2 000 kPa to 68 900 kPa	0.11 % of reading	
Indirect Verification of Rockwell Hardness Tester HRA <sup>FO</sup>	60 HRA to 70 HRA	1.3 HRA	ASTM E18 and Calibrated Rockwell Hardness Test Blocks
	70 HRA to 79 HRA	1.3 HRA	
	79 HRA to 93 HRA	0.75 HRA	
Indirect Verification of Rockwell Hardness Tester HRB <sup>FO</sup>	40 HRB to 60 HRB	1.4 HRB	
	60 HRB to 75 HRB	1.4 HRB	
	75 HRB to 93 HRB	1.4 HRB	
Indirect Verification of Rockwell Hardness Tester HRC <sup>FO</sup>	20 HRC to 40 HRC	1.3 HRC	
	40 HRC to 59 HRC	1.3 HRC	
	59 HRC to 70 HRC	0.78 HRC	
Indirect Verification of Rockwell Hardness Tester HR15N <sup>FO</sup>	63 HR15N to 73 HR15N	1.6 HR15N	
	73 HR15N to 83 HR15N	1.3 HR15N	
	83 HR15N to 94 HR15N	0.9 HR15N	
Indirect Verification of Rockwell Hardness Tester HR30N <sup>FO</sup>	44 HR30N to 55 HR30N	1.4 HR30N	
	55 HR30N to 69 HR30N	1.3 HR30N	
	69 HR30N to 85 HR30N	1.3 HR30N	
Indirect Verification of Rockwell Hardness Tester HR30T <sup>FO</sup>	40 HR30T to 50 HR30T	0.93 HR30T	
	50 HR30T to 63 HR30T	1.7 HR30T	
	63 HR30T to 76 HR30T	1.4 HR30T	



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## Mass, Force, and Weighing Devices

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Scales and Balances <sup>FO</sup>	10 g to 120 g (Resolution = 0.000 1 g)	3 mg	Class 1 Weights
	120 g to 500 g (Resolution = 0.001 g)	6 mg	
	1 kg to 22 kg (Resolution = 0.2 g)	4 g	Class F Weights
	22 kg to 90 kg (Resolution = 0.005 kg)	11 g	
Force Gage & Load Cells <sup>FO</sup>	0.5 kg to 225 kg	0.1 % of reading	

1. The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represents the smallest measurement uncertainty attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is typically 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 presence of a superscript F means that the laboratory performs calibration of the indicated parameter at its fixed location. Example: Outside Micrometer<sup>F</sup> would mean that the laboratory performs this calibration at its fixed location.
4. The presence of a superscript O means that the laboratory performs calibration of the indicated parameter onsite at customer locations. Example: Outside Micrometer<sup>O</sup> would mean that the laboratory performs this calibration onsite at the customer's location.
5. 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<sup>FO</sup> would mean that the laboratory performs this calibration at its fixed location and onsite at customer locations.



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6. 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.
7. The term D represents diameter in inches or millimeters appropriate to the uncertainty statement.
8. The term L represents length in inches or millimeters appropriate to the uncertainty statement.

