



PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

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

Aerospace Metrology & Electromechanical Calibration Ltd.
Met Cal House, Fisher Street, Newcastle-Upon-Tyne NE6 4LT, UK

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

ISO/IEC 17025:2017

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):

Acoustic, Chemical, Dimensional, Electrical, Mass, Force and Weighing Device, Mechanical, Optical Measurements, Thermodynamic, and Time and Frequency
(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

Initial Accreditation Date:

June 19, 2019

Issue Date:

March 08, 2024

Expiration Date:

March 08, 2026

Accreditation No.:

106685

Certificate No.:

L24-189

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.pjilabs.com



Certificate of Accreditation: Supplement

Aerospace Metrology & Electromechanical Calibration Ltd.

Met-Cal House, Fisher Street, Newcastle-upon-Tyne, NE6 4LT, UK
 Contact Name: Stephan Oxborough Phone: 191-262-2266

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

Acoustic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Acoustical Calibrators Fixed Points ^{FO}	94 dB at 1 kHz	0.25 dB	Class 1 SLM by comparison	BS EN IEC 60942:2018
	104 dB at 1 kHz			
	114 dB at 1 kHz	0.34 dB		
Sound level meters 74dB Nominal ^{FO}	125 Hz	0.3 dB	Sound Calibrator GenRad Type Omnical	ASP 152
	250 Hz			
	500 Hz			
	1 kHz			
	2 kHz			
	4 kHz			
Sound level meters 84dB Nominal ^{FO}	125 Hz	0.3 dB	Sound Calibrator GenRad Type Omnical	ASP 152
	250 Hz			
	500 Hz			
	1 kHz			
	2 kHz			
	4 kHz			
Sound level meters 94dB Nominal ^{FO}	125 Hz	0.3 dB	Sound Calibrator GenRad Type Omnical	ASP 152
	250 Hz			
	500 Hz			
	1 kHz			
	2 kHz			
	4 kHz			
Sound level meters 104dB Nominal ^{FO}	125 Hz	0.3 dB	Sound Calibrator GenRad Type Omnical	ASP 152
	250 Hz			
	500 Hz			
	1 kHz			
	2 kHz			
	4 kHz			
Sound level meters 114dB Nominal ^{FO}	125 Hz	0.3 dB	Sound Calibrator GenRad Type Omnical	ASP 152
	250 Hz			
	500 Hz			
	1 kHz			
	2 kHz			
	4 kHz			



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Chemical

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pH Meters, Fixed points ^{FO}	4 pH	0.02 pH	NIST pH Buffers, Fluke 5500A, Omega HH376 thermometer	BS 1647-2:1984
	7 pH			
	10 pH			
Conductivity Meters ^{FO}	84 μ S/cm	0.35 % RDG + 1 μ S/cm	NIST Conductivity solutions	ASP 193
	1 413 μ S/cm			
	5 000 μ S/cm			
	12 880 μ S/cm			
	80 000 μ S/cm			
	111 800 μ S/cm			
TDS Meters ^{FO}	1 382 mg/L (ppm)	0.35 % of Reading + 1 mg/L	NIST TDS Solution	ASP 203
Gas Detector ^{FO}	Carbon Monoxide 308 ppm	5 % of Reading	BOC calibration gas	BS EN 50291-2:2019
	Hydrogen sulphide 52.66 ppm	5 % of Reading		
	Methane 2.6 %	5 % of Reading		
	Oxygen 15.3 %	5 % of Reading		
	Nitrogen Balanced	5 % of Reading		
	Carbon monoxide 100 ppm	5 % of Reading	Total Protection Precision check and calibration gas	BS EN 50291-2:2019
	Hydrogen sulphide 25 ppm	5 % of Reading		
	Methane 2.2 %	5 % of Reading		
	Oxygen 18 %	5 % of Reading		
	Nitrogen > 79.78 %	5 % of Reading		
Alcolmeters ^{FO}	Ethanol 0.35 mg/L BrAC	0.01 mg/L	Lion AlcoCal 2AL gas	ASP 164
	Nitrogen Balance 99.98 %	0.01 mg/L	Fischer Scientific Ethanol absolute	ASP 291
	Pure Ethanol 0.35 g/L (BrAC)	0.01 mg/L		



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Kinematic Viscosity ^{FO} Ford No.5 Shell 6 Zahn No.4 Zahn No.5	1 169 mm ² /s at 20 °C	0.2 % mm ² /s (cSt)	Paragon Scientific Reference viscosity Standard	ASTM D1200 - 10(2018) ASTM D4212 - 16 BS EN ISO 2431:2019 ASTM D 5125 BS 3900-F15:1995, ISO 11503:1995 AFNOR NF-T-30014 BS 3900-F15:1995, ISO 11503:1995 DIN 53 211
	809.4 mm ² /s at 25 °C	\pm 0.19 % mm ² /s (cSt)		
Kinematic Viscosity ^{FO} DIN 4 mm ISO 6 mm Ford No.5 Shell 5 Shell 6 Zahn No.3 Zahn No.4 Zahn No.5	649.1 mm ² /s at 20 °C	0.17 % mm ² /s (cSt)	Paragon Scientific Reference viscosity Standard	ASTM D1200 - 10(2018) ASTM D4212 - 16 BS EN ISO 2431:2019 ASTM D 5125 BS 3900-F15:1995, ISO 11503:1995 AFNOR NF-T-30014 BS 3900-F15:1995, ISO 11503:1995 DIN 53 211
	457.5 mm ² /s at 25 °C	0.17 % mm ² /s (cSt)		
Kinematic Viscosity ^{FO} DIN 4 mm ISO 5 mm ISO 6 mm Ford No.4 Ford No.5 Shell 4 Shell 5 Shell 6 Zahn No.2 Zahn No.3 Zahn No.4	326.1 mm ² /s at 20 °C	0.17% mm ² /s (cSt)		BS 3900-F15:1995, ISO 11503:1995 DIN 53 211
	235 mm ² /s at 25 °C	0.17% mm ² /s (cSt)		



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Kinematic Viscosity ^{FO} DIN 4 mm ISO 4 mm ISO 5 mm Ford No.2 Ford No.3 Ford No.4 Shell 3.5 Shell 4 Shell 5 Zahn No.2 Zahn No.3	161.1 mm ² /s at 20 °C	0.15 % mm ² /s (cSt)	Paragon Scientific Reference viscosity Standard	ASTM D1200 - 10(2018) ASTM D4212 - 16 BS EN ISO 2431:2019 ASTM D 5125 BS 3900-F15:1995, ISO 11503:1995 AFNOR NF-T-30014 BS 3900-F15:1995, ISO 11503:1995 DIN 53 211
	119.4 mm ² /s at 25 °C	0.15 % mm ² /s (cSt)		
Kinematic Viscosity ^{FO} ISO 4 mm Ford No.2 Ford No.3 Shell 2.5 Shell 3 Shell 3.5 Shell 4 Zahn No.2	84.75 mm ² /s at 20 °C	0.15 % mm ² /s (cSt)	Paragon Scientific Reference viscosity Standard	
	64.70 mm ² /s at 25 °C	0.14 % mm ² /s (cSt)		
Kinematic Viscosity ^{FO} ISO 3 mm ISO 4 mm Ford No.2 Shell 2.5 Shell 3 Shell 3.5 Zahn No.1 Zahn No.2	43.25 mm ² /s at 20 °C	0.14 % mm ² /s (cSt)	Paragon Scientific Reference viscosity Standard	
	34.03 mm ² /s at 25 °C	0.14 % mm ² /s (cSt)		
Viscosity Dip Cups ^{FO} (Kinematic Viscosity, Efflux Time) @ 20/25 °C	(10 to 1 000) mm ² /s (cSt)	0.2 % mm ² /s (cSt)	Certified viscosity Oils	ASTM D4212-99



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Dimensional

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Outside Micrometer ^{FO}	Up to 304.8 mm	(1.0 + 5 L) μ m	Gauge Blocks Grade 1 Length Bars	BS 870:2008 ASP 074
External Vernier Caliper ^{FO}	Up to 609.6 mm	0.007 mm + (6L) μ m	Gauge Blocks Grade 1 Length Bars	BS 887:2008 ASP 078
Depth Vernier Caliper ^{FO}	Up to 609.6 mm	0.007 mm + (6L) μ m	Gauge Blocks Grade 1 Length Bars	BS 6365:2008 ASP 085
Depth Micrometers ^{FO}	Up to 300 mm	(1 + 5L) μ m	Gauge Blocks Grade 1	BS 6468:2008 ASP 076
Dial Gauge ^{FO}	Up to 10 mm	(0.005 mm + 6L) μ m	Universal Measuring Machine	BS 907:2008 ASP 075
Ring Gauge ^F	Up to 50 mm	1.5 μ m	Universal Measuring Machine	BS 4064:1966 BS 4065:1966 ASP 214
Thread Plug Gauge ^F (Effective Diameter)	Up to 30 mm	2.5 μ m	Universal Measuring Machine, Thread Measuring Cylinders	BS 919-1:2007 BS 919-2:2007 BS 919-3:2007 BS 919-4:2007 ASP 215
Paint Thickness Gauge ^{FO}	Up to 2 500 μ m	2 μ m	Thickness Shims	BS EN ISO 2808:2019 ASP 145
Height Gauge ^F	Up to 1 000 mm	(10 + 30L) μ m	Gauge Blocks Grade 1	BS EN ISO 13225:2012 BS 1643:2008 ASP 198
Length Measurement Setting Rod ^F	1 mm to 1 200 mm	(1 + 8L) μ m	Reference Setting Rod(s),	ASP 088
Track Gauge ^F	Up to 1.7 m	3 mm	Gauge Blocks Grade 1 Laser Distance Meter	ASP 186
Digital Protractors' ^F	Up to 200 mm	0.014 °	Precision Angle Gauge Set	ASP 195
Gauge Blocks ^F	0.1 mm to 10 mm	0.1 μ m	Grade 0 Master Gauge Block Set with GB comparator	BS EN ISO 3650:1999 ASP 218
	10 mm to 25 mm	0.13 μ m		
	(30, 40 & 50) mm	0.17 μ m		
	(60, 70 & 75) mm	0.21 μ m		
	(80, 90 & 100) mm	0.25 μ m		



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Steel Rule ^F	Up to 2 000 mm	(15 + 20L) μ m	Horizontal Benchtop Optical Comparator	BS 4372:1968 ASP 110
Durometers Calibration Type A, C and D Extension Indenter Display (0 to 100) Duro Units	Up to 2.5 mm	0.025 mm	Gauge Blocks Grade 1	ASP 187 BS ISO 48-4:2018
Thickness Gauge ^{FO}	Up to 50 mm	(2.37 + 0.8L) μ m	Gauge Blocks Grade 1	ASP 219
Bore Micrometer ^{FO}	2 mm to 50 mm	3.0 μ m	Ring Master	ASP 092
	50 mm to 100 mm	4.0 μ m		
Measuring Tape ^F	Up to 50 m	10 mm + (6L) μ m	Laser Distance Meter	SOP12_20141022[1] tape measures
Pi Tape ^F	Up to 2 m	(10 + 6L) μ m	Surface Table	SOP23_20141022[1] pi tape
Depth Micrometer ^{FO}	Up to 1 000 mm	(0.7 + 6L) μ m	Gauge Blocks Grade 1	BS 6468:2008 ASP 076
Inside Micrometer ^{FO}	Up to 1 000 mm	0.000 7 mm + (6L) μ m	Ring Master	BS 959:2008 ASP 079
Thread Measuring Cylinders ^F	Up to 5 mm	0.002 mm	Universal Measuring Machine	BS 5590:1978
Height Master ^F	Up to 1 000 mm	1.2 μ m	Gauge Blocks Grade 1, Length Bars	BS EN ISO 13225:2012 ASP 198
Dial Test Indicator ^{FO}	0.001 mm to 5 mm	1 μ m	Gauge Blocks Grade 1, Height Master	BS 2795:1981 ASP 077
Cylindrical Plug Gauge ^F	1 mm to 50 mm diameter	0.5 μ m	Universal Measuring Machine	BS 1044-1:2008 ASP 082
Optical Comparator X Axis Linearity Y axis Linearity W ^{FO}	Up to 300 mm	1 μ m	Glass Scales	ASP 211
Feeler Gauge ^{FO}	0.03 mm to 0.9 mm	3 μ m	Universal Measuring Machine	BS 957:2008 ASP 132
Optical Comparator Angularity ^{FO}	0 ° to 180 °	0.1 °	Angle Blocks	ASP 211
Optical Comparator Magnification ^{FO}	10X	0.03 %	Glass Standard	
	20X	0.03 %		
	50X	0.04 %		
Ultrasonic Thickness Gauge ^{FO}	0 mm to 200 mm	25 μ m	Gauge Blocks Grade 1	ASP 181



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Laser Distance Meter ^F	Up to 10 m	3 mm	Reference Laser distance meter	ASP 180
Microscopes ^{FO}	200 mm to 100 mm	4.5 μ m	Glass Scale	ASP 225
Micrometer Master ^F	0.5 in to 10 in	(28 + 5L) μ in	Universal Measuring Machine	ASP 080
Bevel Protractors ^F	BS 1685:2008 0 ° to 360 °	6 min of arc	Precision Angle Gauge Set	BS 1685:2008 ASP 093
Length Bars ^F	Up to 900 mm	(1.0 + 8L) mm	Universal Measuring Machine	BS 1790:1961 BS 5317:1976

Electrical

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Equipment to DC Voltage ^F	Up to 220 mV	7.5 μ V/V + 0.4 μ V	Fluke 5730A EURAMET_cg-15_v_2.0	ASP 001
	220 mV to 2.2 V	5 μ V/V + 0.7 μ V		
	2.2 V to 11 V	3.5 μ V/V + 2.5 μ V		
	11 V to 22 V	3.5 μ V/V + 4.0 μ V		
	22 V to 220 V	5 μ V/V + 40 μ V		
	220 V to 1 100 V	6.5 μ V/V + 0.4 μ V	Fluke 5700A	
	Up to 220 mV	8 μ V/V + 0.6 μ V		
	220 mV to 2.2 V	7 μ V/V + 1 μ V		
	2.2 V to 22 V	7 μ V/V + 6.5 μ V		
	22 V to 220 V	8 μ V/V + 80 μ V		
220 V to 1 100 V	9 μ V/V + 0.5 mV			
Equipment to Measure DC Voltage ^F	1 mV to 330 mV	0.006 % of reading + 3 μ V	Fluke 5500A.	ASP 001
	330 mV to 3.3 V	0.005 % of reading + 5 μ V		
	3.3 V to 33 V	0.005 % of reading + 50 μ V		
	33 V to 330 V	0.005 5 % of reading + 500 μ V		
	330V to 1 020 V	0.005 5 % of reading + 1 500 μ V		
Equipment to Measure DC Voltage ^F	Up to 202 mV	5.4 μ V/V + 2 μ V	Fluke 8588A DMM	ASP 002
	120 mV to 2.02 V	5.4 μ V/V + 0.3 μ V		
	1.2 V to 20.2 V	5.4 μ V/V + 0.05 μ V		



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Equipment to Measure DC Voltage ^F	12 V to 202 V	8 μ V/V + 0.3 μ V	Fluke 8588A DMM	ASP 002
	120 V to 1.050 kV	8 μ V/V + 0.5 μ V		
	Up to 120 mV	5 μ V/V + 0.36 μ V	Agilent 3458A Opt 002	
	120 mV to 1.2 V	4 μ V/V + 0.3 μ V		
	1.2 V to 12 V	4 μ V/V + 0.5 μ V		
	12 V to 120 V	6 μ V/V + 36 μ V		
	120 V to 1 kV	6 μ V/V + 0.1 mV		
Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5730A	EURAMET_cg-15_v_2.0 ASP 001
10 Hz to 20 Hz	0.22 mV to 2.2 mV	240 μ V/V + 4 μ V		
20 Hz to 40 Hz	0.22 mV to 2.2 mV	90 μ V/V + 4 μ V		
40 Hz to 20 kHz	0.22 mV to 2.2 mV	80 μ V/V + 4 μ V		
20 kHz to 50 kHz	0.22 mV to 2.2 mV	200 μ V/V + 4 μ V		
50 kHz to 100 kHz	0.22 mV to 2.2 mV	500 μ V/V + 5 μ V		
100 kHz to 300 kHz	0.22 mV to 2.2 mV	1 050 μ V/V + 10 μ V		
300 kHz to 500 kHz	0.22 mV to 2.2 mV	1 400 μ V/V + 20 μ V		
500 kHz to 1MHz	0.22 mV to 2.2 mV	2 700 μ V/V + 20 μ V		
Equipment to Output AC Voltage (At the listed frequencies) ^F				
10 Hz to 20 Hz	2.2 mV to 22 mV	240 μ V/V + 4 μ V		
20 Hz to 40 Hz	2.2 mV to 22 mV	90 μ V/V + 4 μ V		
40 Hz to 20 kHz	2.2 mV to 22 mV	80 μ V/V + 4 μ V		
20 kHz to 50 kHz	2.2 mV to 22 mV	200 μ V/V + 4 μ V		
50 kHz to 100 kHz	2.2 mV to 22 mV	500 μ V/V + 5 μ V		
100 kHz to 300 kHz	2.2 mV to 22 mV	1 050 μ V/V + 10 μ V		
300 kHz to 500 kHz	2.2 mV to 22 mV	1 400 μ V/V + 20 μ V		
500 kHz to 1MHz	2.2 mV to 22 mV	2 700 μ V/V + 20 μ V		
Equipment to Output AC Voltage (At the listed frequencies) ^F				
10 Hz to 20 Hz	22 mV to 220 mV	240 μ V/V + 12 μ V		
20 Hz to 40 Hz	22 mV to 220 mV	90 μ V/V + 7 μ V		
40 Hz to 20 kHz	22 mV to 220 mV	57 μ V/V + 7 μ V		



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Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5730A	EURAMET_cg-15_v_2.0 ASP 001		
20 kHz to 50 kHz	22 mV to 220 mV	120 μ V/V + 7 μ V				
50 kHz to 100 kHz	22 mV to 220 mV	310 μ V/V + 17 μ V				
100 kHz to 300 kHz	22 mV to 220 mV	655 μ V/V + 20 μ V				
300 kHz to 500 kHz	22 mV to 220 mV	1 400 μ V/V + 25 μ V				
500 kHz to 1 MHz	22 mV to 220 mV	2 700 μ V/V + 45 μ V				
Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5730A	EURAMET_cg-15_v_2.0 ASP 001		
10 Hz to 20 Hz	220 mV to 2.2 V	240 μ V/V + 40 μ V				
20 Hz to 40 Hz	220 mV to 2.2 V	90 μ V/V + 15 μ V				
40 Hz to 20 kHz	220 mV to 2.2 V	42 μ V/V + 8 μ V				
20 kHz to 50 kHz	220 mV to 2.2 V	67 μ V/V + 10 μ V				
50 kHz to 100 kHz	220 mV to 2.2 V	85 μ V/V + 30 μ V				
100 kHz to 300 kHz	220 mV to 2.2 V	336 μ V/V + 80 μ V				
300 kHz to 500 kHz	220 mV to 2.2 V	1 000 μ V/V + 200 μ V				
500 kHz to 1 MHz	220 mV to 2.2 V	1 700 μ V/V + 300 μ V				
Equipment to Output AC Voltage (At the listed frequencies) ^F					Fluke 5730A	EURAMET_cg-15_v_2.0 ASP 001
10 Hz to 20 Hz	2.2 V to 22 V	240 μ V/V + 400 μ V				
20 Hz to 40 Hz	2.2 V to 22 V	90 μ V/V + 150 μ V				
40 Hz to 20 kHz	2.2 V to 22 V	42 μ V/V + 50 μ V				
20 kHz to 50 kHz	2.2 V to 22 V	67 μ V/V + 100 μ V				
50 kHz to 100 kHz	2.2 V to 22 V	83 μ V/V + 200 μ V				
100 kHz to 300 kHz	2.2 V to 22 V	254 μ V/V + 600 μ V				
300 kHz to 500 kHz	2.2 V to 22 V	1 000 μ V/V + 2 000 μ V				
Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5730A	EURAMET_cg-15_v_2.0 ASP 001		
10 Hz to 20 Hz	22 V to 220 V	240 μ V/V + 4 mV				
20 Hz to 40 Hz	22 V to 220 V	90 μ V/V + 1.5 mV				
40 Hz to 20 kHz	22 V to 220 V	52 μ V/V + 0.6 mV				



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Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5730A	EURAMET_cg-15_v_2.0 ASP 001
20 kHz to 50 kHz	22 V to 220 V	80 μ V/V + 1 mV		
50 kHz to 100 kHz	22 V to 220 V	150 μ V/V + 2.5 mV		
100 kHz to 300 kHz	22 V to 220 V	900 μ V/V + 16 mV		
300 kHz to 500 kHz	22 V to 220 V	4 400 μ V/V + 40 mV		
500 kHz to 1 MHz	22 V to 220 V	8 000 μ V/V + 80 mV		
Equipment to Output AC Voltage (At the listed frequencies) ^F				
15 Hz to 50 Hz	220 V to 1 100 V	300 μ V/V + 16 mV		
50 Hz to 1 kHz	220 V to 1 100 V	70 μ V/V + 3.5 mV		
40 Hz to 1 kHz	220 V to 1 100 V	90 μ V/V + 4 mV		
1 kHz to 20 kHz	220 V to 1 100 V	165 μ V/V + 6 mV		
20 kHz to 30 kHz	220 V to 1 100 V	600 μ V/V + 11 mV		
30 kHz to 50 kHz	220 V to 750 V	600 μ V/V + 11 mV		
50 kHz to 100 kHz	220 V to 750 V	2 300 μ V/V + 45 mV		
Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5700A	ASP 005
10 Hz to 20 Hz	0.22 mV to 2.2 mV	550 μ V/V + 4.5 μ V		
20 Hz to 40 Hz	0.22 mV to 2.2 mV	210 μ V/V + 4.5 μ V		
40 Hz to 20 kHz	0.22 mV to 2.2 mV	105 μ V/V + 4.5 μ V		
20 kHz to 50 kHz	0.22 mV to 2.2 mV	370 μ V/V + 4.5 μ V		
50 kHz to 100 kHz	0.22 mV to 2.2 mV	850 μ V/V + 7 μ V		
100 kHz to 300 kHz	0.22 mV to 2.2 mV	1 100 μ V/V + 13 μ V		
300 kHz to 500 kHz	0.22 mV to 2.2 mV	1 700 μ V/V + 25 μ V		
500 kHz to 1 MHz	0.22 mV to 2.2 mV	3 400 μ V/V + 25 μ V		
Equipment to Output AC Voltage (At the listed frequencies) ^F				
10 Hz to 20 Hz	2.2 mV to 22 mV	550 μ V/V + 5 μ V		
20 Hz to 40 Hz	2.2 mV to 22 mV	210 μ V/V + 5 μ V		
40 kHz to 20 kHz	2.2 mV to 22 mV	105 μ V/V + 5 μ V		
20 kHz to 50 kHz	2.2 mV to 22 mV	370 μ V/V + 5 μ V		
50 kHz to 100 kHz	2.2 mV to 22 mV	850 μ V/V + 7 μ V		
100 kHz to 300 kHz	2.2 mV to 22 mV	1 100 μ V/V + 12 μ V		



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Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5700A	ASP 005
300 kHz to 500 kHz	2.2 mV to 22 mV	1 700 μ V/V + 25 μ V		
500 kHz to 1 MHz	2.2 mV to 22 mV	3 400 μ V/V + 25 μ V		
Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5700A	EURAMET_cg-15_v_2.0 ASP 005
10 Hz to 20 Hz	22 mV to 220 mV	550 μ V/V + 13 μ V		
20 Hz to 40 Hz	22 mV to 220 mV	210 μ V/V + 8 μ V		
40 kHz to 20 kHz	22 mV to 220 mV	105 μ V/V + 8 μ V		
20 kHz to 50 kHz	22 mV to 220 mV	320 μ V/V + 8 μ V		
50 kHz to 100 kHz	22 mV to 220 mV	850 μ V/V + 25 μ V		
100 kHz to 300 kHz	22 mV to 220 mV	1 100 μ V/V + 25 μ V		
300 kHz to 500 kHz	22 mV to 220 mV	1 700 μ V/V + 35 μ V		
500 kHz to 1 MHz	22 mV to 220 mV	3 400 μ V/V + 80 μ V		
Equipment to Output AC Voltage (At the listed frequencies) ^F				
10 Hz to 20 Hz	220 mV to 2.2 V	500 μ V/V + 80 μ V		
20 Hz to 40 Hz	220 mV to 2.2 V	160 μ V/V + 25 μ V		
40 kHz to 20 kHz	220 mV to 2.2 V	75 μ V/V + 6 μ V		
20 kHz to 50 kHz	220 mV to 2.2 V	120 μ V/V + 16 μ V		
50 kHz to 100 kHz	220 mV to 2.2 V	250 μ V/V + 70 μ V		
100 kHz to 300 kHz	220 mV to 2.2 V	430 μ V/V + 130 μ V		
300 kHz to 500 kHz	220 mV to 2.2 V	1 050 μ V/V + 350 μ V		
500 kHz to 1 MHz	220 mV to 2.2 V	2 200 μ V/V + 850 μ V		
Equipment to Output AC Voltage (At the listed frequencies) ^F				
10 Hz to 20 Hz	2.2 V to 22 V	500 μ V/V + 800 μ V		
20 Hz to 40 Hz	2.2 V to 22 V	160 μ V/V + 250 μ V		
40 kHz to 20 kHz	2.2 V to 22 V	75 μ V/V + 60 μ V		
20 kHz to 50 kHz	2.2 V to 22 V	120 μ V/V + 160 μ V		
50 kHz to 100 kHz	2.2 V to 22 V	250 μ V/V + 350 μ V		
100 kHz to 300 kHz	2.2 V to 22 V	500 μ V/V + 1 500 μ V		
300 kHz to 500 kHz	2.2 V to 22 V	1 250 μ V/V + 4 300 μ V		
500 kHz to 1 MHz	2.2 V to 22 V	2 700 μ V/V + 8 500 μ V		



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Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5700A	EURAMET_cg-15_v_2.0 ASP 005
10 Hz to 20 Hz	22 V to 220 V	500 μ V/V + 8 mV		
20 Hz to 40 Hz	22 V to 220 V	160 μ V/V + 2.5 mV		
40 kHz to 20 kHz	22 V to 220 V	80 μ V/V + 0.8 mV		
20 kHz to 50 kHz	22 V to 220 V	220 μ V/V + 3.5 mV		
50 kHz to 100 kHz	22 V to 220 V	500 μ V/V + 8 mV		
100 kHz to 300 kHz	22 V to 220 V	1 500 μ V/V + 90 mV		
300 kHz to 500 kHz	22 V to 220 V	4 700 μ V/V + 90 mV		
500 kHz to 1 MHz	22 V to 220 V	11 500 μ V/V + 190 mV		
Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5700A w/ 5725A	
15 Hz to 50 Hz	220 V to 1 100 V	400 μ V/V + 16 mV		
50 Hz to 1 kHz	220 V to 1 100 V	80 μ V/V + 3.5 mV		
Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5700A w/ 5725A	
40 Hz to 1 kHz	220 V to 1 100 V	90 μ V/V + 4 mV		
1 kHz to 20 kHz	220 V to 1 100 V	165 μ V/V + 6 mV		
20 kHz to 30 kHz	220 V to 1 100 V	600 μ V/V + 11 mV		
30 kHz to 50 kHz	220 V to 750 V	600 μ V/V + 11 mV		
50 kHz to 100 kHz	220 V to 750 V	2 300 μ V/V + 45 mV		
Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5500A	ASP 001
10 Hz to 45 Hz	1 mV to 33 mV	0.35 % of reading + 20 μ V		
45 Hz to 10 kHz	1 mV to 33 mV	0.15 % of reading + 20 μ V		
10 kHz to 20 kHz	1 mV to 33 mV	0.2 % of reading + 20 μ V		
20 kHz to 50 kHz	1 mV to 33 mV	0.25 % of reading + 20 μ V		
50 kHz to 100 kHz	1 mV to 33 mV	0.35 % of reading + 33 μ V		
100 kHz to 500 kHz	1 mV to 33 mV	1 % of reading + 60 μ V		
Equipment to Output AC Voltage (At the listed frequencies) ^F				
10 Hz to 45 Hz	33 mV to 330 mV	0.25 % of reading + 50 μ V		
45 Hz to 10 kHz	33 mV to 330 mV	0.05 % of reading + 20 μ V		
10 kHz to 20 kHz	33 mV to 330 mV	0.1 % of reading + 20 μ V		
20 kHz to 50 kHz	33 mV to 330 mV	0.16 % of reading + 40 μ V		
50 kHz to 100 kHz	33 mV to 330 mV	0.24 % of reading + 170 μ V		
100 kHz to 500 kHz	33 mV to 330 mV	0.7 % of reading + 330 μ V		



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Equipment to Output AC Voltage (At the listed frequencies) ^F			Fluke 5500A	ASP 001
10 Hz to 45 Hz	330 mV to 3.3 V	0.15 % of reading + 250 μ V		
45 Hz to 10 kHz	330 mV to 3.3 V	0.03 % of reading + 60 μ V		
10 kHz to 20 kHz	330 mV to 3.3 V	0.08 % of reading + 60 μ V		
20 kHz to 50 kHz	330 mV to 3.3 V	0.14 % of reading + 300 μ V		
50 kHz to 100 kHz	330 mV to 3.3 V	0.24 % of reading + 1 700 μ V		
100 kHz to 500 kHz	330 mV to 3.3 V	0.5 % of reading + 3 300 μ V		
Equipment to Output AC Voltage (At the listed frequencies) ^F				
10 Hz to 45 Hz	3.3 V to 33 V	0.15 % of reading + 2 500 μ V		
45 Hz to 10 kHz	3.3 V to 33 V	0.04 % of reading + 600 μ V		
10 kHz to 20 kHz	3.3 V to 33 V	0.08 % of reading + 2 600 μ V		
20 kHz to 50 kHz	3.3 V to 33 V	0.19 % of reading + 5 000 μ V		
50 kHz to 100 kHz	3.3 V to 33 V	0.19 % of reading + 5 000 μ V		
100 kHz to 500 kHz	3.3 V to 33 V	0.24 % of reading + 17 000 μ V		
Equipment to Output AC Voltage (At the listed frequencies) ^F				
45 Hz to 1 kHz	33 V to 330 V	0.05 % of reading + 6.6 mV		
1 kHz to 10 kHz	33 V to 330 V	0.08 % of reading + 15 mV		
10 kHz to 20 kHz	33 V to 330 V	0.09 % of reading + 33 mV		
Equipment to Output AC Voltage (At the listed frequencies) ^F				
45 Hz to 1 kHz	330 V to 1 020 V	0.05 % of reading + 80 mV		
1 kHz to 5 kHz	330 V to 1 020 V	0.2 % of reading + 100 mV		
5 kHz to 10 kHz	330 V to 1 020 V	0.09 % of reading + 500 mV		
Equipment to Measure AC Voltage (At the listed frequencies) ^F			Agilent 3458A Opt 002	ASP 006
1 Hz to 40 Hz	10 μ V to 12 mV	0.03 % of Reading + 3 μ V		
40 Hz to 1 kHz	10 μ V to 12 mV	0.02 % of Reading + 1.1 μ V		
1 kHz to 20 kHz	10 μ V to 12 mV	0.03 % of Reading + 1.1 μ V		
20 kHz to 50 kHz	10 μ V to 12 mV	0.1 % of Reading + 1.1 μ V		
50 kHz to 100 kHz	10 μ V to 12 mV	0.5 % of Reading + 1.1 μ V		
100 kHz to 300 kHz	10 μ V to 12 mV	4 % of Reading + 2 μ V		



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Equipment to Measure AC Voltage (At the listed frequencies) ^F			Agilent 3458A Opt 002	ASP 006
1 Hz to 40 Hz	12 mV to 120 mV	0.007 % of Reading + 4 μ V		
40 Hz to 1 kHz	12 mV to 120 mV	0.007 % of Reading + 2 μ V		
1 kHz to 20 kHz	12 mV to 120 mV	0.014 % of Reading + 2 μ V		
20 kHz to 50 kHz	12 mV to 120 mV	0.03 % of Reading + 2 μ V		
50 kHz to 100 kHz	12 mV to 120 mV	0.08 % of Reading + 2 μ V		
100 kHz to 300 kHz	12 mV to 120 mV	0.3 % of Reading + 10 μ V		
300 kHz to 1 MHz	12 mV to 120 mV	1 % of Reading + 10 μ V		
1 MHz to 2 MHz	12 mV to 120 mV	1.5 % of Reading + 10 μ V		
Equipment to Measure AC Voltage (At the listed frequencies) ^F			Fluke 8588A DMM	ASP 343
1 Hz to 2 kHz	10 μ V to 12.12 mV	251 μ V/V + 110 μ V		
2 kHz to 10 kHz	10 μ V to 12.12 mV	415 μ V/V + 110 μ V		
10 kHz to 30 kHz	10 μ V to 12.12 mV	415 μ V/V + 110 μ V		
30 kHz to 100 kHz	10 μ V to 12.12 mV	0.35 % + 0.011 %		
100 kHz to 300 kHz	10 μ V to 12.12 mV	1.3 % + 0.04 %		
300 kHz to 1 MHz	10 μ V to 12.12 mV	2.3 % + 0.04 %		
Equipment to Measure AC Voltage (At the listed frequencies) ^F			Fluke 8588A DMM	
1 Hz to 2 kHz	12.12 mV to 121.2 mV	108 μ V/V + 5 μ V		
2 kHz to 10 kHz	12.12 mV to 121.2 mV	180 μ V/V + 5 μ V		
10 kHz to 30 kHz	12.12 mV to 121.2 mV	361 μ V/V + 10 μ V		
30 kHz to 100 kHz	12.12 mV to 121.2 mV	901 μ V/V + 50 μ V		
100 kHz to 300 kHz	12.12 mV to 121.2 mV	0.37 % + 0.03 %		
300 kHz to 1 MHz	12.12 mV to 121.2 mV	1.3 % + 0.10 %		
1 MHz to 2 MHz	12.12 mV to 121.2 mV	1.8 % + 0.5 %		
2 MHz to 4 MHz	12.12 mV to 121.2 mV	5.42 % + 1 %		
4 MHz to 8 MHz	12.12 mV to 121.2 mV	x9.35 % + 1 %		
8 MHz to 10 MHz	12.12 mV to 121.2 mV	17 % + 1 %		



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Equipment to Measure AC Voltage (At the listed frequencies) ^F			Fluke 8588A DMM	ASP 343
1 Hz to 2 kHz	121.2 mV to 1.212 V	108 μ V/V + 5 μ V		
2 kHz to 10 kHz	121.2 mV to 1.212 V	180 μ V/V + 5 μ V		
10 kHz to 30 kHz	121.2 mV to 1.212 V	361 μ V/V + 10 μ V		
30 kHz to 100 kHz	121.2 mV to 1.212 V	901 μ V/V + 50 μ V		
100 kHz to 300 kHz	121.2 mV to 1.212 V	0.36 % + 0.03 %		
300 kHz to 1 MHz	121.2 mV to 1.212 V	1.3 % + 0.1 %		
1 MHz to 2 MHz	121.2 mV to 1.212 V	1.8 % + 0.5 %		
2 MHz to 4 MHz	121.2 mV to 1.212 V	5.4 % + 1 %		
4 MHz to 8 MHz	121.2 mV to 1.212 V	9.4 % + 1 %		
8 MHz to 10 MHz	121.2 mV to 1.212 V	16.7 % + 1 %		
Equipment to Measure AC Voltage (At the listed frequencies) ^F				
1 Hz to 2 kHz	1.212 V to 12.12 V	108 μ V/V + 5 μ V		
2 kHz to 10 kHz	1.212 V to 12.12 V	180 μ V/V + 5 μ V		
10 kHz to 30 kHz	1.212 V to 12.12 V	361 μ V/V + 10 μ V		
30 kHz to 100 kHz	1.212 V to 12.12 V	901 μ V/V + 50 μ V		
100 kHz to 300 kHz	1.212 V to 12.12 V	0.36 % + 0.03 %		
300 kHz to 1 MHz	1.212 V to 12.12 V	1.3 % + 0.1 %		
1 MHz to 2 MHz	1.212 V to 12.12 V	1.8 % + 0.5 %		
2 MHz to 4 MHz	1.212 V to 12.12 V	5.4 % + 1 %		
4 MHz to 8 MHz	1.212 V to 12.12 V	9.4 % + 1 %		
8 MHz to 10 MHz	1.212 V to 12.12 V	16.7 % + 1 %		
Equipment to Measure AC Voltage (At the listed frequencies) ^F				
1 Hz to 2 kHz	12.12 V to 121.2 V	108 μ V/V + 5 μ V		
2 kHz to 10 kHz	12.12 V to 121.2 V	135 μ V/V + 5 μ V		
10 kHz to 30 kHz	12.12 V to 121.2 V	361 μ V/V + 10 μ V		



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Equipment to Measure AC Voltage (At the listed frequencies) ^F			Fluke 8588A DMM	ASP 343
30 kHz to 100 kHz	12.12 V to 121.2 V	901 μ V/V + 50 μ V		
100 kHz to 300 kHz	12.12 V to 121.2 V	0.55 % + 0.05 %		
300 kHz to 1 MHz	12.12 V to 121.2 V	1.3 % + 0.5 %		
Equipment to Measure AC Voltage (At the listed frequencies) ^F				
1 Hz to 2 kHz	121.2 V to 1 050 V	174 μ V/V + 32 μ V		
2 kHz to 10 kHz	121.2 V to 1 050 V	174 μ V/V + 32 μ V		
10 kHz to 30 kHz	121.2 V to 1 050 V	465 μ V/V + 32 μ V		
30 kHz to 100 kHz	121.2 V to 1 050 V	1 163 μ V/V + 129 μ V		
Equipment to Measure AC Voltage (At the listed frequencies) ^F				
1 Hz to 40 Hz	120 mV to 1.2 V	0.007 % of Reading + 40 μ V		
40 Hz to 1 kHz	120 mV to 1.2 V	0.007 % of Reading + 20 μ V		
1 kHz to 20 kHz	120 mV to 1.2 V	0.014 % of Reading + 20 μ V		
20 kHz to 50 kHz	120 mV to 1.2 V	0.03 % of Reading + 20 μ V		
50 kHz to 100 kHz	120 mV to 1.2 V	0.08 % of Reading + 20 μ V		
100 kHz to 300 kHz	120 mV to 1.2 V	0.3 % of Reading + 100 μ V		
300 kHz to 1 MHz	120 mV to 1.2 V	1 % of Reading + 100 μ V		
Equipment to Measure AC Voltage (At the listed frequencies) ^F				
1 Hz to 40 Hz	1.2 V to 12 V	0.007 % of Reading + 0.4 mV		
40 Hz to 1 kHz	1.2 V to 12 V	0.007 % of Reading + 0.2 mV		
1 kHz to 20 kHz	1.2 V to 12 V	0.014 % of Reading + 0.2 mV		
20 kHz to 50 kHz	1.2 V to 12 V	0.03 % of Reading + 0.2 mV		
50 kHz to 100 kHz	1.2 V to 12 V	0.08 % of Reading + 0.2 mV		
100 kHz to 300 kHz	1.2 V to 12 V	0.3 % of Reading + 1 mV		
300 kHz to 1 MHz	1.2 V to 12 V	1 % of Reading + 1 mV		
1 MHz to 2 MHz	1.2 V to 12 V	1.5 % of Reading + 1 mV		



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Equipment to Measure AC Voltage (At the listed frequencies) ^F			Agilent 3458A Opt 002	ASP 006
1 Hz to 40 Hz	12 V to 120 V	0.02 % of Reading + 4 mV		
40 Hz to 1 kHz	12 V to 120 V	0.02 % of Reading + 2 mV		
1 kHz to 20 kHz	12 V to 120 V	0.02 % of Reading + 2 mV		
20 kHz to 50 kHz	12 V to 120 V	0.035 % of Reading + 2 mV		
50 kHz to 100 kHz	12 V to 120 V	0.12 % of Reading + 2 mV		
100 kHz to 300 kHz	12 V to 120 V	0.4 % of Reading + 10 mV		
300 kHz to 1 MHz	12 V to 120 V	1.5 % of Reading + 10 mV		
Equipment to Measure AC Voltage (At the listed frequencies) ^F				
1 Hz to 40 Hz	120 V to 700 V	0.04 % of Reading + 40 mV		
40 Hz to 1 kHz	120 V to 700 V	0.04 % of Reading + 20 mV		
1 kHz to 20 kHz	120 V to 700 V	0.06 % of Reading + 20 mV		
20 kHz to 50 kHz	120 V to 700 V	0.12 % of Reading + 20 mV		
50 kHz to 100 kHz	120 V to 700 V	0.3 % of Reading + 20 mV		
Equipment to Measure AC Voltage (At the listed frequencies) ^F				
Equipment to Output AC Voltage 40 Hz to 60 Hz	300 V to 3 000 V	0.2 % of Reading + 1.2 V	Time Electronics 5075	
Equipment to Output DC Current ^F	Up to 220 μ A	40 μ A/A + 6 nA	Fluke 5730A With Fluke 5725A Amplifier	EURAMET_cg-15_v_2.0 ASP 001
	220 μ A to 2.2 mA	35 μ A/A + 7 nA		
	2.2 mA to 22 mA	35 μ A/A + 40 nA		
	22 mA to 220 mA	45 μ A/A + 0.7 μ A		
	220 mA to 2.2 A	80 μ A/A + 12 μ A		
	2.2 A to 11A	360 μ A/A + 480 μ A		
	Up to 20.2 μ A	30 μ A/A + 40 μ A	Fluke 5730A	
	20.2 μ A to 202 μ A	9.8 μ A/A + 4 μ A		
	202 μ A to 2.02 mA	9.8 μ A/A + 4 μ A		
	2.02 mA to 20.2 mA	12 μ A/A + 4 μ A		
	20.2 mA to 202 mA	50 μ A/A + 10 μ A		
	202 mA to 2.02 A	150 μ A/A + 100 μ A		
	2.02 A to 20.2 A	255 μ A/A + 40 μ A		
	20.2 A to 30.2 A	490 μ A/A + 146 μ A		



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Equipment to Output DC Current ^F	Up to 220 μ A	50 μ A/A + 8 nA	Fluke 5700A	EURAMET_cg-15__v_2.0 ASP 003
	220 μ A to 2.2 mA	50 μ A/A + 8 nA		
	2.2 mA to 22 mA	50 μ A/A + 80 nA		
	22 mA to 220 mA	60 μ A/A + 0.8 μ A		
	220 mA to 2.2 A	80 μ A/A + 25 μ A		
	2.2 A to 11A	360 μ A/A + 480 μ A	Fluke 5700A w/ 5725A ASP 003	
Equipment to Measure DC Current ^F	Up to 3.3 mA	0.013 % of reading + 0.05 μ A	Fluke 5500A ASP 003	
	3.3 mA to 33 mA	0.01 % of reading + 0.25 μ A		
	33 mA to 330 mA	0.01 % of reading + 3.3 μ A		
	330 mA to 2.2 A	0.03 % of reading + 44 μ A		
	2.2 A to 11 A	0.06 % of reading + 330 μ A		
Equipment to Output AC Current ^F			Fluke 5730A	EURAMET_cg-15__v_2.0 ASP 001
10 Hz to 20 Hz	9 μ A to 220 μ A	300 μ A/A + 20 nA		
20 Hz to 40 Hz	9 μ A to 220 μ A	200 μ A/A + 12 nA		
40 Hz to 1 kHz	9 μ A to 220 μ A	120 μ A/A + 10 nA		
1 kHz to 5 kHz	9 μ A to 220 μ A	350 μ A/A + 15 nA		
5 kHz to 10 kHz	9 μ A to 220 μ A	1 300 μ A/A + 80 nA		
Equipment to Output AC Current ^F				
10 Hz to 20 Hz	220 μ A to 2.2 mA	300 μ A/A + 50 nA		
20 Hz to 40 Hz	220 μ A to 2.2 mA	200 μ A/A + 40 nA		
40 Hz to 1 kHz	220 μ A to 2.2 mA	120 μ A/A + 40 nA		
1 kHz to 5 kHz	220 μ A to 2.2 mA	240 μ A/A + 130 nA		
5 kHz to 10 kHz	220 μ A to 2.2 mA	1 300 μ A/A + 800 nA		
Equipment to Output AC Current ^F				
10 Hz to 20 Hz	2.2 mA to 22 mA	300 μ A/A + 0.5 μ A		
20 Hz to 40 Hz	2.2 mA to 22 mA	200 μ A/A + 0.4 μ A		
40 Hz to 1 kHz	2.2 mA to 22 mA	120 μ A/A + 0.4 μ A		
1 kHz to 5 kHz	2.2 mA to 22 mA	240 μ A/A + 0.7 μ A		
5 kHz to 10 kHz	2.2 mA to 22 mA	1 300 μ A/A + 6 μ A		



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Equipment to Output AC Current ^F			Fluke 5730A	EURAMET_cg-15__v_2.0 ASP 001
10 Hz to 20 Hz	22 mA to 220 mA	300 μ A/A + 5 μ A		
20 Hz to 40 Hz	22 mA to 220 mA	200 μ A/A + 4 μ A		
40 Hz to 1 kHz	22 mA to 220 mA	120 μ A/A + 3 μ A		
1 kHz to 5 kHz	22 mA to 220 mA	240 μ A/A + 4 μ A		
5 kHz to 10 kHz	22 mA to 220 mA	1 300 μ A/A + 12 μ A		
Equipment to Output AC Current ^F				
20 Hz to 1 kHz	220 mA to 2.2 A	300 μ A/A + 40 μ A		
1 kHz to 5 kHz	220 mA to 2.2 A	500 μ A/A + 100 μ A		
5 kHz to 10 kHz	220 mA to 2.2 A	8 000 μ A/A + 200 μ A		
10 Hz to 20 Hz	2.2 A to 11 A	460 μ A/A + 170 μ A		
20 Hz to 40 Hz	2.2 A to 11 A	950 μ A/A + 380 μ A		
40 Hz to 1 kHz	2.2 A to 11 A	3 600 μ A/A + 750 μ A		
Equipment to Output DC Power ^{FO} (at the listed per Voltage and Current)			Fluke 5500A	ASP 001 ASP 003
33 mV to 1 020 V and 3 mA to 11A	109 μ W to 9.18 W	0.04 % of reading		
	297 μ W to 33.66 W	0.03 % of reading		
	1 089 μ W to 91.8 W	0.04 % of reading		
	2.97 mW to 336.6 W	0.03 % of reading		
	10.89 mW to 918 W	0.08 % of reading		
	29.7 mW to 2 244 W	0.06 % of reading		
	72.6 mW to 4 590 W	0.12 % of reading		
	148.5 mW to 11 220 W	0.09 % of reading		
Equipment to Output DC Current ^F			Agilent 3458A Opt 002	ASP 004
Up to 120 nA	30 ppm + 40 pA			
120 nA to 1.2 μ A	20 μ A/A + 40 pA			
1.2 μ A to 12 μ A	20 μ A/A + 100 pA			
12 μ A to 120 μ A	20 μ A/A + 0.8 nA			
120 μ A to 1.2 mA	20 μ A/A + 5 nA			
1.2 mA to 12 mA	20 μ A/A + 50 nA			
12 mA to 120 mA	35 μ A/A + 0.5 μ A			
120 mA to 1.05 A	110 μ A/A + 10 μ A			



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Equipment to Measure AC Current (At the listed frequencies) ^F			Fluke 5700A	EURAMET_cg-15_v_2.0 ASP 007
10 Hz to 20 Hz	9 μ A to 220 μ A	700 μ A/A + 25 nA		
20 Hz to 40 Hz	9 μ A to 220 μ A	350 μ A/A + 20 nA		
40 Hz to 1 kHz	9 μ A to 220 μ A	140 μ A/A + 16 nA		
1 kHz to 5 kHz	9 μ A to 220 μ A	600 μ A/A + 40 nA		
5 kHz to 10 kHz	9 μ A to 220 μ A	1 600 μ A/A + 80 nA		
Equipment to Measure AC Current (At the listed frequencies) ^F				
10 Hz to 20 Hz	220 μ A to 2.2 mA	700 μ A/A + 40 nA		
20 Hz to 40 Hz	220 μ A to 2.2 mA	350 μ A/A + 35 nA		
40 Hz to 1 kHz	220 μ A to 2.2 mA	140 μ A/A + 35 nA		
1 kHz to 5 kHz	220 μ A to 2.2 mA	600 μ A/A + 400 nA		
5 kHz to 10 kHz	220 μ A to 2.2 mA	1 600 μ A/A + 800 nA		
Equipment to Measure AC Current (At the listed frequencies) ^F				
10 Hz to 20 Hz	2.2 mA to 22 mA	700 μ A/A + 0.4 μ A		
20 Hz to 40 Hz	2.2 mA to 22 mA	350 μ A/A + 0.35 μ A		
40 Hz to 1 kHz	2.2 mA to 22 mA	140 μ A/A + 0.35 μ A		
1 kHz to 5 kHz	2.2 mA to 22 mA	600 μ A/A + 4 μ A		
5 kHz to 10 kHz	2.2 mA to 22 mA	1 600 μ A/A + 8 μ A		
Equipment to Measure AC Current (At the listed frequencies) ^F				
10 Hz to 20 Hz	22 mA to 220 mA	700 μ A/A + 4 μ A		
20 Hz to 40 Hz	22 mA to 220 mA	350 μ A/A + 3.5 μ A		
40 Hz to 1 kHz	22 mA to 220 mA	140 μ A/A + 3.5 μ A		
1 kHz to 5 kHz	22 mA to 220 mA	600 μ A/A + 40 μ A		
5 kHz to 10 kHz	22 mA to 220 mA	1 600 μ A/A + 80 μ A		
Equipment to Measure AC Current (At the listed frequencies) ^F				
20 Hz to 1 kHz	220 mA to 2.2 A	650 μ A/A + 35 μ A		
1 kHz to 5 kHz	220 mA to 2.2 A	750 μ A/A + 80 μ A		
5 kHz to 10 kHz	220 mA to 2.2 A	8 500 μ A/A + 160 μ A		



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Equipment to Measure AC Current (At the listed frequencies) ^F				
10 Hz to 20 Hz	2.2 A to 11 A	460 μ A/A + 170 μ A	Fluke 5700A w/ 5725A	EURAMET_cg-15_v_2.0 ASP 007
20 Hz to 40 Hz	2.2 A to 11 A	950 μ A/A + 380 μ A		
40 Hz to 1 kHz	2.2 A to 11 A	3 600 μ A/A + 750 μ A		
Equipment to Measure AC Current (At the listed frequencies) ^F				
10 Hz to 20 Hz	29 μ A to 330 μ A	0.15 μ A + 0.25 % of reading	Fluke 5500A	ASP 007
20 Hz to 45 Hz	29 μ A to 330 μ A	0.15 μ A + 0.125 % of reading		
45 Hz to 1 kHz	29 μ A to 330 μ A	0.15 μ A + 0.125 % of reading		
1 kHz to 5 kHz	29 μ A to 330 μ A	0.15 μ A + 0.4 % of reading		
5 kHz to 10 kHz	29 μ A to 330 μ A	0.15 μ A + 1.25 % of reading		
Equipment to Measure AC Current (At the listed frequencies) ^F				
10 Hz to 20 Hz	0.33 mA to 3.3 mA	0.2 % of reading + 0.3 μ A		
20 Hz to 45 Hz	0.33 mA to 3.3 mA	0.1 % of reading + 0.3 μ A		
45 Hz to 1 kHz	0.33 mA to 3.3 mA	0.1 % of reading + 0.3 μ A		
1 kHz to 5 kHz	0.33 mA to 3.3 mA	0.2 % of reading + 0.3 μ A		
5 kHz to 10 kHz	0.33 mA to 3.3 mA	0.6 % of reading + 0.3 μ A		
Equipment to Measure AC Current (At the listed frequencies) ^F				
10 Hz to 20 Hz	3.3 mA to 33 mA	0.2 % of reading + 3 μ A		
20 Hz to 45 Hz	3.3 mA to 33 mA	0.1 % of reading + 3 μ A		
45 Hz to 1 kHz	3.3 mA to 33 mA	0.09 % of reading + 3 μ A		
1 kHz to 5 kHz	3.3 mA to 33 mA	0.2 % of reading + 3 μ A		
5 kHz to 10 kHz	3.3 mA to 33 mA	0.6 % of reading + 3 μ A		
Equipment to Measure AC Current				
10 Hz to 20 Hz	33 mA to 330 mA	0.2 % of reading + 30 μ A		
20 Hz to 45 Hz	33 mA to 330 mA	0.1 % of reading + 30 μ A		
45 Hz to 1 kHz	33 mA to 330 mA	0.09 % of reading + 30 μ A		
1 kHz to 5 kHz	33 mA to 330 mA	0.2 % of reading + 30 μ A		
5 kHz to 10 kHz	33 mA to 330 mA	0.6 % of reading + 30 μ A		



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Equipment to Measure AC Current (At the listed frequencies) ^F			Fluke 5500A	ASP 007
10 Hz to 45 Hz	0.33 A to 2.2 A	0.2 % of reading + 300 μ A		
20 Hz to 45 Hz	0.33 A to 2.2 A	0.1 % of reading + 300 μ A		
45 Hz to 1 kHz	0.33 A to 2.2 A	0.75 % of reading + 300 μ A		
Equipment to Measure AC Current (At the listed frequencies) ^F				
45 Hz to 65 Hz	2.2 A to 11 A	0.06 % of reading + 2 000 μ A		
65 Hz to 500 Hz	2.2 A to 11 A	0.1 % of reading + 2 000 μ A		
500 Hz to 1 kHz	2.2 A to 11 A	0.33 % of reading + 2 000 μ A	Fluke 8588A DMM	ASP 343
Equipment to Measure AC Current (at the listed frequencies) ^F				
1 Hz to 2 kHz	100 pA to 20.2 μ A	3 040 μ A/A + 250 μ A		
2 kHz to 10 kHz	100 pA to 20.2 μ A	3 040 μ A/A + 250 μ A		
10 kHz to 30 kHz	100 pA to 20.2 μ A	3 040 μ A/A + 250 μ A		
Equipment to Measure AC Current (at the listed frequencies) ^F				
1 Hz to 2 kHz	20.2 μ A to 202 μ A	361 μ A/A + 50 μ A		
2 kHz to 10 kHz	20.2 μ A to 202 μ A	721 μ A/A + 50 μ A		
10 kHz to 30 kHz	20.2 μ A to 202 μ A	938 μ A/A + 50 μ A		
30 kHz to 100 kHz	20.2 μ A to 202 μ A	5 220 μ A/A + 100 μ A		
Equipment to Measure AC Current (at the listed frequencies) ^F				
1 Hz to 2 kHz	202 μ A to 2.02 mA	361 μ A/A + 50 μ A		
2 kHz to 10 kHz	202 μ A to 2.02 mA	721 μ A/A + 50 μ A		
10 kHz to 30 kHz	202 μ A to 2.02 mA	938 μ A/A + 50 μ A		
30 kHz to 100 kHz	202 μ A to 2.02 mA	5 220 μ A/A + 100 μ A		
Equipment to Measure AC Current (at the listed frequencies) ^F				
1 Hz to 2 kHz	2.02 mA to 20.2 mA	361 μ A/A + 50 μ A		
2 kHz to 10 kHz	2.02 mA to 20.2 mA	721 μ A/A + 50 μ A		
10 kHz to 30 kHz	2.02 mA to 20.2 mA	938 μ A/A + 50 μ A		
30 kHz to 100 kHz	2.02 mA to 20.2 mA	5 220 μ A/A + 100 μ A		



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Equipment to Measure AC Current (at the listed frequencies) ^F			Fluke 8588A DMM	ASP 343
1 Hz to 2 kHz	20.2 mA to 202 mA	361 μ A/A + 50 μ A		
2 kHz to 10 kHz	20.2 mA to 202 mA	721 μ A/A + 50 μ A		
10 kHz to 30 kHz	20.2 mA to 202 mA	938 μ A/A + 50 μ A		
Equipment to Measure AC Current (at the listed frequencies) ^F				
1 Hz to 2 kHz	202 mA to 2.02 A	361 μ A/A + 100 μ A		
2 kHz to 10 kHz	202 mA to 2.02 A	721 μ A/A + 100 μ A		
10 kHz to 30 kHz	202 mA to 2.02 A	938 μ A/A + 100 μ A		
Equipment to Measure AC Current (at the listed frequencies) ^F				
10 Hz to 2 kHz	2.02 A to 20.2 A	1 510 μ A/A + 50 μ A		
2 kHz to 10 kHz	2.02 A to 20.2 A	1 370 μ A/A + 50 μ A		
10 Hz to 2 kHz	20.2 A to 30.2 A	1 220 μ A/A + 400 μ A		
2 kHz to 10 kHz	20.2 A to 30.2 A	1 460 μ A/A + 400 μ A		
Equipment to Measure DC Current ^F	Up to 120 nA	30 ppm + 40 pA	Agilent 3458A Opt 002	ASP 004
	120 nA to 1.2 μ A	20 μ A/A + 40 pA		
	1.2 μ A to 12 μ A	20 μ A/A + 100 pA		
	12 μ A to 120 μ A	20 μ A/A + 0.8 nA		
	120 μ A to 1.2 mA	20 μ A/A + 5 nA		
	1.2 mA to 12 mA	20 μ A/A + 50 nA		
	12 mA to 120 mA	35 μ A/A + 0.5 μ A		
	120 mA to 1.05 A	110 μ A/A + 10 μ A		



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Equipment to Output AC Power (0.1 mV to 1000 V) (0.3 mA to 11 A) @ 50 Hz	109 μ W to 297 μ W	0.4 % of reading	Fluke 5500A	ASP 005 ASP 007
	297 μ W to 109 μ W	0.25 % of reading		
	1.09 mW to 2.97 mW	0.35 % of reading		
	2.97 mW to 10.9 mW	0.25 % of reading		
	10.9 mW to 297 mW	0.25 % of reading		
	297 mW to 726 mW	0.15 % of reading		
	726 mW to 1.485W	0.25 % of reading		
	1.485 W to 3.63 W	0.15 % of reading		
	3.63 W to 9.18 W	0.35 % of reading		
	9.18 W to 33.66 W	0.25 % of reading		
	33.66 W to 918 W	0.35 % of reading		
	918 W to 336.6 W	0.25 % of reading		
	336.6 W to 918 W	0.25 % of reading		
	918 W to 2 244 W	0.15 % of reading		
2 244 W to 4 590 W	0.2 % of reading			
4 590 W to 11 220 W	0.15 % of reading			
Equipment to Measure AC Current (At the listed frequencies) ^F			Fluke 8588A DMM	ASP 343
1 Hz to 2 kHz	100 pA to 20.2 μ A	3 040 μ A/A + 250 μ A		
2 kHz to 10 kHz	100 pA to 20.2 μ A	3 040 μ A/A + 250 μ A		
10 kHz to 30 kHz	100 pA to 20.2 μ A	3 040 μ A/A + 250 μ A		
Equipment to Measure AC Current (At the listed frequencies) ^F				
1 Hz to 2 kHz	20.2 μ A to 202 μ A	361 μ A/A + 50 μ A		
2 kHz to 10 kHz	20.2 μ A to 202 μ A	721 μ A/A + 50 μ A		
10 kHz to 30 kHz	20.2 μ A to 202 μ A	938 μ A/A + 50 μ A		
30 kHz to 100 kHz	20.2 μ A to 202 μ A	5 220 μ A/A + 100 μ A		
1 Hz to 2 kHz	202 μ A to 2.02 mA	361 μ A/A + 50 μ A		
2 kHz to 10 kHz	202 μ A to 2.02 mA	721 μ A/A + 50 μ A		
10 kHz to 30 kHz	202 μ A to 2.02 mA	938 μ A/A + 50 μ A		
30 kHz to 100 kHz	202 μ A to 2.02 mA	5 220 μ A/A + 100 μ A		



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Equipment to Measure AC Current (At the listed frequencies) ^F			Fluke 8588A DMM	ASP 343
1 Hz to 2 kHz	2.02 mA to 20.2 mA	361 μ A/A + 50 μ A		
2 kHz to 10 kHz	2.02 mA to 20.2 mA	721 μ A/A + 50 μ A		
10 kHz to 30 kHz	2.02 mA to 20.2 mA	938 μ A/A + 50 μ A		
30 kHz to 100 kHz	2.02 mA to 20.2 mA	5 220 μ A/A + 100 μ A		
1 Hz to 2 kHz	20.2 mA to 202 mA	361 μ A/A + 50 μ A		
2 kHz to 10 kHz	20.2 mA to 202 mA	721 μ A/A + 50 μ A		
10 kHz to 30 kHz	20.2 mA to 202 mA	938 μ A/A + 50 μ A		
1 Hz to 2 kHz	202 mA to 2.02 A	361 μ A/A + 100 μ A		
2 kHz to 10 kHz	202 mA to 2.02 A	721 μ A/A + 100 μ A		
10 kHz to 30 kHz	202 mA to 2.02 A	938 μ A/A + 100 μ A		
10 Hz to 2 kHz	2.02 A to 20.2 A	1 510 μ A/A + 50 μ A		
2 kHz to 10 kHz	2.02 A to 20.2 A	1 370 μ A/A + 50 μ A		
10 Hz to 2 kHz	20.2 A to 30.2 A	1 220 μ A/A + 400 μ A		
2 kHz to 10 kHz	20.2 A to 30.2 A	1 460 μ A/A + 400 μ A		
Equipment to AC Current (At the listed frequencies) ^F			Agilent 3458A Opt 002	ASP 008
10 Hz to 20 Hz	100 pA to 120 μ A	0.4 % of Reading + 30 nA		
20 Hz to 45 Hz	100 pA to 120 μ A	0.15 % of Reading + 30 nA		
45 Hz to 100 Hz	100 pA to 120 μ A	0.06 % of Reading + 30 nA		
100 Hz to 5 kHz	100 pA to 120 μ A	0.06 % of Reading + 30 nA		
Equipment to AC Current (At the listed frequencies) ^F				
10 Hz to 20 Hz	120 μ A to 1.2 mA	0.4 % of Reading + 0.2 μ A		
20 Hz to 45 Hz	120 μ A to 1.2 mA	0.15 % of Reading + 0.2 μ A		
45 Hz to 100 Hz	120 μ A to 1.2 mA	0.06 % of Reading + 0.2 μ A		
100 Hz to 5 kHz	120 μ A to 1.2 mA	0.03 % of Reading + 0.2 μ A		
5 kHz to 20 kHz	120 μ A to 1.2 mA	0.06 % of Reading + 0.2 μ A		
20 kHz to 50 kHz	120 μ A to 1.2 mA	0.4 % of Reading + 0.4 μ A		
50 kHz to 100 kHz	120 μ A to 1.2 mA	0.55 % of Reading + 1.5 μ A		



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Equipment to AC Current (At the listed frequencies) ^F			Agilent 3458A Opt 002	ASP 008
10 Hz to 20 Hz	1.2 mA to 12 mA	0.4 % of Reading + 2 μ A		
20 Hz to 45 Hz	1.2 mA to 12 mA	0.15 % of Reading + 2 μ A		
45 Hz to 100 Hz	1.2 mA to 12 mA	0.06 % of Reading + 2 μ A		
100 Hz to 5 kHz	1.2 mA to 12 mA	0.03 % of Reading + 2 μ A		
5 kHz to 20 kHz	1.2 mA to 12 mA	0.06 % of Reading + 2 μ A		
20 kHz to 50 kHz	1.2 mA to 12 mA	0.4 % of Reading + 4 μ A		
50 kHz to 100 kHz	1.2 mA to 12 mA	0.55 % of Reading + 15 μ A		
Equipment to AC Current (At the listed frequencies) ^F				
10 Hz to 20 Hz	12 mA to 120 mA	0.4 % of Reading + 20 μ A		
20 Hz to 45 Hz	12 mA to 120 mA	0.15 % of Reading + 20 μ A		
45 Hz to 100 Hz	12 mA to 120 mA	0.06 % of Reading + 20 μ A		
100 Hz to 5 kHz	12 mA to 120 mA	0.03 % of Reading + 20 μ A		
5 kHz to 20 kHz	12 mA to 120 mA	0.06 % of Reading + 20 μ A		
20 kHz to 50 kHz	12 mA to 120 mA	0.4 % of Reading + 40 μ A		
50 kHz to 100 kHz	12 mA to 120 mA	0.55 % of Reading + 150 μ A		
Equipment to AC Current (At the listed frequencies) ^F				
10 Hz to 20 Hz	120 mA to 1.05 A	0.4 % of Reading + 0.2 mA		
20 Hz to 45 Hz	120 mA to 1.05 A	0.16 % of Reading + 0.2 mA		
45 Hz to 100 Hz	120 mA to 1.05 A	0.08 % of Reading + 0.2 mA		
100 Hz to 5 kHz	120 mA to 1.05 A	0.1 % of Reading + 0.2 mA		
5 kHz to 20 kHz	120 mA to 1.05 A	0.3 % of Reading + 0.2 mA		
20 kHz to 50 kHz	120 mA to 1.05 A	1 % of Reading + 0.4 mA		
Equipment to Output Resistance 4 wire ^F	0 Ω	40 $\mu\Omega/\Omega$	Fluke 5730A	EURAMET_cg-15_v_2.0 ASP 009
	1 Ω	95 $\mu\Omega/\Omega$		
	1.9 Ω	95 $\mu\Omega/\Omega$		
	10 Ω	23 $\mu\Omega/\Omega$		
	19 Ω	23 $\mu\Omega/\Omega$		
	100 Ω	10 $\mu\Omega/\Omega$		
	190 Ω	10 $\mu\Omega/\Omega$		
	1 k Ω	6.5 $\mu\Omega/\Omega$		



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Equipment to Output Resistance 4 wire ^F	1.9 K ω	6.5 $\mu\Omega/\Omega$	Fluke 5730A	EURAMET_cg-15__v_2.0 ASP 009
	10 k Ω	6.5 $\mu\Omega/\Omega$		
	19 k Ω	6.5 $\mu\Omega/\Omega$		
	100 k Ω	8.5 $\mu\Omega/\Omega$		
	190 k Ω	8.5 $\mu\Omega/\Omega$		
	1 M Ω	13 $\mu\Omega/\Omega$		
	1.9 M Ω	18 $\mu\Omega/\Omega$		
	10 M Ω	40 $\mu\Omega/\Omega$		
	19 M Ω	47 $\mu\Omega/\Omega$		
	100 M Ω	100 $\mu\Omega/\Omega$		
Equipment to Resistance ^F	0 Ω	50 $\mu\Omega/\Omega$	Fluke 5700A	
	1 Ω	95 $\mu\Omega/\Omega$		
	1.9 Ω	95 $\mu\Omega/\Omega$		
	10 Ω	28 $\mu\Omega/\Omega$		
	19 Ω	27 $\mu\Omega/\Omega$		
	100 Ω	17 $\mu\Omega/\Omega$		
	190 Ω	17 $\mu\Omega/\Omega$		
	1 k Ω	13 $\mu\Omega/\Omega$		
	1.9 k Ω	13 $\mu\Omega/\Omega$		
	10 k Ω	12 $\mu\Omega/\Omega$		
	19 k Ω	12 $\mu\Omega/\Omega$		
	100 k Ω	14 $\mu\Omega/\Omega$		
	190 k Ω	14 $\mu\Omega/\Omega$		
	1 M Ω	20 $\mu\Omega/\Omega$		
	1.9 M Ω	21 $\mu\Omega/\Omega$		
	10 M Ω	40 $\mu\Omega/\Omega$		
	19 M Ω	47 $\mu\Omega/\Omega$		
100 M Ω	110 $\mu\Omega/\Omega$			



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Equipment to Resistance ^F	0 Ω to 11 Ω	0.012 % of reading + 0.008 Ω	Fluke 5500A	ASP 009
	11 Ω to 33 Ω	0.012 % of reading + 0.015 Ω		
	33 Ω to 110 Ω	0.009 % of reading + 0.015 Ω		
	110 Ω to 330 Ω	0.009 % of reading + 0.015 Ω		
	330 Ω to 1.1k Ω	0.009 % of reading + 0.06 Ω		
	1.1 k Ω to 3.3 k Ω	0.009 % of reading + 0.06 Ω		
	3.3 k Ω to 11 k Ω	0.009 % of reading + 0.6 Ω		
	11 k Ω to 33 k Ω	0.009 % of reading + 0.6 Ω		
	33 k Ω to 110 k Ω	0.011 % of reading + 6 Ω		
	110 k Ω to 330 k Ω	0.012 % of reading + 6 Ω		
	330 k Ω to 1.1 M Ω	0.015 % of reading + 55 Ω		
	1.1 M Ω to 3.3 M Ω	0.015 % of reading + 55 Ω		
	3.3 M Ω to 11 M Ω	0.06 % of reading + 550 Ω		
	11 M Ω to 33 M Ω	0.1 % of reading + 550 Ω		
	33 M Ω to 110 M Ω	0.5 % of reading + 5 500 Ω		
110 M Ω to 330 M Ω	0.5 % of reading + 16 500 Ω			
Equipment to DC Resistance ^F	10 $\mu\Omega$ to 12 Ω	15 $\mu\Omega/\Omega$ Reading+ 5 $\mu\Omega/\Omega$ of range	Agilent 3458A Opt 002	ASP 010
	12 Ω to 120 Ω	12 $\mu\Omega/\Omega$ Reading + 5 $\mu\Omega/\Omega$ of range		
	120 Ω to 1.2 k Ω	10 $\mu\Omega/\Omega$ Reading + 0.5 $\mu\Omega/\Omega$ of range		
	1.2 k Ω to 12 k Ω	10 $\mu\Omega/\Omega$ Reading + 0.5 $\mu\Omega/\Omega$ of range		
	12 k Ω to 120 k Ω	10 $\mu\Omega/\Omega$ Reading + 0.5 $\mu\Omega/\Omega$ of range		
	120 k Ω to 1.2 M Ω	15 $\mu\Omega/\Omega$ Reading + 2 $\mu\Omega/\Omega$ of range		
	1.2 M Ω to 12 M Ω	50 $\mu\Omega/\Omega$ Reading + 10 $\mu\Omega/\Omega$ of range		
	12 M Ω to 120 M Ω	500 $\mu\Omega/\Omega$ Reading + 10 $\mu\Omega/\Omega$ of range		
	120 M Ω to 1.2 G Ω	5 000 $\mu\Omega/\Omega$ Reading + 10 $\mu\Omega/\Omega$ of range		
Equipment to Capacitance 50 Hz to 1 000 Hz ^{FO}	0.33 nF to 0.5 nF	0.5 % of reading + 0.01 nF	Fluke 5500A	ASP 012
	0.5 nF to 1.1 nF	0.5 % of reading + 0.01 nF		
	1.1 nF to 3.3 nF	0.5 % of reading + 0.01 nF		
	3.3 nF to 11 nF	0.5 % of reading + 0.01 nF		
	11 nF to 33 nF	0.25 % of reading + 0.1 nF		
	33 nF to 110 nF	0.25 % of reading + 0.1 nF		
	110 nF to 330 nF	0.25 % of reading + 0.3 nF		
	0.33 μ F to 1.1 μ F	0.25 % of reading + 1 nF		



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Aerospace Metrology & Electromechanical Calibration Ltd.

Met-Cal House, Fisher Street, Newcastle-upon-Tyne, NE6 4LT, UK
 Contact Name: Stephan Oxborough Phone: 191-262-2266

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

Electrical

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	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Equipment to Capacitance 50 Hz to 1 000 Hz ^{FO}	1.1 μ F to 3.3 μ F	0.35 % of reading + 3 nF	Fluke 5500A	ASP 012
	3.3 μ F to 11 μ F	0.35 % of reading + 10 nF		
	11 μ F to 33 μ F	0.4 % of reading + 30 nF		
	33 μ F to 110 μ F	0.5 % of reading + 100 nF		
	110 μ F to 330 μ F	0.7 % of reading + 300 nF		
	330 μ F to 1.1 mF	1 % of reading + 300 nF		
Equipment to Measure Voltage ^F	2 V	0.025 % + 40 μ V	Keithley 6517B Electrometer	ASP 127
	20 V	0.025 % + 300 μ V		
	200 V	0.06 % + 3 mV		
Equipment to Measure Current ^F	20 pA	1 % + 3 fA		
	200 pA	1 % + 5 fA		
	2 nA	0.2 % + 300 fA		
	20 nA	0.2 % + 500 fA		
	200 nA	0.2 % + 5 pA		
	2 μ A	0.1 % + 100 pA		
	20 μ A	0.1 % + 500 pA		
	200 μ A	0.1 % + 5 nA		
	2 mA	0.1 % + 100 nA		
	20 mA	0.1 % + 500 nA		
Equipment to Capacitance 50 Hz to 100 kHz ^F	0.001 pF to 1 mF	0.05 % + 0.000 01 pF	Eucol U2817A Precision LCR Bridge	ASP 118
	1 mF to 3 mF	0.05 % + 0.001 5 mF		
Equipment to Resistance 50 Hz to 100 kHz ^F	0.001 Ω to 100 M Ω	0.005 % + 0.000 005 Ω		
Equipment to Inductance 50 Hz to 100 kHz ^F	100 μ H to 100 kH	0.05 % + 0.05 μ H		
Resistance Measurement ^F	2 M Ω	0.125 % + 10 Ω	Keithley 6517B Electrometer	ASP 127
	20 M Ω	0.125 % + 100 Ω		
	200 M Ω	0.15 % + 1 k Ω		
	2 G Ω	0.225 % + 10 k Ω		
	20 G Ω	0.225 % + 100 k Ω		
	200 G Ω	0.35 % + 1 M Ω		
	2 T Ω	0.35 % + 10 M Ω		
	20 T Ω	1.025 % + 100 M Ω		
200 T Ω	1.15 % + 1 G Ω			



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Voltage Source ^F	100 V	0.15 % + 10 Mv	Keithley 6517B Electrometer	ASP 127
	1 000 V	0.15 % + 100 mV		
Coulombs Measurement ^F	2 nC	0.4 % + 50 fC	Fluke Multifunction Calibrator and Keithley 6517B Electrometer with Capacitor	ASP 127
	20 nC	0.4 % + 500 fC		
	200 nC	0.4 % + 5 pC		
	2 μ C	0.4 % + 50 pC		
Equipment to Measure/Output High Voltage ^{FO}			HV divider ROSS VMD4+VMP200	ASP 179
DC Voltage	1 kV to 150 kV	0.25 %		
AC Voltage @ 50 Hz	1 kV to 150 kV	1 %		
Equipment to Output High Current ^{FO}			Reference CT H.W.Sullivan s1	ASP 056
AC Current @ 50 Hz	10 A to 500 A	0.04 %		
DC Current	10 A to 300 A	0.3 %	Precision Shunt AMECaL 300A	ASP 100
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type B ^{FO}	Up to 200 °C	1 °C	ITS-90 Beamex MC5	ASP 031
	200 °C to 500 °C	0.7 °C		
	500 °C to 800 °C	0.5 °C		
	800 °C to 1 820 °C	0.6 °C		
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type R ^{FO}	-50 °C to 0 °C	1 °C		
	Up to 150 °C	0.7 °C		
	150 °C to 1 400 °C	0.5 °C		
	1 400 °C to 1 768 °C	0.6 °C		
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type S ^{FO}	-50 °C to 0 °C	1 °C		
	Up to 50 °C	0.7 °C		
	50 °C to 1 500 °C	0.6 °C		
	1 500 °C to 1 768 °C	0.7 °C		
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type E ^{FO}	-270 °C to -200 °C	0.26 °C		
	-200 °C to 0 °C	0.2 °C		
	Up to 600 °C	0.16 °C		
	600 °C to 1 000 °C	0.26 °C		



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Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type J ^{FO}	-210 °C to -200 °C	0.32 °C	ITS-90 Beamex MC5	ASP 031
	-200 °C to 0 °C	0.22 °C		
	Up to 1 200 °C	0.32 °C		
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type K ^{FO}	-270 °C to -200 °C	1.7 °C		
	-200 °C to 0 °C	0.12 °C		
	Up to 1 000 °C	0.30 °C		
	1 000 °C to 1 372 °C	0.42 °C		
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type N ^{FO}	-200 °C to -100 °C	0.40 °C		
	-100 °C to 0 °C	0.20 °C		
	Up to 750 °C	0.23 °C		
	750 °C to 1 300 °C	0.39 °C		
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type T ^{FO}	-270 °C to -250 °C	1.0 °C		
	-250 °C to -200 °C	1.75 °C		
	-200 °C to 0 °C	0.3 °C		
	Up to 400 °C	0.14 °C		
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type U ^{FO}	-200 °C to 0 °C	0.35 °C		
	Up to 600 °C	0.21 °C		
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type L ^{FO}	-200 °C to 0 °C	0.27 °C	Electrical Simulation of Thermocouple Output Using Beamex MC5 to provide mV signals per ITS-90	ASP 031
	Up to 900 °C	0.31 °C		
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type C ^{FO}	Up to 900 °C	0.4 °C		
	900 °C to 2 000 °C	0.9 °C		
	2 000 °C to 2 315 °C	1.2 °C		
Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type G ^{FO}	Up to 70 °C	0.12 °C		
	70 °C to 200 °C	1 °C		
	200 °C to 1 600 °C	0.5 °C		
	1 600 °C to 2 000 °C	0.7 °C		
Thermistors RTD ^{FO}	-80 °C to 150 °C	0.001 °C		
	-200 °C to 850 °C			



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Temperature Calibration, Indication, and Control Equipment use with Thermocouple Type D ^{FO}	Up to 1 000 °C	0.4 °C	Electrical Simulation of Thermocouple Output Using Beamex MC5 to provide mV signals per ITS-90	ASP 031
	1 00 °C to 2 000 °C	0.8 °C		
	2 000 °C to 2 315 °C	1.2 °C		
PT Sensors	-200 °C to 0 °C	0.06 °C		
	Up to 850 °C	0.01 °C		
Temperature – Measuring Equipment ^{FO} Thermistors and RTD	- 80 °C to 150°C	0.001 °C	Agilent 3458 Opt 002 ESI RS925D BS EN 60751:2008	ASP 036
	-200 °C to 850 °C			

Mass, Force and Weighing Device

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	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Test Weights ^F	100 g	0.16 mg	Hafner E2 Mass Set with Sartorius MC1 Semi-Micro Bale	ASP 227
	50 g	0.1 mg		
	20 g	0.08 mg		
	10 g	0.06 mg		
	5 g	0.05 mg		
	2 g	0.04 mg		
	1 g	0.03 mg		
	500 mg	0.025 mg		
	200 mg	0.02 mg		
	100 mg	0.016 mg		
	50 mg	0.012 mg		
	20 mg	0.01 mg		
	10 mg	0.008 mg		
	5 mg	0.006 mg		
	2 mg	0.006 mg		
1 mg	0.006 mg			



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Mass, Force and Weighing Device

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Test Weights ^F	1 kg	5 mg	KERN F1 Mass Set Sartorius MC1 Semi-Micro Balance	ASP 227
	500 g	2.5 mg		
	200 g	1 mg		
	100 g	0.5 mg		
	50 g	0.3 mg		
	20 g	0.25 mg		
	10 g	0.2 mg		
	5 g	0.16 mg		
	2 g	0.12 mg		
	1 g	0.1 mg		
	500 mg	0.08 mg		
	200 mg	0.06 mg		
	100 mg	0.05 mg		
	50 mg	0.04 mg		
	20 mg	0.03 mg		
	10 mg	0.025 mg		
	Analytical Balance ^{FO}	1 mg to 100 mg		
100 mg to 1 g		30 μ g		
1 g to 100 g		160 μ g		
100 g to 211.111 g		440 μ g		
Electronic Balance ^{FO}	1 mg to 100 mg	0.05 mg	KERN F1 Mass Set	
	100 mg to 1 g	0.1 mg		
	1 g to 100 g	0.5 mg		
	100 g to 211.111 g	2.5 mg		
Industrial Balances ^{FO}	1 g to 100 g	5 mg	M1 AVERY Mass Set	
	100 g to 1 kg	50 mg		
	1 kg to 10 kg	0.5 g		
	10 kg to 100 kg	5 g		
	100 kg to 750 kg	38 g		



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Mechanical

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Pipettes, Burettes, Dispensers, ^{FO}	1 μ L	0.006 μ L	Analytical Balances	BS EN ISO 8655 (parts 1,2,3,4,5,6) Gravimetric Method
	10 μ L	0.006 μ L		
	20 μ L	0.011 μ L		
	50 μ L	0.022 μ L		
	100 μ L	0.05 μ L		
	200 μ L	0.07 μ L		
	500 μ L	0.1 μ L		
	1 mL	0.1 μ L		
	2 mL	0.12 μ L		
5 mL	0.15 μ L			
Force Gauge ^{FO}	Up to 70 kgf	\pm 0.005 % of Reading	M1 standard weights	ASP 197
Low differential Pressure Measurement ^{FO}	\pm 3 000 Pa	< 0.1 % of Reading + 0.03 Pa	Furness Controls FCO560 Differential Pressure Calibrator	BS EN 837-1:1998
Absolute Pressure ^{FO} Beamex MC5-IS Multifunction Calibrator	800 mbar a to 1 200 mbar a	0.5 mbar	Beamex MC5-IS Multifunction Calibrator	BS EN 837-1:1998
Pneumatic Pressure ^{FO} (Chambers and Autoclaves)	1 bar to 20 bar -1 bar to 20 bar	0.01 % FS + 0.025 % of Reading		
Hydraulic Pressure ^{FO}	-1 bar to 700 bar	0.01 % FS + 0.025 % Reading	Budenberg 380G Dead Weight Tester	
	Up to 2 500 bar	0.005 % + 0.01 % Reading	Creat Wit 2500 bar Dead Weight Tester	BS EN 837-1:1998 ASP 344



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Mechanical

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Accelerometers Frequency Response ^{FO} Sensitivity @ 100 Hz (0.1 to 1 000) pC/g (2 to 1 000) pC/g	20 Hz to 5 kHz	1.5 % of Reading	Endevco 28959	BS EN ISO 8041-1:2017
	5 kHz to 6.3 kHz	2 % of Reading		
	6.3 kHz to 10 kHz	2.5 % of Reading		
Torque Wrench ^{FO} (Clockwise Only)	Up to 300 Nm	0.6 Nm	Static Transducer(s) 001T, 007T, Torque Tool Tester 002T	BS EN ISO 6789-2:2017
	300 Nm to 600 Nm	1.3 Nm		
	600 Nm to 900 Nm	2.0 Nm		
	900 Nm to 1 200 Nm	2.7 Nm		
	1 200 Nm to 1 500 Nm	3.4 Nm		
Torque Transducer ^F	Up to 12 Nm	1 % of reading	Hanging Mass	ASP 118
Torque Screwdriver ^{FO} (Clockwise Only)	Up to 12 Nm	1 % of reading	Digital Torque Meter 005T	BS EN ISO 6789-2:2017
Measure Rational Speed, Non-Contact RPM ^{FO}	200 rpm to 99 999 rpm	0.005 % of Reading + 0.3 rpm	Digital Tachometer	ASP 028

Optical

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	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Specular Gloss Tiles ^{FO} Mirror Gloss High Gloss Semi Gloss Mirror Gloss High Gloss Semi Gloss Mirror Gloss High Gloss Semi Gloss	(100 to 2 000) GU @ 20 °	18.4 SGU	Gloss Standards	ASP 023A BS EN ISO 2813
	(Up to 100) GU @ 20 °	0.55 SGU		
	(Up to 100) GU @ 20 °	0.66 SGU		
	(100 to 1 000) GU @ 60 °	19.64 SGU		
	(Up to 100) GU @ 60 °	0.54 SGU		
	(Up to 100) @ 60 °	0.66 SGU		
	(100 to 160) GU @ 85	0.76 SGU		
	(Up to 100) GU @ 85 °	0.56 SGU		
	(Up to 100) @ 85 °	0.76 SGU		



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Specular Gloss – Gloss Meters ^{FO} @ geometries of 20 °, 60 °, 85 °	(0 to 100) GU	0.8 GU	Gloss Meters	ASP 023A BS EN ISO 2813
	(100 to 2 000) GU	1.1 GU		
Colorimeter & Spectrophotometry – Diffuse Reflectance Color data: CIELAB ^F L	0 to 100	L : 0.21	3nh YS3060 Spectrophotometer Ceramic Colour Standards Series 2	ASP 212
	a*	a*:0.14		
	b*	b*:0.14		
	C*	C*:0.12		
	H*	h° :0.13 Colour data is given for the CIE 2 ° and 10 ° observers and CIE Standard illuminants A, C D65 and D50.		
0 to 1	0.000 30			
Colour data: CIE F x, y, u', v' Luminous transmittance Y ^F	0 % Y to 100 % Y	0.78 % for white, 0.29 % for black Colour data is given for the CIE 2 ° and 10 ° observers and CIE Standard Illuminants A, C, D65 and D50.	Sample expanded uncertainties in Hunter L* a*b* space:	ASP 346
Colour data: Hunter ^F L* a* b*	Up to 100 - 200 to + 200 - 200 to + 200	L*:0.21 a*:0.14 b*:0.14		
Refractometers ^{FO}	0 % Brix to 95 % Brix 1.3 n to 1.7 n	0.25 % Brix 0.000 25 n	Reference Refractometer oils and ABBE Refractometer OIML R142	ASP 175 ASP 124



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Colour Temperature Illumination ^o (Within reproducibility uncertainty no filter)	2 856 K	± 0.8 % of Reading	Gigahertz Optik HCT99D Chroma Meter with CT-4501-4 detector	ASP 216
	1 to 10 lux	± 3.1 % of Reading		
	10 to 20 lux	± 2.9 % of Reading		
	20 to 200 lux	± 2.3 % of Reading		
	200 to 1 000 lux	± 1.9 % of Reading		
	1 000 to 2 000 lux	± 2.4 % of Reading		
	2 000 to 10 000 lux	± 3.1 % of Reading		
	10 000 to 20 000 lux	± 5 % of Reading Within reproducibility uncertainty (no filter)		
Colour ^o	BG 34, nominal x = 0.391 4 / y = 0.392 5	1 % of Reading		
	BG 7, nominal x = 0.264 6 / y = 0.405 7	1 % of Reading		
	OG 530, nominal x = 0.541 7 / y = 0.453 8	1 % of Reading		
	VG 3, nominal x = 0.365 6 / y = 0.527 2	1 % of Reading		
	RG 6, nominal x = 0.686 / y = 0.313 5	2 % of Reading		
	SFK 100,	20 % of Reading		
1 x & y ^o y = 0.042 6 (Reference light source at 2856 K (A) for filter illumination nominal x = 0.447 6 / y = 0.407 4)	SF _K 101, nominal x = 0.429 9 / y = 0.537 6	1 % RDG		
	SF _K 102, nominal x = 0.545 7 / y = 0.451 1	2 % RDG		



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Thermodynamic

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	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Temperature – Measuring Equipment ^{FO} Closed Volume Sensors (Incubators, Ovens, Environmental chambers, Fridges/Refrigerators and Freezers)	-50 °C to -20 °C	0.024 °C	2 x PT100 with Cropico 3000, Liquid bath BS EN 60751:2008 Isotech Pegasus Hot Block Calibrator with Type R 935-14-91	ASP 031
	-20 °C to 160 °C	0.026 °C		
	160 °C to 400 °C	0.043 °C		
	400 °C to 1 100 °C	2 °C		
	1 100 °C to 1 200 °C	4 °C		
Temperature – Measure ^{FO} Dry Block calibrators	-50 °C to -20 °C	0.024 °C	PT 100 with Cropico 3000 Type R 935-14-91 Thermocouple with Beamex MC5	ASP 030
	-20 °C to 160 °C	0.026 °C		
	160 °C to 400 °C	0.043 °C		
	400 °C to 1 100 °C	2 °C		
	1 100 °C to 1 200 °C	4 °C		
Temperature – Measure ^{FO} Data Loggers (in air chamber)	-50 °C to -20 °C	0.024 °C		
	-20 °C to 160 °C	0.026 °C		
	160 °C to 400 °C	0.043 °C		
	400 °C to 1 100 °C	2 °C		
	1 100 °C to 1 200 °C	4 °C		
Block calibrators ^{FO}	- 50 °C to -20 °C	0.024 °C	PT 100 with Cropico 3000 Type R 935-14-91 Thermocouple with Beamex MC5	
	-20 °C to 160 °C	0.026 °C		
	160 °C to 400 °C	0.043 °C		
	400 °C to 1 100 °C	2.0 °C		
	1 100 °C to 1 200 °C	4.0 °C		
Temperature – Measure ^{FO} Data Loggers (in air chamber)	- 40 °C to 125 °C	0.64 °C	Omega HH376 Data logger RTD Thermometer	ASP 032
Temperature – Measure and Measuring Devices Cold junction compensation ^{FO}	15 °C to 35 °C	0.026 °C	PT100 with Cropico 3000 & Ice bath	ASP 115



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Equipment to Output Relative Humidity ^{FO}	2.5 % RH to 100 % RH	0.7 % RH	Vaisala HMP 75	ASP 345
Relative Humidity – Measuring Equipment, Relative Humidity Meter ^{FO}	5 % RH to 95 % RH	1.2 % RH	With General Eastern RHCL-1 In portable chamber at ambient temperature	ASP 113
Relative Humidity – Measuring Equipment, Relative Humidity Meter ^{FO}	11.3 % RH	0.3 % RH	Unsaturated Salt Ampoules Rotronic	ASP 046
	35 % RH	0.4 % RH		
	50 % RH	0.6 % RH		
	75.3 % RH	0.7 % RH		
	80 % RH	0.7% RH		
	33 % RH	0.7 % RH	Saturated Salts AZ Corporation	ASP 048
75 % RH	0.7 % RH			
Infra-Red (IR) Thermometers ^F	30 °C to 200 °C 200 °C to 500 °C	1.6 °C 2.8 °C	BX-500	ASP 217

Time and Frequency

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	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Frequency Measure and Measuring Devices ^F	Up to 20 GHz	4 parts in 10^{10}	Racal-Dana 1992 universal counter with Disciplined GPS standard	ASP 053
Stopwatch ^F	Up to 24 hr	20 ms	Racal-Dana 1992 nanosecond universal counter, Disciplined GPS standard	ASP 039
Rotational speed non-contact measurement generation ^{FO}	Up to 100 000 RPM	0.005 % Reading + 0.003 RPM	Racal-Dana 1992 nanosecond universal counter, Disciplined GPS standard	ASP 028



Certificate of Accreditation: Supplement

Aerospace Metrology & Electromechanical Calibration Ltd.

Met-Cal House, Fisher Street, Newcastle-upon-Tyne, NE6 4LT, UK
Contact Name: Stephan Oxborough Phone: 191-262-2266

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

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.
4. The presence of a superscript O means that the laboratory performs calibration of the indicated parameter onsite at customer locations.
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.
6. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.
7. The term "X" preceded by a number represents the number of times a lense system magnifies an image relative to its actual size. CMC stated as "% of magnification" represents the CMC of magnification expressed as a percentage of the total magnification.