



Certificate of Accreditation: Supplement

Metrosmart, S.A. de C.V. / Metrokal

Av. Peñuelas No. 5, Nave 29, Colonia Peñuelas
 Querétaro, Querétaro, México C.P. 76148
 Contact Name: Miriam Diaz Phone: 442-220-7054

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

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
Refractometer ^{FO}	0 °Brix to 75 °Brix	0.022 °Brix	Reference Solution INIMET
pH Meters ^{FO}	4 pH	0.014 pH	Reference Solution Fermont/CENAM CENAM Technical Guide
	7 pH	0.011 pH	
	10 pH	0.02 pH	
Conductivity Meter ^{FO}	10 μ S	1 μ S	Conductivity Solutions & Aliquot Cenam, Aqueous Solution of 0.0003 mol/kg Cenam Aqueous Solution of 0.001 mol/kg Analytical Scale Mettler Toledo AT201, Mettler Toledo XP1203S CENAM Technical Guide
	84 μ S	1 μ S	
	5 μ S to 12 880 μ S	1 μ S to 50 μ S	
	1 413 μ S	5 μ S	
	12 880 μ S	50 μ S	
Dynamic Viscosity ^F	0.1 Pa·s to 100 Pa·s	2.2 % of reading	Canon Certified Reference Standards Oil 25 °C ASTM D2196

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
Tachometer ^{FO} Rate of Rotation, Rotational Frequency Measuring Machines.	0.1 rpm to 99 999 rpm	0.6 rpm	AS432-B Tachometer Mitutoyo Stroboscopic Lamp OMEGA Optical Tachometer Adapter TRANSMILLE CENAM Technical Guide
	0.01 rad/s to 10 472 rad/s	0.006 rad/s	
Stopwatch Fixed Point ^{FO}	86 400 s	0.7 s	960-12 Chronometer, Control Company Model: 1021 NIST Recommended Practice Guide, Special Publication
Melt Flow Index Time ^{FO}	1 min to 10 min	0.84 s	Stopwatch ASTM D1238-13
Impact Tester Time ^{FO}	1 min to 10 min	0.84 s	Stopwatch ASTM D256-10
Speed - Force Test Machines ^{FO}	1 mm/min to 600 mm/min	0.84 s	Stopwatch ASTM E2658-15



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Mechanical

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Vacuum ^{FO}	-99.9 kPa to -6 kPa	0.016 kPa	Vacuum Meter Brand: SPMK Model: SPMK700 Direct Comparison CENAM Technical Guide
	-6 kPa to -0.138 kPa	0.069 kPa	Vacuum Meter Brand: Druck Model: DPI 610 Direct Comparison CENAM Technical Guide
Pressure Gauge ^{FO}	2 Pa to 496 Pa	0.4 Pa	Column Pressure Gage Brand: Dwyer Model: Microtector Accuracy: 0.05 Pa Direct Comparison CENAM Technical Guide
	5 kPa to 69.95 MPa	0.018 MPa	Manometer Absolute DPI 140 & Crystal XPSi Direct comparison CENAM Technical Guide
Pressure Gauge and Pressure Transmitter ^{FO}	496 Pa to 1 245 Pa	1.3 Pa	Pressure Gage Brand: Druck Model: DPI610 Direct Comparison CENAM Technical Guide
	1 245 Pa to 40 000 Pa	1.3 kPa	Pressure Gauge Brand: Huaxin Instrument / Model: ME01 Direct Comparison CENAM Technical Guide
	34.47 kPa to 3.44 MPa	0.059 kPa	Pressure Balance Brand: Dynametric Model: PPS500
	3.44 MPa to 20.68 MPa	2 kPa	Pressure Gage Brand: Druck Model: DPI610 Direct Comparison CENAM Technical Guide



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Pressure Gauge and Pressure Transmitter ^{FO}	20.68 MPa to 68.94 MPa	12 kPa	Pressure Gage Brand: CRYSTAL Model: XP2i Direct Comparison CENAM Technical Guide
	68.94 MPa to 137.88 MPa	16 kPa	Pressure Gage Brand: ADDITEL Model: 681 Direct Comparison CENAM Technical Guide
	137.88 MPa to 250 MPa	16 kPa	Pressure Gage Brand: SPMK Model: SPMK700 Direct Comparison CENAM Technical Guide
Sphygmomanometer ^{FO}	4 kPa to 40 kPa	0.038 kPa	Pressure Gage Brand: Huaxin Instrument Brand: ME01 Direct Comparison CENAM Technical Guide
Pressure Gauge Differential ^{FO}	2 Pa to 496 Pa	0.4 Pa	Column Manometer (Differential) Brand: Dwyer Model: Microtector Accuracy: 0.05 Pa Direct Comparison CENAM Technical Guide
	496 Pa to 1 245 Pa	11 Pa	Column Manometer (Differential) Brand: KIMO Model: GF 1000 VF1 Accuracy: 0.098 Pa Column Manometer Brand: KIMO Model: GF 500 VF1 Accuracy: 0.098 Pa Direct Comparison CENAM Technical Guide
	1 245 Pa to 9 972 Pa	19 Pa	



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Pressure Gauge Absolute and Pressure Transmitter ^{FO}	5 kPa to 110.38 kPa	8.8 kPa	Pressure Gage Absolute Brand: Druck Model: DPI140 Direct Comparison CENAM Technical Guide
	110.38 kPa to 3.44 MPa	66 kPa	Barometer Brand: Druck / Model: DPI140 Accuracy: 0.01 % ET Pressure Balance Brand: Dynamitic / Model: PPS 500 Direct Comparison CENAM Technical Guide
	3.44 MPa to 68.94 MPa	11 kPa	Barometer Brand: Druck / Model: DPI140 Pressure Gage Brand: Crystal / Model: XP2i Direct Comparison CENAM Technical Guide
Pressure Dead Weight Tester ^{FO}	34.47 kPa to 3.44 MPa	0.36 kPa	Dead Weight Tester Brand: Dynametrics Model: PPS 500 Cross Floating CENAM Technical Guide
Dead Weight Tester Industrial ^{FO}	68.95 kPa to 68.95 MPa (10 psi to 10 000 psi)	0.28 kPa	Dead Weight Tester Brand: Pressurements M2200 Cross Floating CENAM Technical Guide
Indirect Verification of Rockwell Hardness Tester HRBW ^{FO}	20 HRBW to 59 HRBW	0.61 HRBW	ASTM E-18 Hardness Reference Test Block
	60 HRBW to 84 HRBW	0.56 HRBW	
	85 HRBW to 100 HRBW	0.59 HRBW	
Indirect Verification of Rockwell Hardness Tester HRC ^{FO}	20 HRC to 34 HRC	0.46 HRC	
	35 HRC to 59 HRC	0.39 HRC	
	60 HRC to 70 HRC	0.38 HRC	



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Indirect Verification of Rockwell Hardness Tester HRA ^{FO}	20 HRA to 65 HRA	0.36 HRA	Hardness Reference Test Block ASTM E-18	
	70 HRA to 78 HRA	0.35 HRA		
	80 HRA to 84 HRA	0.23 HRA		
Indirect Verification of Rockwell Hardness Tester HRF ^{FO}	57 HRF to 75 HRF	0.45 HRF		
	80 HRF to 90 HRF	0.5 HRF		
	94 HRF to 100 HRF	0.47 HRF		
Indirect Verification of Rockwell Hardness Tester HR30N ^{FO}	42 HR30N to 50 HR30N	0.29 HR30N		
	55 HR30N to 73 HR30N	0.35 HR30N		
	77 HR30N to 82 HR30N	0.25 HR30N		
Indirect Verification of Rockwell Hardness Tester HR30T ^{FO}	43 HR30T to 56 HR30T	0.48 HR30T		Hardness Reference Test Block ASTM E-18
	57 HR30T to 69 HR30T	0.54 HR30T		
	70 HR30T to 83 HR30T	0.52 HR30T		
Indirect Verification of Brinell Hardness tester HBW 10/3 000 ^{FO}	95.5 HBW to 250 HBW	2.9 HBW	Hardness Reference Blocks ASTM E-10	
	250 HBW to 450 HBW	6.8 HBW		
	450 HBW to 600 HBW	8.9 HBW		
Indirect Verification of Brinell Hardness tester HBW 2.5/187.5 ^{FO}	95.5 HBW to 250 HBW	2.4 HBW		
	250 HBW to 450 HBW	5.1 HBW		
	450 HBW to 600 HBW	9.2 HBW		
Verification of Vickers Micro Hardness Tester HV 0.5 ^{FO}	100 HV to 240 HV	4.4 HV	Hardness Reference Blocks ASTM E-384	
	240 HV to 600 HV	7.6 HV		
	600 HV to 999 HV	11 HV		
Direct Calibration of Testing Machines, Force Instruments and Force Transducer (Tension) ^{FO}	0.49 N to 499 N	0.11 % of reading	Reference Force Transducer ISO-7500-1 NMX-CH-7500-1-INMC ISO-376 NMX-CH-376-INMC	
	49.8 N to 499 N	0.17 % of reading		
	0.98 kN to 9.806 kN	0.2 % of reading		
	4.9 kN to 49.03 kN	0.18 % of reading		
	9.806 kN to 98.06 kN	0.19 % of reading		
Direct Calibration of Testing Machines, Force Instruments and Force Transducer (Compression) ^{FO}	58.84 kN to 588.39 kN	0.25 % of reading		
	0.49 N to 499 N	0.11 % of reading		
	4.9 N to 49.8 N	0.15 % of reading		
	49.8 N to 499 N	0.16 % of reading		
	0.98 kN to 9.806 kN	0.22 % of reading		
4.9 kN to 49.03 kN	0.16 % of reading			



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Direct Calibration of Testing Machines, Force Instruments and Force Transducer (Compression) ^{FO}	9.806 kN to 98.06 kN	0.15 % of reading	Reference Force Transducer ISO-7500-1 NMX-CH-7500-1-INMC ISO-376 NMX-CH-376-INMC
	58.84 kN to 588.39 kN	0.18 % of reading	
Torque Tools, Electrical and Pneumatic Screwdriver ^{FO}	3.38 N·m to 67.6 N·m	0.12 % of reading	ISO-6789 Torque Transducer MOUNTZ BMX-50F; BMX-500F Joint Simulator and Dynamic Transducer Desoutter, DRT5SQ75, ISO 5393
	33.8 N·m to 676 N·m	0.1 % of reading	
Torque Tools, Electrical and Pneumatic Screwdriver ^{FO}	0.5 N·m to 25 N·m	0.12 % of reading	ISO-6789 Set Torque Transducer NORBAR 50673 Log; 50675 Log; 50703 Log Joint Simulator and Dynamic Transducer Desoutter, RT5SQ75 ISO 5393
	20 N·m to 400 N·m	0.16 % of reading	
	250 N·m to 2 500 N·m	0.19 % of reading	
Torque Transducer, Spring Tester Machines, Bottle Cap Torque tester, Analyzer of Torque ^{FO}	0.1 N·m to 100 N·m	0.1 % of reading	Lever Arm and Suspended Set Mass, Class F1 Weights. ISO-6789-2 CENAM Technical Guide
Direct Verification of Durometer Hardness Tester Types: A, B, C, D, E, O, OO & DO			ASTM D2240
Extension at zero reading	2.46 mm to 2.54 mm	6 μ m	Mahr, MarVision MM320 Vision Equipment
Indenter Shape (Not all parameters apply to all of Durometer Types) Indenter Diameter Indenter Tip Diameter Indenter Tip Radius Indenter Tip Angle		6 μ m 6 μ m 6 μ m 0.1°	
Durometers Indenter Spring Types A, B, E & O Types C, D, & DO ^{FO}	0.55 N to 8.05 N 4.445 N to 44.45 N	0.045 N 1.4 N	Load Cell (Res.= 0.1 g)



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Volume

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Piston Micropipettes ^{FO}	1 μ L to 1 000 μ L	0.3 % of reading	Analytical Scale RADWAG AS 82/220.X2 ISO 8655-2 CENAM Technical Guide
Pipettes ^{FO}	1 mL to 1 000 mL	0.42 % of reading	Analytical Scale RADWAG AS 82/220.X2, METTLER TOLEDO XP1203S, OHAUS EX6202, ISO 4787 CENAM Technical Guide
Burettes Piston, Burettes ^{FO}	1 mL to 1 000 mL	0.65 % of reading	Analytical Scale RADWAG AS 82/220.X2, METTLER TOLEDO XP1203S, OHAUS EX6202, ISO 4787 CENAM Technical Guide
Cylinders Graduated, Dilutors, Dispensers, Pycnometers, Volumetric Flask, special Containers ^{FO}	1 mL to 1 000 mL	0.25 % of reading	OHAUS, EX6202, Electronic Balance WA30IX, Master Volumetric Container ISO 4787, NMX-CH-049- IMNC-2006 CENAM Technical Guide
Volumetric Flask Cylinders Graduated, special Containers, Volumetric Measurement of Graduated Neck ^{FO}	1 000 mL to 20 000 mL	0.021 % of reading	Electronic Balance WA30IX, Master Volumetric Container, ISO 4787, NMX-CH-049- IMNC-2006 OIML R120 CENAM Technical Guide
Special Containers, Volumetric Containers, Volumetric Measurement of Graduated Neck ^{FO}	20 000 mL to 250 000 mL	0.025 % of reading	Flow Meter Brand: Micro Motion Model: 00F138NABAEZZZZ Type Coriolis, OIML R120
Volume Measurement Containers ^{FO}	200 L to 30 000 L (Res.= 0.01 L)	0.11 % of reading	



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Flow Meter Calibration ^{FO}	3 360 L/h to 18 000 L/h (Res.= 0.01 L)	0.11 % of reading	Flow Meter, Brand: Micro Motion, Model: 00F138NABAEZZZZ Type Coriolis OIML R117 ISO 10790 API -MPMS, Chapter 5 and 6 CENAM Technical Guide
Standard Leak Tester and Leak Tester ^{FO}	0.000 2 L/min to 0.1 L/min	0.012 mL/min	Chronometer, Control Company Model: 1021, Lector ASL/WIKA Model: CTR2000-024, Pt100 Burns Model: WPP0G1-12-5A Manometer Const Model: 211 No.211H13110220 CENAM Technical Guide
Fixed Contain Volume Tank and Mobile ^{FO}	250 L to 120 000 L	0.088 % of reading	Metric Tape with Lufkin Ballast of 15 mm and 50 mm
Tanks on Ground "to contain" (Horizontal) ^F	500 L to 200 000 L	0.41 % of reading	Karl Deutsch Thickness Meter and Thermometer Fluke ISO 7507-1
Tanks on The Ground "to contain(Vertical) ^F	5 m ³ to 32 000 m ³	0.19 % of reading	
Gas Flow Meters: Standard Leak Leak Tester Mass Flow Meter Mass Flow Controller Laminar Flow Meter ^{FO}	(0.5 mL/min to 10 mL/min	0.74 % of reading	ALICAT Mass Flow Meter, CEM Calibration Procedure ME-009
	10 mL/min to 100 mL/min	0.53 % of reading	
Gas Flow Meters: Standard Leak, Leak Tester Mass Flow Meter, Mass Flow Controller Laminar Flow Meter Piston Flow Meter Bubble Flow Meter ^{FO}	0.1 L/min to 1 L/min	0.6 % of reading	



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Gas Flow Meters: Standard Leak, Leak Tester Mass Flow Meter, Mass Flow Controller, Laminar Flow Meter, Piston Flow Meter, Bubble Flow Meter, Wet Test Meter Diaphragm Test Meter Rotameter, Turbine Meter Roots Meter, Differential Pressure Meter, Hot Wire Meter ^{FO}	1 L/min to 10 L/min	0.5 % of reading	ALICAT Mass Flow Meter CEM Calibration Procedure ME-009
	10 L/min to 100 L/min	0.81 % of reading	
Gas Flow Meters: Mass Flow Meter, Mass Flow Controller, Laminar Flow Meter, Diaphragm Test Meter, Rotameter, Turbine Meter Roots Meter, Differential Pressure Meter, Hot Wire Meter ^{FO}	100 L/min to 400 L/min	0.56 % of reading	
Particle Counters - Flow ^{FO}	Up to 500 L/m	0.81 % of reading	ALICAT Mass Flow Meter (Sampling Flow Rate Error) ISO 21501-4

Dimensional

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Measurement Horizontal Systems and Benches of only One Axes ^{FO}	Up to 10 m	(1.1 + 0.01L) μ m	Laser Measurement System, Renishaw Mod: XL-80 ISO 10360-2
Handheld Laser Distance Meters ^{FO}	Up to 100 m	(0.61 + 0.012L) mm	Measuring Tape, Lufkin Mod: N250M BS ISO 16331-1
Laser Micrometer ^{FO}	Up to 25.4 mm	(0.19 + 3 x 10 ⁻³ L) μ m	Cilindric Patterns, Mahr; NMX-CH-99-SCFI
Numerically Controlled Machine Tool (CNC)- X, Y, Z (Linear Displacement Accuracy) ^{FO}	Up to 15 000 mm	(0.25 + 8.4 x 10 ⁻⁴ L) μ m	Laser Measurement System, Renishaw Mod: XL-80 ISO 230-2



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Block Gauges ^F	400 mm to 406.4 mm	0.75 μ m	Gage Blocks Master Grade 0 NMX-CH-3650 Direct Comparison
	500 mm to 508 mm	0.94 μ m	
Melt Flow Index ^{FO}	Up to 25 mm	2 μ m	ASTM D1238 Micrometer
Impact Tester and Notch ^{FO}	Up to 300 mm	0.01 mm	ASTM D256 Digital Caliper
Force Test Machines Displacement ^O	Up to 600 mm	0.011 mm	ASTM E2309 Height Caliper Fixture
Length Measure Instruments ^{FO}	Up to 3 000 mm (Res.= 0.000 1 mm)	(0.81 + 0.005L) mm	Blocks Gage Master K MTK-LAB-TEC-64 Horizontal Measurement System. Direct Comparison ISO 10360-2
Digital Scale Ruler ^{FO}	Up to 1 000 mm (Res.= 0.01 mm)	(6.8 + 0.004 4L) mm	Blocks Gage Master Grade 0 and Grade 1 JIS B 7507 Direct Comparison
Microscopes ^{FO} X and Y Axis	Up to 300 mm (Res.= 0.001 mm)	(0.52 + 0.006 4L) mm	Glass Rule (Res.= 0.1 mm) Master Blocks Grade 1 JIS-B-7153 Direct Comparison
Block Gauges ^F	125 mm to 127 mm	0.36 μ m	Gage Blocks Master Grade 0 NMX-CH-3650 Direct Comparison
	150 mm to 152.4 mm	0.38 μ m	
	175 mm to 177.8 mm	0.41 μ m	
	200 mm to 203.2 mm	0.45 μ m	
	250 mm to 254 mm	0.52 μ m	
	300 mm to 304.8 mm	0.59 μ m	
Pi Tapes ^F	50.8 mm to 3 048 mm (Res.= 0.01 mm)	(0.105 + 0.020 6L) mm	Linear Scale (Horizontal Measurement System) SINO SDS6-2V MTK-LAB-TEC-69, Pi tapes SOP 23 NIST Technical Guide



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Thermodynamic

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Furnaces–Mufflers ^{FO}	0 °C to 420 °C	0.042 °C	RTD Brand: Bourns, Model: WPP0G1-12-5/LT40/FS03 Calibrator with Indicator ASL/WIKA CTR2000-024 Thermocouple Type S & Dry Block Fluke 9150 Procedure MTK-LAB-T-01 CENAM Technical Guide
	420 °C to 900 °C	0.33 °C	
Radiation Thermometer ^{FO}	30 °C to 400 °C	0.7 °C	Black body, Thermocouple Type K & Dry Block Fluke 9150 Procedure MTK-LAB-T-01 CENAM Technical Guide
	400 °C to 900 °C	1.2 °C	
Humidity Meter ^{FO}	10 % RH to 95 % RH	1.2 % RH	Digital Hygrometer, Vaisala MI70 Chamber of Humidity and Salts CENAM Technical Guide Procedure MTK-LAB-H-01
	97 % RH	1.2 % RH	Digital Hygrometer Vaisala MI70 Salt Certified by Vaisala CENAM Technical Guide Procedure MTK-LAB-H-01
Liquids in Glass Thermometer ^{FO}	-25 °C to 140 °C	0.062 °C	RTD Brand: Bourns, Model: WPP0G1-12-5 ^a /LT40/FS03; Calibrator with Indicator ASL/WIKA CTR2000-024 Dry Block Kaye LTR140, Fluke 9140, Fluke 9150 Brookfield TC-500 CENAM Technical Guide Procedure MTK-LAB-T-01
	140 °C to 420 °C	0.062 °C	
Thermometer Direct Reading ^{FO}	-25 °C to 350 °C	0.062 °C	RTD Brand: Bourns, Model: WPP0G1-12-5 ^a /LT40/FS03 Calibrator with Indicator ASL/WIKA CTR2000-024, Dry Block Kaye LTR140, Fluke 9140, Fluke 9150 Brookfield TC-500, Process Calibrator, RTD ACCUMAC Dry Block ADDITEL Direct Comparison Method CENAM Technical Guide Procedure MTK-LAB-T-01
	350 °C to 420 °C	0.062 °C	
	420 °C to 1 197 °C	1.8 °C	



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Bi-Metal Thermometer ^{FO}	-25 °C to 420 °C	0.062 °C	RTD Brand: Bourns Model: WPP0G1-12-5/ LT40/FS03 Calibrator with Indicator ASL/WIKA CTR2000-024 Dry Block Kaye LTR140, Fluke 9140, Fluke 9150 Direct Comparison Method CENAM Technical Guide Procedure MTK-LAB-T-01
Climatic Chambers, Refrigerating (Freezer) Chambers, Sterilizer & Incubators ^{FO}	-40 °C to 420 °C	0.042 °C	RTD Brand: Bourns Model: WPP0G1-12-5/LT40/FS03 Calibrator with Indicator ASL/WIKA CTR2000-024
Water Baths, Temperature Calipers and Bain-Marie ^{FO}	-40 °C to 420 °C	0.042 °C	Thermocouple Type K. Process Calibrator SPMK518 with
Temperature Measurement Thermocouple Type B ^{FO}	20 °C to 420 °C	0.062 °C	Thermocouple Type "S" Dry Block, Fluke 9150, EA 10/11 Direct Comparison CENAM Technical Guide Procedure MTK-LAB-T-01
	420 °C to 900 °C	0.7 °C	
Temperature Measurement Thermocouple Type E ^{FO}	-25 °C to 420 °C	0.062 °C	CENAM Technical Guide Procedure MTK-LAB-T-01
	420 °C to 850 °C	0.7 °C	
Temperature Measurement Thermocouple Type N, K and J ^{FO}	-25 °C to 420 °C	0.062 °C	CENAM Technical Guide Procedure MTK-LAB-T-01
	420 °C to 900 °C	0.7 °C	
Temperature Measurement Thermocouple Type R ^{FO}	5 °C to 420 °C	0.062 °C	CENAM Technical Guide Procedure MTK-LAB-T-01
	420 °C to 900 °C	0.7 °C	
Temperature Measurement Thermocouple Type S ^{FO}	-25 °C to 420 °C	0.062 °C	CENAM Technical Guide Procedure MTK-LAB-T-01
	420 °C to 900 °C	0.7 °C	
Temperature Measurement Thermocouple Type T ^{FO}	-25 °C to 370 °C	0.062 °C	RTD Brand: Bourns Model: WPP0G1-12-5/LT40/FS03 Calibrator with Indicator ASL/WIKA CTR2000-024 Thermocouple Type K. Process Calibrator SPKM Instrument Process Calibrator, RTD Accumac Dry Block ADDITEL, Process Calibrator SPMK518 with Thermocouple Type "S" Procedure MTK-LAB-T-01 Direct Comparison Method ASTM E220, ASTM E230



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Av. Peñuelas No. 5, Nave 29, Colonia Peñuelas

Querétaro, Querétaro, México C.P. 76148

Contact Name: Miriam Diaz Phone: 442-220-7054

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

Thermodynamic

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
Melt Flow Index Temperature ^{FO}	20 °C to 400 °C	0.1 °C	Thermometer with RTD PT 100 Industrial (Res.+ 0.01 °C) Direct Comparison Method ASTM D1238

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
Temperature Calibration Indication and Control Equipment Used with Thermocouple Type E ^{FO}	-100 °C to 0 °C	0.9 °C	Electrical Simulation of Thermocouple Output Process Calibrator SPKM Instrument Procedure MTK-LAB-T-01 Direct Comparison Method ASTM E220 ASTM E230
	0 °C to 1 700 °C	0.7 °C	
Temperature Calibration Indication and Control Equipment Used with Thermocouple Type J ^{FO}	-100 °C to 0 °C	0.12 °C	
	0 °C to 1 100 °C	0.18 °C	
Temperature Calibration Indication and Control Equipment Used with Thermocouple Type K ^{FO}	-100 °C to 0 °C	0.14 °C	
	0 °C to 1 200 °C	0.31 °C	
Temperature Calibration Indication and Control Equipment Used with Thermocouple Type S ^{FO}	-100 °C to 0 °C	0.36 °C	
	0 °C to 1 200 °C	0.31 °C	
Temperature Calibration Indication and Control Equipment Used with Thermocouple Type T ^{FO}	-100 °C to 0 °C	0.19 °C	
	0 °C to 350 °C	0.47 °C	
Temperature Calibration Indication and Control Equipment Used with RTD, Type Pt 100 ^{FO}	-200 °C to 0 °C	0.059 °C	Electrical Simulation of RTD Output Process Calibrator SPKM Instrument Procedure MTK-LAB-T-01 Direct Comparison Method ASTM E220 ASTM E230
	0 °C to 420 °C	0.059 °C	



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Electrical

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Equipment to Measure DC Voltage ^{FO}	0.001 mV to 104 mV	0.015 % of reading	Multifunctional Calibrator 1 000A Transmille SPMK518 Euramet-cg-15 EA 10/15
	0.104 V to 1.04 V	0.015 % of reading	
	1.04 V to 10.4 V	0.015 % of reading	
	10.4 V to 104 V	0.009 % of reading	
	104 V to 1 020 V	0.015 % of reading	
Equipment to Measure AC Voltage ^{FO}	0.001 mV to 104 mV	0.04 % of reading	Multifunctional Calibrator 1 000A Transmille Euramet-cg-15 EA 10/15
	0.001 mV to 104 mV	0.09 % of reading	
	1.04 V to 10.4 V	0.09 % of reading	
	10.4 V to 104 V	0.07 % of reading	
	104 V to 1 020 V	0.1 % of reading	
Equipment to Measure DC Current ^{FO}	0.001 μ A to 104 μ A	0.007 % of reading	
	104 μ A to 1.04 mA	0.032 % of reading	
	1.04 mA to 10.4 mA	0.017 % of reading	
	10.4 mA to 104 mA	0.014 % of reading	
Equipment to Measure DC Current ^{FO}	104 mA to 1 040 mA	0.31 % of reading	Multifunctional Calibrator 1 000A Transmille Euramet-cg-15 EA 10/15
	1.04 A to 10.2 A	0.01 % of reading	
	0.001 A to 60 A	0.6 % of reading	Multifunctional Calibrator 1 000 A Transmille Turn Clamp Coil 2, 10, 50
	0.01 A to 300 A	1.2 % of reading	
	0.05 A to 1 500 A	0.25 % of reading	
Equipment to Measure AC Current @ 10 Hz to 2 kHz ^{FO}	0.001 μ A to 104 μ A	0.68 % of reading	Multifunctional Calibrator 1 000 A Transmille Euramet-cg-15 EA 10/15 Turn Clamp Coil 2, 10, 50
	0.104 mA to 104 mA	0.68 % of reading	
	1.04 mA to 10.4 mA	0.68 % of reading	
	10.4 mA to 104 mA	0.68 % of reading	
	104 mA to 1 040 mA	0.68 % of reading	
	1.04 A to 10.4 A	0.68 % of reading	
	0.001 A to 60 A	0.6 % of reading	
	0.01 A to 300 A	1.2 % of reading	
	0.05 A to 1 500 A	0.25 % of reading	
Equipment to Measure Capacitance ^{FO}	0.001 μ F to 10 μ F	0.81 % of reading	
	10 μ F to 100 μ F	0.81 % of reading	
	100 μ F to 1 μ F	0.81 % of reading	



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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 Measure Resistance ^{FO}	0.001 Ω to 10 Ω	0.025 % of reading	Multifunctional Calibrator 1 000 A Transmille Euramet-cg-15 EA 10/15 Turn Clamp Coil 2, 10, 50
	10 Ω to 50 Ω	0.027 % of reading	
	50 Ω to 100 Ω	0.011 % of reading	
	101 Ω to 1 k Ω	0.021 % of reading	
	1.01 k Ω to 10 k Ω	0.004 7 % of reading	
	10.1 k Ω to 100 k Ω	0.35 % of reading	
	101 k Ω to 1M Ω	0.027 % of reading	
	1.01 M Ω to 10 M Ω	0.021 % of reading	
	10.1 M Ω to 100 M Ω	0.019 % of reading	

Mass, Force and Weighing Devices

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
Balances ^O	2 g to 5 g (Res.= 0.000 1 mg)	(0.019 + 2 x 10 ⁻⁶ Wt) mg	Class E2 Weights 1 mg to 1 kg MTK-PM-10 Direct Comparison MTK-LAB-M-01 CENAM Technical Guide
	5 g to 110 g (Res. = 0.01 mg)	(2.91 x 10 ⁻⁵ + 9.1 x 10 ⁻¹⁰ Wt) mg	
	110 g to 1 100 g (Res.= 0.01 mg)	(0.032 + 8.8 x 10 ⁻⁷ Wt) mg	
	1 100 g to 2 000 g (Res.= 0.1 mg)	(2.2 x 10 ⁻² + 8.8 x 10 ⁻⁷ Wt) mg	Class F1 Weights MTK-PM-01, MTK-PM-02, MTK-PM-03, MTK-PM-04 Direct Comparison MTK-LAB-M-01 CENAM Technical Guide
	2 000 g to 6 000 g (Res.= 0.1 mg)	(8 + 4.7 x 10 ⁻⁶ Wt) mg	
	6 000 g to 12 000 g (Res.= 10 mg)	(1 + 3.5 x 10 ⁻⁶ Wt) mg	



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Mass, Force and Weighing Devices

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
Balances ^o	12 000 g to 30 000 g (Res.= 20 mg)	$(1.7 + 3.27 \times 10^{-6}Wt)$ mg	Class F1 Weights MTK-PM-01, MTK-PM-02, MTK-PM-03, MTK-PM-04, MTK-PM-05, MTK-PM-06 Direct Comparison MTK-LAB-M-01 CENAM Technical Guide
	30 000 g to 60 000 g (Res.= 50 mg)	$(0.01 + 3.4 \times 10^{-6}Wt)$ mg	Class F1 Weights MTK-PM-01, MTK-PM-02, MTK-PM-03, MTK-PM-04, MTK-PM-05, MTK-PM-06, MTK-PM-14, MTK-PM-20, Direct Comparison MTK-LAB-M-01 CENAM Technical Guide
	60 kg to 120 kg (Res.= 0.1 g)	$(3.7 + 6.5 \times 10^{-5}Wt)$ g	Class F1 Weights MTK-PM-01, MTK-PM-02, MTK-PM-03, MTK-PM-04, MTK-PM-05, MTK-PM-06, MTK-PM-14, MTK-PM-20, Class M1 MTK-PM-07, MTK-PM-08. Direct Comparison MTK-LAB-M-01 CENAM Technical Guide
Scale ^o	120 kg to 200 kg (Res.= 2 g)	$(0.51 + 3.8 \times 10^{-5}Wt)$ g	Class M1 Weights MTK-PM-07, MTK-PM-08 Direct Comparison MTK-LAB-M-01 Technical Guide
	200 kg to 500 kg Res.= 5 g	$(0.6 + 3.23 \times 10^{-5}Wt)$ g	Class M1 Weights MTK-PM-07, MTK-PM-08 Direct Comparison MTK-LAB-M-01 CENAM Technical Guide
	500 kg to 1 000 kg (Res.= 10 g)	$(0.1 + 33.4 \times 10^{-5}Wt)$ g	Class M1 Weights MTK-PM-07, MTK-PM-08 Direct Comparison MTK-LAB-M-01 CENAM Technical Guide
	1 000 kg to 2 000 kg (Res.= 20 g)	$(4.4 + 3.79 \times 10^{-5}Wt)$ g	Class M1 Weights MTK-PM-08, MTK-PM-09 Direct Comparison MTK-LAB-M-01 CENAM Technical Guide



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Mass, Force and Weighing Devices

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
Scales ⁰	2 000 kg to 3 000 kg (Res.= 50 g)	$(20.6 + 2.54 \times 10^{-5}Wt) \text{ g}$	Class M1 Weights MTK-PM-08, MTK-PM-09, MTK-PM-16 Direct Comparison MTK-LAB-M-01 CENAM Technical Guide
	3 000 kg to 4 000 kg (Res.= 50 g)	$(40.9 + 4.59 \times 10^{-5}Wt) \text{ g}$	Class M1 Weights MTK-PM-08, MTK-PM-09, MTK-PM-16, MTK-PM-17 Direct comparison MTK-LAB-M-01 CENAM Technical Guide
	4 000 kg to 5 000 kg (Res.= 100 g)	$(43.1 + 2.49 \times 10^{-5}Wt) \text{ g}$	Class M1 Weights MTK-PM-08, MTK-PM-09, MTK-PM-16, MTK-PM-17, MTK-PM-18 Direct comparison MTK-LAB-M-01 CENAM Technical Guide
	Up to 200 kg (Res.= 100 g)	$(0.029 + 2.65 \times 10^{-4}Wt) \text{ kg}$	Direct Comparison Substitution Loads Class M1 Weights MTK-PM-08 MTK-LAB-M-01 CENAM Technical Guide
	200 kg to 400 kg (Res.= 100 g)	$(0.024 + 2.9 \times 10^{-4}Wt) \text{ kg}$	
	400 kg to 600 kg (Res.= 100 g)	$(0.06 + 2 \times 10^{-4}Wt) \text{ kg}$	
	600 kg to 800 kg (Res.= 100 g)	$(0.06 + 2 \times 10^{-4}Wt) \text{ kg}$	
	800 kg to 1 000 kg (Res.= 100 g)	$(0.1 + 1.5 \times 10^{-4}Wt) \text{ kg}$	
	Up to 2 000 kg (Res.= 1 kg)	$(0.29 + 1.04 \times 10^{-5}Wt) \text{ kg}$	Direct Comparison Substitution Loads Class M1 Weights MTK-PM-08, MTK-PM-09 MTK-LAB-M-01 CENAM Technical Guide
	2 000 kg to 4 000 kg (Res.= 1 kg)	$(1.2 + 6.59 \times 10^{-5}Wt) \text{ kg}$	
	4 000 kg to 6 000 kg (Res.= 1 kg)	$(0.6 + 2 \times 10^{-5}Wt) \text{ kg}$	
	6 000 kg to 8 000 kg (Res.= 1 kg)	$(0.6 + 2 \times 10^{-5}Wt) \text{ kg}$	
	8 000 kg to 10 000 kg (Res.= 1 kg)	$(1 + 1.5 \times 10^{-5}Wt) \text{ kg}$	



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Mass, Force and Weighing Devices

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	
Scales ^O	Up to 4 000 kg (Res.= 2 kg)	$(0.57 + 2.57 \times 10^{-4}Wt)$ kg	Direct Comparison Substitution Loads Class M1 Weights MTK-PM-08, MTK-PM-09, MTK-PM-16, MTK-PM-17 MTK-LAB-M-01 CENAM Technical Guide	
	4 000 kg to 8 000 kg (Res.= 2 kg)	$(0.4 + 3 \times 10^{-4}Wt)$ kg		
	8 000 kg to 12 000 kg (Res.= 2 kg)	$(1 + 2.25 \times 10^{-4}Wt)$ kg		
	12 000 kg to 16 000 kg (Res.= 2 kg)	$(1.9 + 1.5 \times 10^{-4}Wt)$ kg		
	16 000 kg to 20 000 kg (Res.= 2 kg)	$(1.9 + 1.5 \times 10^{-4}Wt)$ kg		
	Scales ^O	Up to 5 000 kg (Res.= 5 kg)	$(1.4 + 5.4 \times 10^{-4}Wt)$ kg	Direct Comparison Substitution Loads Class M1 Weights MTK-PM-08, MTK-PM-09, MTK-PM-16, MTK-PM-17, MTK-PM-18 MTK-LAB-M-01 CENAM Technical Guide
		5 000 kg to 10 000 kg (Res.= 5 kg)	$(1.1 + 6 \times 10^{-4}Wt)$ kg	
		10 000 kg to 15 000 kg (Res.= 5 kg)	$(3.1 + 4 \times 10^{-4}Wt)$ kg	
		15 000 kg to 20 000 kg (Res.= 5 kg)	$(3.4 + 3.8 \times 10^{-4}Wt)$ kg	
		20 000 kg to 25 000 kg (Res.= 5 kg)	$(7 + 2 \times 10^{-4}Wt)$ kg	
Tanks on Load Cells ^O	0 kg to 1 000 kg (Res.= 0.1 kg)	$(0.029 + 1.17 \times 10^{-5}Wt)$ kg	Massive Flow Meter Direct comparison MTK-PM-19 MTK-LAB-M-05 Technical Guide of Institute of Measurement and Control of London "A Guide to the Specification and Procurement of Industrial Process Weighing Systems" Technical Papers "Calibration of Industrial Weighing Systems by Use of a Coriolis Flowmeter"	
	1 000 kg to 2 000 kg (Res.= 0.2 kg)	$(0.1 + 1.1 \times 10^{-5}Wt)$ kg		
	2 000 kg to 5 000 kg (Res.= 0.5 kg)	$(0.33 + 1.13 \times 10^{-5}Wt)$ kg		
	5 000 kg to 10 000 kg (Res.= 1 kg)	$(0.4 + 1.06 \times 10^{-5}Wt)$ kg		
	10 000 kg to 20 000 kg (Res.= 2 kg)	$(0.5 + 1.1 \times 10^{-5}Wt)$ kg		
	20 000 kg to 30 000 kg (Res.= 5 kg)	$(2 + 1.2 \times 10^{-5}Wt)$ kg		
Mass Weight F2 ^F	50 mg	0.04 mg	Double Substitution with Air Buoyancy correction. Class F1 OIML R111 Weigh Set MTK-PM-15 MTK-PM-21 MTK-LAB-M-03 CENAM Technical Guide	
	100 mg	0.053 mg		
	200 mg	0.067 mg		
	500 mg	0.083 mg		
	1 g	0.1 mg		



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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 OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Mass Weight F2 ^F	2 g	0.13 mg	Double Substitution with Air Buoyancy Correction. Class F1 OIML R111 Weigh Set MTK-PM-15 MTK-PM-21 MTK-LAB-M-03 CENAM Technical Guide
	5 g	0.17 mg	
	10 g	0.2 mg	
	20 g	0.27 mg	
	50 g	0.33 mg	
	100 g	0.53 mg	
	200 g	1 mg	
	500 g	2.7 mg	
	1 kg	5.3 mg	
Mass Weight Class M1, M2 and M3 ^F	20 kg	340 mg	Double Substitution Class F1 Weight Set OIML-R111Class MTK-PM-15, MTK-PM-21 MTK-PM-11, MTK-PM-12 and MTK-PM-13 MTK-LAB-M-03 CENAM Technical Guide
	10 kg	170 mg	
	5 kg	84 mg	
	2 kg	34 mg	
	1 kg	17 mg	
	500 g	8.4 mg	
	200 g	3.4 mg	
	100 g	1.7 mg	
	50 g	1 mg	
	20 g	0.83 mg	
	10 g	0.67 mg	
	5 g	0.53 mg	
	2 g	0.4 mg	
	1 g	0.33 mg	
	500 mg	0.27 mg	
	200 mg	0.2 mg	
	100 mg	0.17 mg	
	50 mg	0.13 mg	
	20 mg	0.1 mg	
	10 mg	0.08 mg	
5 mg	0.067 mg		
2 mg	0.067 mg		
1 mg	0.067 mg		



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Mass, Force and Weighing Devices

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
Weight Class 4 ^F	50 mg	0.028 mg	Double Substitution Class F 1 OIML-R111 Weights Set MTK-PM-15, MTK-PM-21 MTK-PM-11, MTK-PM-12 and MTK-PM-13 ASTM E 617
	100 mg	0.033 mg	
	200 mg	0.04 mg	
	300 mg	0.046 mg	
	500 mg	0.053 mg	
	1 g	0.067 mg	
	2 g	0.087 mg	
	3 g	0.1 mg	
	5 g	0.12 mg	
	10 g	0.17 mg	
	20 g	0.23 mg	
	30 g	0.3 mg	
	50 g	0.4 mg	
	100 g	0.67 mg	
	200 g	1.3 mg	
	300 g	2 mg	
	500 g	3.3 mg	
Weight Class 5, 6 and 7	1 kg	6.7 mg	Double Substitution Class F1 OIML-R111 Weights Set MTK-PM-15, MTK-PM-21 MTK-PM-11, MTK-PM-12 and MTK-PM-13 ASTM E617
	25 kg	400 mg	
	20 kg	350 mg	
	10 kg	170 mg	
	5 kg	84 mg	
	3 kg	50 mg	
	2 kg	34 mg	
	1 kg	17 mg	
	500 g	10 mg	
	300 g	7 mg	
	200 g	5 mg	
	100 g	3 mg	
	50 g	1.9 mg	
30 g	1.3 mg		



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Weight Class 5, 6 and 7	20 g	1 mg	Double Substitution Class F1 Weights Set MTK-PM-15, MTK-PM-21 MTK-PM-11, MTK-PM-12 and MTK-PM-13 ASTM E 617
	10 g	0.7 mg	
	5 g	0.43 mg	
	3 g	0.32 mg	
	2 g	0.25 mg	
	1 g	0.17 mg	
	500 mg	0.13 mg	
	300 mg	0.1 mg	
	200 mg	0.087 mg	
	100 mg	0.067 mg	
	50 mg	0.053 mg	
	30 mg	0.047 mg	
	20 mg	0.04 mg	
	10 mg	0.033 mg	
	5 mg	0.027 mg	
	3 mg	0.023 mg	
2 mg	0.02 mg		
1 mg	0.017 mg		
Solid Objects Not Normalized ^o	100 mg to 200 g	0.52 mg	Scale Direct Measure MTK-BAS-05 MTK-BAL-01, MTK-BAL-02 MTK-BAL-03 and MTK-BAS-05 MTK-LAB-M-04 OIML-D28
	200 g to 1 200 g	3.9 mg	
	1 200 g to 6 100 g	89 mg	
	6 100 g to 25 kg	780 mg	
	25 kg to 1 000 kg	450 mg	

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.



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

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.