



PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

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

Metrocal S.A. de CV

***Paseo de las Fuentes # 5100, Col. Del Paseo Residencial
Monterrey, Nuevo León, 64920***

*(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 January 2009):

Dimensional, Time & Frequency, Optical, Mechanical, Mass, Force, and Weighing Devices and Thermodynamic Calibration

(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:

Tracy Szerszen
President/Operations Manager

Initial Accreditation Date:

December 17, 2004

Issue Date:

November 30, 2015

Expiration Date:

February 28, 2018

Accreditation No.:

46962

Certificate No.:

L15-404

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*



Certificate of Accreditation: Supplement

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Paseo de las Fuentes # 5100, Col. Del Paseo Residencial
 Monterrey, Nuevo León 64920
 Contact Name: Cesar Gonzalez Phone: 818-349-4400

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

Optical

| 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 |
|--|--|--|--|
| ρ (λ) Spectral Reflectance ^{FO} | ρ (400 nm to 700 nm): 0.35 % to 92.13 % | 2.5% of reading | Ceramic Research Tiles |
| Color Values ^{FO} | CIE L* 4.19 to 96.61 | 0.5 | |
| | CIE a* -34.83 to 58.01 | 0.5 | |
| | CIE b* -40.49 to 87.63 | 0.5 | |
| | X : 0.42 to 101.56 | 0.5 | |
| | Y : 0.46 to 91.48 | 0.5 | |
| Z : 0.3 to 106.22 | 0.5 | 0.5 | |
| Spectrophotometers τ (λ) Transmittance ^{FO} | τ : 3 % to 90 % | 0.4 % of reading | CENAM Glass Filters |
| Spectrophotometers α (λ) Absorbance ^{FO} | α (λ): 0.02 to 2.0 | 0.05 % of reading | |
| Spectrophotometers λ Wavelength ^{FO} | λ : 230 nm to 700 nm | 0.27 nm | Holmium Oxide |
| ρ (e): Glossmeters ^{FO} 20° | ρ (e): (0.4 to 92.1) Gloss Units | 0.3 Gloss Units | Ceramic Research Gloss and Semi-Gloss Std. |
| ρ (e): Glossmeters ^{FO} 60° | ρ (e): (4.4 to 94.9) Gloss Units | 0.3 Gloss Units | |
| ρ (e): Glossmeters ^{FO} 85° | ρ (e): (17.6 to 99.8) Gloss Units | 0.3 Gloss Units | |
| ρ (e): Gloss Tiles ^F 20° | ρ (e): (0.4 to 92.1) Gloss Units | 0.3 Gloss Units | Elcometer 480T Glossmeter 20 / 60 / 85 |
| ρ (e): Gloss Tiles ^F 60° | ρ (e): (4.4 to 94.9) Gloss Units | 0.3 Gloss Units | |
| ρ (e): Gloss Tiles ^F 85° | ρ (e): (17.6 to 99.8) Gloss Units | 0.3 Gloss Units | |
| E_v Illuminance ^O | 120 lux to 3 000 lux | 1.3 % of reading | LC-1 Meter |
| E_v Light Color ^O | 50 K to 10 000 K | 15 K | |
| E (v) Light Meters ^F | 120 lux to 3 000 lux | 2 % of reading | LC-1 Meter, Optical Bench |
| E (λ) UV Spectral Radiance ^O | 220/420 nm 0 W/m ² /nm to 2 W/m ² /nm | 5 % of reading | UV Radiometer UVCR-20 |

Time and 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 |
|--|---|--|--|
| Frequency of Rotation ^{FO} | 6 r/min to 24 000 r/min | 2 % of reading | Tachometer Shimpo DT-205L |



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Mechanical

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|---|---|--|--|
| Vacuum Gauge ^{FO} | -88 kPa to -1.0 kPa | 0.2% of reading | DPG8000 -VAC, TP1-40 |
| Pressure Gauge ^{FO} | 69 kPa to 690 kPa | 0.7% of reading | DPG8000 -100, TP1-40 |
| Pressure Gauge ^{FO} | 690 kPa to 6 900 kPa | 0.7 % of reading | DPG8000-1k, T1302 |
| Dynamic Viscosity ^{FO} | 0.1 mPa.s to 30 000 mPa.s | 2 % of reading | Cannon, Brookfield STD |
| Kinematic Viscosity ^{FO} Ford Cup | 26 mm ² /s to 367 mm ² /s | 2.5 % of reading | Cannon, Brookfield STD (Flow Time 20 s to 100 s) |
| | Ford 2 mm ² /s | 2.5 % of reading | Cannon, Brookfield STD s = 1.44 (t-18) |
| | Ford 3 mm ² /s | 2.5 % of reading | Cannon, Brookfield STD s = 2.31 (t-6.58) |
| | Ford 4 mm ² /s | 2.5 % of reading | Cannon, Brookfield STD s = 3.85 (t-4.49) |
| | Ford 5 mm ² /s | 2.5 % of reading | Cannon, Brookfield STD s = 12.1 (t-2) |
| Kinematic Viscosity ^{FO} Zahn Cup | 20 mm ² /s to 1 400 mm ² /s | 2.5 % of reading | Cannon, Brookfield STD (Flow Time 20 s to 80 s) |
| | Zahn 2 mm ² /s | 2.5 % of reading | Cannon, Brookfield STD s = 3.5 (t-14) |
| | Zahn 3 mm ² /s | 2.5 % of reading | Cannon, Brookfield STD s = 11.7 (t-7.5) |
| | Zahn 4 mm ² /s | 2.5 % of reading | Cannon, Brookfield STD s = 14.8 (t-5) |
| | Zahn 5 mm ² /s | 2.5 % of reading | Cannon, Brookfield STD s = 23 (t) |
| Micropipettes ^F | 100 μ L to 1 000 μ L | 3.2 μ L | Analytical Balance AND HR-200 |
| Burette and Pipettes ^F | 1 mL to 50 mL | 3.8 μ L | |
| Flask ^F | 100 mL to 4 L | 0.65 mL | Precision Balance AND GF30K |
| | 4 L to 20 L | 5.8 mL | |

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 |
|--|---|--|--|
| Micrometers ^F | 0.5 mm to 101.6 mm (0.1 in to 4 in) | 10 μ m (393.7 μ m) | Gage Blocks Grade 0 |
| Calipers ^F | 0.5 mm to 304.8 mm (0.1 in to 12 in) | 45 μ m (1 777 μ m) | |
| Measuring Tape ^F | 0.1 m to 5 m | 1 mm | Chrome Rule |



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Thermodynamic

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|---|---|--|--|
| Glass Thermometers ^{FO} | -20 °C to 150 °C | 0.15 °C | VWR 1160 Bath, PT100, Agilent 34410A |
| Thermocouple Type J ^{FO} | -40 °C to 400 °C | 0.1 °C | Dry Block Fluke 517, 9122A, PT100, Agilent 34410A |
| | 400 °C to 1 100 °C | 3 °C | Dry Block Fluke 9122A, Terlab MA-12D |
| Thermocouple Type B ^{FO} | 0 °C to 400 °C | 0.1 °C | Dry Block Fluke 517, 9122A, PT100, Agilent 34410A |
| | 400 °C to 1 100 °C | 3 °C | Dry Block Fluke 9122A, Terlab MA-12D |
| Thermocouple Type K ^{FO} | -40 °C to 400 °C | 0.1 °C | Dry Block Fluke 517, 9122A, PT100, Agilent 34410A |
| | 400 °C to 1 100 °C | 3 °C | Dry Block Fluke 9122A, Terlab MA-12D |
| Thermocouple Type S ^{FO} | -40 °C to 400 °C | 0.1 °C | Dry Block Fluke 517, 9122A, PT100, Agilent 34410A |
| | 400 °C to 1 100 °C | 3 °C | Dry Block Fluke 9122A, Terlab MA-12D |
| Thermocouple Type T ^{FO} | -40 °C to 400 °C | 0.1 °C | Dry Block Fluke 517, 9122A, PT100, Agilent 34410A |
| Thermocouple Type R ^{FO} | -40 °C to 400 °C | 0.1 °C | Dry Block Fluke 517, 9122A, PT100, Agilent 34410A |
| | 400 °C to 1 100 °C | 3 °C | Dry Block Fluke 9122A, Terlab MA-12D |
| Thermocouple Type N ^{FO} | -40 °C to 400 °C | 0.1 °C | Dry Block Fluke 517, 9122A, PT100, Agilent 34410A |
| | 400 °C to 1 100 °C | 3 °C | Dry Block Fluke 9122A, Terlab MA-12D |
| Thermocouple Type E ^{FO} | -40 °C to 400 °C | 0.1 °C | Dry Block Fluke 517, 9122A, PT100, Agilent 34410A |
| | 400 °C to 1 000 °C | 3 °C | Dry Block Fluke 9122A, Terlab MA-12D |
| RTD Pt100 ^{FO} | -40 °C to 400 °C | 0.1 °C | Dry Block Fluke 517, 9122A, PT100, Agilent 34410A |
| Digital Thermometer ^{FO} (Temperature Controller's Indicator and Probe) | -40 °C to 400 °C | 0.1 °C | Dry Block Fluke 517, 9122A, PT100, Agilent 34410A |
| | 400 °C to 1 100 °C | 3 °C | Dry Block Fluke 9122A, Terlab MA-12D |



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Mass, Force, and Weighing Devices

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|--|---|--|--|
| Scales and Balances ^{FO} | 1 g to 200 g (Res. = 0.1 mg) | $(2.55 \times 10^{-1} + 1.38 \times 10^{-7}Wt)$ mg | F1 Weight Set Rice Lake |
| | 200g to 6 kg (Res.= 0.01g) | $(1.1 \times 10^{-2} + 3.36 \times 10^{-6}Wt)$ g | F2 Weight Set Rice Lake |
| | 10 kg to 200 kg (Res.= 1 g) | $(8 \times 10^{-3} + 5.43 \times 10^{-5}Wt)$ kg | M1 Weight Set Tabesa |
| Analytical Balances ^{FO} | 0.1 g to 200 g (Res.= 0.01 mg) | $(0.13 + 1.27 \times 10^{-3}Wt)$ mg | E2 Weight Set Rice Lake |
| Force ^F | 900 N to 8 826 N | 0.5 % of reading | Load Cell |
| Mass Density ^F | 10 g/cm ³ to 100 g/cm ³ | 2 % of reading | Balance and HR-200 (Res.= 0.1mg) |

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^F 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^O 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^{FO} would mean that the laboratory performs this calibration at its fixed location and onsite at customer locations.
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 L represents length in inches or millimeters as appropriate to the uncertainty statement.
8. The term Wt represents weight in pounds or grams (including SI multiple and submultiple units) appropriate to the uncertainty statement.