

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

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

Total Calibration Solutions, INC

7722 Metric Drive, Mentor, OH 44060

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

ISO/IEC 17025:2017/Z540-1

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):

Chemical, Dimensional, Electrical, Mechanical, Thermodynamic, Time and Frequency, and Mass, Force and Weighing Device Calibration (As detailed in the supplement)

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

For PJLA:

Tracy Szerszen President

Perry Johnson Laboratory Accreditation, Inc. (PJLA) 755 W. Big Beaver, Suite 1325 Troy, Michigan 48084 Initial Accreditation Date: March 07, 2020 Nove Accreditation No.: 97175

Issue Date: November 22, 2024 tion No.: Cert

Certificate No.:

L24-897-1

Expiration Date:

January 31, 2027

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: <u>www.pjlabs.com</u>



Total Calibration Solutions, INC

7722 Metric Drive, Mentor, OH 44060 Contact Name: Mark Hanson Phone: 440-299-4811

Dimensional				
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
Calipers FO	Up to 40 in	(12L + 150) µin	Gage Blocks /	SOP-02 Caliper
Micrometers FO	Up to 6 in	(9.2L + 21) µin	Surface Plate	Calibration
	6 in to 20 in	(16L + 177) µin	1	SOP-01 Micrometer Calibration
Indicators, Dial, Test FO	Up to 4 in	(30L - 5.5) µin		SOP-12 Dial and Digital Indicator Calibration
Height Gages FO	Up to 48 in	(10L + 205) µin		SOP-06 Height Gage Calibration
Optical Comparators	Up to 12 in	200 µin	Gage Line Glass	SOP-37 Optical
X and Y Axis Linearity ^{FO}			Standard	Comparators
Optical Comparators Magnification ^{FO}	10 x, 20 x, 31.25 x, 50 x, 62.5 x, 100 x	200 µin		
Optical Comparators Angle ^{FO}	0°, 5°, 10°, 15°, 20°, 25°, 30°, 45°, 90°	0.10°		
		9		

Electrical				
MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Equipment to Source DC	Up to 100 mV	1.8 μV	HP 3458A Opt 002	GIDEP / OEM
Voltage ^{FO}	100 mV to 1 V	7 μV		Manual
	1 V to 10 V	72 µV		
	10 V to 100 V	1.2 mV		
	100 V to 1 kV	30 mV		
	1 kV to 4 kV	2.2 V	Vitrek 4700	
	4 kV to 10 kV	3.9 V		
	10 kV to 30 kV	0.027 kV	Vitrek 4700,	
	30 kV to 50 kV	0.045 kV	Vitrek HVL-100	
	50 kV to 100 kV	0.15 kV		
Equipment to Measure	Up to 220 mV	2.9 μV	Fluke 5730A	
DC Voltage FO	220 mV to 2.2 V	16 μV		
	2.2 V to 11 V	55 μV		
	11 V to 22 V	0.11 mV]	
	22 V to 220 V	1.6 mV]	
	220 V to 1.1 kV	11 mV		



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Equipment to Source DC	Up to 100 µA	7.4 nA	HP 3458A Opt 002	GIDEP / OEM
Current FO	100 µA to 1 mA	84 nA		Manual
	1 mA to 10 mA	0.71 μΑ		
	10 mA to 100 mA	10 µA		
	100 mA to 1 A	0.16 mA	-	
	1 A to 3 A	11 mA	-	
	3 A to 11 A	40 mA	HP 3458A Opt 002,	
	11 A to 20.5 A	73 mA	Shunt	
Equipment to Measure	Up to 220 µA	17 nA	Fluke 5730A	
DC Current FO	220 µA to 2.2 mA	98 nA		
,	2.2 mA to 22 mA	1.2 μΑ	-	
	22 mA to 220 mA	12 μΑ		
	220 mA to 2.2 A	0.23 mA	\square	
,	2.2 A to 3.1 A	1.0 mA	Fluke 5560A	-
,	3.1 A to 12 A	3.5 mA		
,	12 A to 30.2 A	28 mA		
Equipment to Source AC V At the listed frequencies FC			HP 3458A Opt 002	
Up to 1 kHz	Up to 10 mV	4.7 μV		
1 kHz to 20 kHz	Up to 10 mV	9 μV		
20 kHz to 100 kHz	Up to 10 mV	90 μV		
100 kHz to 300 kHz	Up to 10 mV	0.72 mV		
Equipment to Source AC V At the listed frequencies FC		1		
Up to 1 kHz	10 mV to 100 mV	12 µV	_	
1 kHz to 20 kHz	10 mV to 100 mV	20 µV	-	
20 kHz to 100 kHz	10 mV to 100 mV	0.1 mV	-	
100 kHz to 300 kHz	10 mV to 100 mV	0.39 mV	-	
Equipment to Source AC V At the listed frequencies FC		1	-	
Up to 1 kHz	100 mV to 1 V	0.12 mV		
1 kHz to 20 kHz	100 mV to 1 V	0.2 mV		
20 kHz to 50 kHz	100 mV to 1 V	0.39 mV		
50 kHz to 100 kHz	100 mV to 1 V	0.97 mV		
100 kHz to 300 kHz	100 mV to 1 V	3.6 mV		
300 kHz to 500 kHz	100 mV to 1 V	12 mV	1	

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Equipment to Source AC			HP 3458A Opt 002	GIDEP/OEM
At the listed frequencies ^{FI} Up to 10 Hz	1 V to 10 V	3.8 mV	-	Manual
10 Hz to 20 Hz	1 V to 10 V	1.4 mV	-	
20 Hz to 40 Hz	1 V to 10 V	1.4 mV	-	
40 Hz to 1 kHz	1 V to 10 V	1.2 mV	-	
1 kHz to 10 kHz	1 V to 10 V	1.2 mV	-	
10 kHz to 20 kHz	1 V to 10 V		-	
20 kHz to 50 kHz	1 V to 10 V	2 mV	-	
		3.9 mV	_	
50 kHz to 100 kHz	1 V to 10 V	9.6 mV	_	
Equipment to Source AC At the listed frequencies F	0		_	
Up to 1 kHz	10 V to 100 V	27 mV	0	
1 kHz to 20 kHz	10 V to 100 V	28 mV		
20 kHz to 50 kHz	10 V to 100 V	45 mV		
50 kHz to 100 kHz	10 V to 100 V	0.15 V		
Equipment to Source AC At the listed frequencies ^F				
Up to 20 kHz	100 V to 1 kV	0.36 V		
Equipment to Source AC At the listed frequencies ^F			Vitrek 4700	
60 Hz	1 kV to 10 kV	0.021 kV	7	
60 Hz	10 kV to 75 kV	0.18 kV	Vitrek 4700, Vitrek HVL-100	
Equipment to Measure AC			Fluke 5560A	
At the listed frequencies F			_	
3 Hz to 45 Hz	10 μA to 120 μA	0.036 µA	_	
45 Hz to 1 kHz	10 μA to 120 μA	0.036 µA	_	
1 kHz to 5 kHz	10 μA to 120 μA	0.036 μΑ		
5 kHz to 10 kHz	10 μA to 120 μA	0.19 μΑ		
10 kHz to 30 kHz	10 µA to 120 µA	1.6 μΑ		
Equipment to Measure AC At the listed frequencies F	0			
3 Hz to 45 Hz	120 µA to 1.2 mA	0.36 μΑ		
45 Hz to 1 kHz	120 µA to 1.2 mA	0.36 μΑ		
1 kHz to 5 kHz	120 µA to 1.2 mA	0.36 μΑ		
5 kHz to 10 kHz	120 µA to 1.2 mA	1.5 μΑ		
10 kHz to 30 kHz	120 µA to 1.2 mA	11 μA	7	



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Equipment to Measure A At the listed frequencies ¹		Fluke 5560A	GIDEP/OEM Manual	
3 Hz to 45 Hz	1.2 mA to 12 mA	3.6 µA		
45 Hz to 1 kHz	1.2 mA to 12 mA	3.6 µA		
1 kHz to 5 kHz	1.2 mA to 12 mA	3.6 µA		
5 kHz to 10 kHz	1.2 mA to 12 mA	15 μΑ		
10 kHz to 30 kHz	1.2 mA to 12 mA	59 µA		
Equipment to Measure A At the listed frequencies ¹			-	
3 Hz to 45 Hz	12 mA to 120 mA	36 µA		
45 Hz to 1 kHz	12 mA to 120 mA	20 µA		
1 kHz to 5 kHz	12 mA to 120 mA	33 µA		
5 kHz to 10 kHz	12 mA to 120 mA	0.15 mA		
10 kHz to 30 kHz	12 mA to 120 mA	0.59 mA		
Equipment to Measure A At the listed frequencies				
3 Hz to 45 Hz	120 mA to 1.2 A	0.35 mA		
45 Hz to 1 kHz	120 mA to 1.2 A	0.3 mA		
1 kHz to 5 kHz	120 mA to 1.2 A	0.33 mA		
5 kHz to 10 kHz	120 mA to 1.2 A	2.7 mA		
10 kHz to 30 kHz	120 mA to 1.2 A	5 mA		
Equipment to Measure A At the listed frequencies ¹	0		l l	
3 Hz to 45 Hz	1.2 A to 3.1 A	1.7 mA		
45 Hz to 1 kHz	1.2 A to 3.1 A	1.2 mA		
1 kHz to 5 kHz	1.2 A to 3.1 A	1.5 mA		
5 kHz to 10 kHz	1.2 A to 3.1 A	7.9 mA		
Equipment to Measure A At the listed frequencies ¹				
3 to 45 Hz	3.1 A to 12 A	4.7 mA		
45 Hz to 1 kHz	3.1 A to 12 A	3.5 mA		
1 kHz to 5 kHz	3.1 A to 12 A	4.5 mA		
5 kHz to 10 kHz	3.1 A to 12 A	25 mA		
Equipment to Measure A At the listed frequencies ¹	0			
3 Hz to 45 Hz	12 A to 30.2 A	40 mA		
45 Hz to 1 kHz	12 A to 30.2 A	29 mA		
1 kHz to 5 kHz	12 A to 30.2 A	150 mA		

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Equipment to Measure AC	Voltage		Fluke 5522A	GIDEP/OEM
At the listed frequencies ^{FO} 10 Hz to 45 Hz	II (22 V	25 11	-	Manual
	Up to 33 mV	35 μV	-	
45 Hz to 10 kHz	Up to 33 mV	12 μV	-	
10 kHz to 20 kHz	Up to 33 mV	14 μV	-	
20 kHz to 50 kHz	Up to 33 mV	42 μV	-	
50 kHz to 100 kHz	Up to 33 mV	0.14 mV		
100 kHz to 500 kHz	Up to 33 mV	0.34 mV		
Equipment to Measure AC At the listed frequencies ^{FO}				
10 Hz to 45 Hz	33 mV to 330 mV	0.12 mV		
45 Hz to 10 kHz	33 mV to 330 mV	60 μV		
10 kHz to 20 kHz	33 mV to 330 mV	65 μV		
20 kHz to 50 kHz	33 mV to 330 mV	0.13 mV		
50 kHz to 100 kHz	33 mV to 330 mV	0.32 mV		
Equipment to Measure AC At the listed frequencies ^{FO}	Voltage			
10 Hz to 45 Hz	330 mV to 3.3 V	11 mV		
45 Hz to 10 kHz	330 mV to 3.3 V	0.59 mV		
10 kHz to 20 kHz	330 mV to 3.3 V	0.73 mV		
20 kHz to 50 kHz	330 mV to 3.3 V	1.1 mV	1	
50 kHz to 100 kHz	330 mV to 3.3 V	2.9 mV		
100 kHz to 500 kHz	330 mV to 3.3 V	9.1 mV		
Equipment to Measure AC At the listed frequencies ^{FO}	Voltage			
10 Hz to 45 Hz	3.3 V to 33 V	11 mV		
45 Hz to 10 kHz	3.3 V to 33 V	5.9 mV	-	
10 kHz to 20 kHz	3.3 V to 33 V	9.1 mV	1	
20 kHz to 50 kHz	3.3 V to 33 V	13 mV	1	
50 kHz to 100 kHz	3.3 V to 33 V	33 mV	1	
Equipment to Measure AC At the listed frequencies ^{FO}		1		
45 Hz to 1 kHz	33 V to 330 V	69 mV	1	
1 kHz to 10 kHz	33 V to 330 V	79 mV	1	
10 kHz to 20 kHz	33 V to 330 V	94 mV	1	
20 kHz to 50 kHz	33 V to 330 V	0.12 V	1	
50 kHz to 100 kHz	33 V to 330 V	0.53 V	1	

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$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		Voltage		Fluke 5522A	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		1	1	_	Manual
5 kHz to 10 kHz330 V to 1.02 kV0.33 VEquipment to Source AC Current At the listed frequencies F0Up to 100 μ A0.11 μ AEquipment to Source AC Current At the listed frequencies F0100 μ A to 1 mA0.6 μ AEquipment to Source AC Current At the listed frequencies F0100 μ A to 1 mA0.6 μ AEquipment to Source AC Current At the listed frequencies F0100 μ A to 1 mA0.6 μ AEquipment to Source AC Current At the listed frequencies F010 mA to 100 mA6.1 μ AEquipment to Source AC Current At the listed frequencies F010 mA to 100 mA6.1 μ AEquipment to Source AC Current At the listed frequencies F0100 mA to 1.1 A1.4 mAEquipment to Source AC Current At the listed frequencies F0100 mA to 1.1 A1.4 mAI Hz to 5 kHz100 mA to 1.1 A1.4 mAEquipment to Source AC Current At the listed frequencies F011 A to 3.3 A12 mA10 Hz to 5 kHz1.1 A to 3.3 A12 mA11 Hz to 5 kHz3 A to 11 A13 mAEquipment to Source AC Current 	-			_	
Equipment to Source AC Current At the listed frequencies 10 HP 3458A Opt 00210 Hz to 5 kHzUp to 100 μ A0.11 μ AEquipment to Source AC Current At the listed frequencies 10 100 μ A to 1 mA0.6 μ AEquipment to Source AC Current At the listed frequencies 10 10 mA to 10 mA6.1 μ AEquipment to Source AC Current At the listed frequencies 10 10 mA to 10 mA6.1 μ AEquipment to Source AC Current At the listed frequencies 10 10 mA to 100 mA61 μ AEquipment to Source AC Current At the listed frequencies 10 10 mA to 100 mA61 μ AEquipment to Source AC Current At the listed frequencies 10 10 mA to 1.1 A1.4 mAEquipment to Source AC Current At the listed frequencies 10 10 Hz to 3.3 A13 mA10 Hz to 5 kHz100 mA to 1.1 A1.4 mAEquipment to Source AC Current At the listed frequencies 10 11.1 k to 3.3 A12 mA11 Hz to 5 kHz1.1 A to 3.3 A12 mA1 kHz to 5 kHz1.1 A to 3.3 A14 mAEquipment to Source AC Current At the listed frequencies 10 4.9 μ V20 Hz to 40 Hz4.9 μ V45 HZ to 1 kHz3 A to 11 A13 mA1 kHz to 5 kHz10 Hz to 20 Hz5.3 μ V40 Hz to 20 kHz4.9 μ V20 Hz to 40 Hz4.9 μ V20 Hz to 20 kHz5.2 μ V30 kHz to 100 kHz7.1 μ V100 kHz to 300 kHz14 μ V	1 kHz to 5 kHz	330 V to 1.02 kV	0.28 V		
At the listed frequencies POImage: Constraint of the listed frequencies PO10 Hz to 5 kHz100 μ A to 1 mA0.11 μ AEquipment to Source AC CurrentAt the listed frequencies PO10 Hz to 5 kHz100 μ A to 1 mA0.6 μ AEquipment to Source AC CurrentAt the listed frequencies PO10 Hz to 5 kHz1 mA to 10 mA6.1 μ AEquipment to Source AC CurrentAt the listed frequencies PO10 Hz to 5 kHz1 0 mA to 100 mA61 μ AEquipment to Source AC CurrentAt the listed frequencies PO10 Hz to 5 kHz10 mA to 100 mA61 μ AEquipment to Source AC CurrentAt the listed frequencies PO10 Hz to 5 kHz100 mA to 1.1 A1.4 mAEquipment to Source AC CurrentHP 3458A Opt 002At the 1 isted frequencies POWith HP 34330A Shunt10 Hz to 5 kHz1.1 A to 3.3 A13 mA40 Hz to 1 kHz1.1 A to 3.3 A12 mA1 kHz to 5 kHz1.1 A to 3.3 A13 mA45 Hz to 1 kHz3 A to 11 A13 mAEquipment to measure AC Voltage PO20 Hz to 40 Hz4.9 μ V20 Hz to 40 Hz5.3 μ V20 Hz to 50 KHz20 Hz to 50 KHz5.2 μ V50 kHz to 100 kHz20 kHz to 50 KHz5.2 μ V50 kHz to 100 kHz20 kHz to 50 kHz1.4 μ VFluke 5730A	5 kHz to 10 kHz	330 V to 1.02 kV	0.33 V		
Equipment to Source AC CurrentAt the listed frequencies F010 Hz to 5 kHz100 μ A to 1 mAEquipment to Source AC CurrentAt the listed frequencies F010 Hz to 5 kHz1 mA to 10 mAEquipment to Source AC CurrentAt the listed frequencies F010 Hz to 5 kHz10 mA to 100 mA10 Hz to 5 kHz10 mA to 100 mAEquipment to Source AC CurrentAt the listed frequencies F010 Hz to 5 kHz10 mA to 1.1 A1.4 the listed frequencies F010 Hz to 5 kHz100 mA to 1.1 A1.4 the listed frequencies F010 Hz to 5 kHz100 mA to 1.1 A1.4 the listed frequencies F010 Hz to 5 kHz1.1 A to 3.3 A10 Hz to 5 kHz1.1 A to 3.3 A12 mA14 kHz to 5 kHz1.1 A to 3.3 A12 mA14 kHz to 5 kHz3 A to 11 A13 mA16 Hz to 5 kHz10 Hz to 20 Hz5.3 μ V45 Hz to 1 kHz10 Hz to 20 kHz40 Hz to 20 kHz40 Hz to 20 kHz40 Hz to 20 kHz40 Hz to 20 kHz20 kHz to 50 kHz20 kHz to 300 kHz10 kHz to 300 kHz10 kHz to 300 kHz14 μ V	At the listed frequencies FO			HP 3458A Opt 002	
At the listed frequencies FO 10 Hz to 5 kHz100 µA to 1 mA0.6 µAEquipment to Source AC CurrentAt the listed frequencies FO 10 Hz to 5 kHz1 mA to 10 mA6.1 µAEquipment to Source AC CurrentAt the listed frequencies FO 10 Hz to 5 kHz10 mA to 100 mA61 µAEquipment to Source AC CurrentAt the listed frequencies FO 10 Hz to 5 kHz10 mA to 100 mA61 µAEquipment to Source AC CurrentAt the listed frequencies FO 10 Hz to 5 kHz100 mA to 1.1 A1.4 mAEquipment to Source AC CurrentHP 3458A Opt 002At the listed frequencies FO with HP 34330A Shunt10 Hz to 40 Hz1.1 A to 3.3 A12 mA11 kHz to 5 kHz1.1 A to 3.3 A12 mA12 kHz to 5 kHz1.1 A to 3.3 A14 mAEquipment to Source AC CurrentH2 signification (Source AC Current)At the listed frequencies FO H2 to 1 kHz10 Hz to 20 Hz5.3 µV45 Hz to 1 kHz3 A to 11 A13 mA10 Hz to 20 kHz40 Hz to 20 kHz5.2 µV20 kHz to 50 kHz5.2 µV20 kHz to 50 kHz5.2 µV30 kHz to 100 kHz7.1 µV100 kHz to 300 kHz14 µV	10 Hz to 5 kHz	Up to 100 µA	0.11 μΑ		
Equipment to Source AC Current At the listed frequencies F010 Hz to 5 kHz1 mA to 10 mA6.1 μ AEquipment to Source AC Current At the listed frequencies F010 mA to 100 mA61 μ AEquipment to Source AC Current At the listed frequencies F010 mA to 1.1 A1.4 mAEquipment to Source AC Current At the listed frequencies F010 mA to 1.1 A1.4 mAEquipment to Source AC Current At the listed frequencies F0with HP 3458A Opt 00210 Hz to 5 kHz100 mA to 1.1 A1.4 mAEquipment to Source AC Current At the listed frequencies F0with HP 34330A Shunt10 Hz to 40 Hz1.1 A to 3.3 A12 mA10 Hz to 5 kHz1.1 A to 3.3 A14 mAEquipment to Source AC Current At the listed frequencies F0Flue 5 kHz11 Hz to 5 kHz1.1 A to 3.3 A14 mAEquipment to Source AC Current At the listed frequencies F0H2 to 2.2 mV45 Hz to 1 kHz3 A to 11 A13 mA10 Hz to 20 Hz5.3 μ VFluke 5730AGIDEP / OEM Manual20 kHz to 20 kHz4.9 μ Vup to 2.2 mV20 kHz to 50 kHz5.2 μ V50 kHz to 100 kHz7.1 μ V100 kHz to 300 kHz					
At the listed frequencies PO 10 Hz to 5 kHz1 mA to 10 mA6.1 μ AEquipment to Source AC CurrentAt the listed frequencies PO 10 Hz to 5 kHz10 mA to 100 mA61 μ AEquipment to Source AC CurrentAt the listed frequencies PO 10 Hz to 5 kHz100 mA to 1.1 A1.4 mAEquipment to Source AC CurrentAt the 1 listed frequencies PO 10 Hz to 40 Hz1.1 A to 3.3 A13 mA40 Hz to 1 kHz1.1 A to 3.3 A12 mA1 kHz to 5 kHz1.1 A to 3.3 A14 mAEquipment to Source AC CurrentAt the listed frequencies PO 10 Hz to 5 kHz1.1 A to 3.3 A1 kHz to 5 kHz3 A to 11 A20 Hz to 40 Hz4.9 μ V20 kHz to 50 kHz5.2 μ V50 kHz to 100 kHz7.1 μ V100 kHz to 300 kHz14 μ V	10 Hz to 5 kHz	100 µA to 1 mA	0.6 μΑ		
$ \begin{array}{ c c c c c c } \hline Equipment to Source AC Current At the listed frequencies ^{FO} \\\hline 10 \ Hz to 5 \ Hz \\ \hline 10 \ Hz to 5 \ Hz \\ \hline 10 \ Hz to 5 \ Hz \\ \hline 10 \ Hz to 5 \ Hz \\ \hline 10 \ Hz to 5 \ Hz \\ \hline 10 \ Hz to 5 \ Hz \\ \hline 10 \ Hz to 5 \ Hz \\ \hline 10 \ Hz to 1 \ Source AC \ Current \\At the listed frequencies } \hline \\ \hline$	At the listed frequencies FO	furrent			
At the listed frequencies FO10 Hz to 5 kHz10 mA to 100 mA61 μ AEquipment to Source AC Current At the listed frequencies FO10 Hz to 5 kHz100 mA to 1.1 A10 Hz to 5 kHz100 mA to 1.1 A1.4 mAEquipment to Source AC Current At the listed frequencies FOHP 3458A Opt 002 with HP 34330A Shunt10 Hz to 40 Hz1.1 A to 3.3 A13 mA40 Hz to 1 kHz1.1 A to 3.3 A12 mA1 kHz to 5 kHz1.1 A to 3.3 A14 mAEquipment to Source AC Current At the listed frequencies FOHe 34330A Shunt1 kHz to 5 kHz1.1 A to 3.3 A12 mA1 kHz to 5 kHz1.1 A to 3.3 A14 mAEquipment to Source AC Current At the listed frequencies FOHe to 1 kHz45 Hz to 1 kHz3 A to 11 A13 mA1 kHz to 5 kHz3 A to 11 A13 mA1 kHz to 5 kHz3 A to 11 A13 mA1 kHz to 5 kHz3 A to 11 A13 mA1 kHz to 5 kHz3 A to 11 A13 mA1 kHz to 5 kHz3 A to 11 A13 mA1 kHz to 5 kHz3 A to 11 A13 mA1 kHz to 5 kHz3 A to 11 A13 mA20 Hz to 40 Hz4.9 μ Vup to 2.2 mV20 kHz to 50 kHz5.2 μ V50 kHz to 100 kHz7.1 μ V100 kHz to 300 kHz14 μ V	10 Hz to 5 kHz	1 mA to 10 mA	6.1 μA	0	
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At the listed frequencies FO10 Hz to 5 kHz100 mA to 1.1 A1.4 mAEquipment to Source AC Current At the listed frequencies FOHP 3458A Opt 002 with HP 34330A Shunt10 Hz to 40 Hz1.1 A to 3.3 A13 mA40 Hz to 1 kHz1.1 A to 3.3 A12 mA1 kHz to 5 kHz1.1 A to 3.3 A14 mAEquipment to Source AC Current At the listed frequencies FOHP 3458A Opt 002 with HP 34330A Shunt1 kHz to 5 kHz1.1 A to 3.3 A12 mA1 kHz to 5 kHz1.1 A to 3.3 A14 mAEquipment to Source AC Current At the listed frequencies FOHE to 1 kHz45 Hz to 1 kHz3 A to 11 A13 mA1 kHz to 5 kHz3 A to 11 A13 mAEquipment to measure AC Voltage FO up to 2.2 mV10 Hz to 20 Hz5.3 μ V20 kHz to 50 kHz4.9 μ V40 Hz to 20 kHz4.9 μ V20 kHz to 50 kHz5.2 μ V50 kHz to 100 kHz7.1 μ V100 kHz to 300 kHz14 μ VHE to 14 μ V	10 Hz to 5 kHz	10 mA to 100 mA	61 µA		
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At the listed frequencies F0 with HP 34330A Shunt 10 Hz to 40 Hz 1.1 A to 3.3 A 13 mA 40 Hz to 1 kHz 1.1 A to 3.3 A 12 mA 1 kHz to 5 kHz 1.1 A to 3.3 A 14 mA Equipment to Source AC Current 40 Hz to 1 kHz 3 A to 11 A At the listed frequencies F0 3 A to 11 A 13 mA 45 Hz to 1 kHz 3 A to 11 A 13 mA 1 kHz to 5 kHz 3 A to 11 A 13 mA Equipment to measure 10 Hz to 20 Hz 5.3 μ V AC Voltage F0 20 Hz to 40 Hz 4.9 μ V up to 2.2 mV 40 Hz to 20 kHz 5.2 μ V 50 kHz to 100 kHz 7.1 μ V 100 kHz to 300 kHz 14 μ V			1.4 mA		-
	At the listed freq	uencies ^{FO}		-	
$ \begin{array}{ c c c c c } \hline 1 \ \text{kHz to 5 kHz} & 1.1 \ \text{A to 3.3 A} & 14 \ \text{mA} \\ \hline \text{Equipment to Source AC Current} \\ \hline \text{At the listed frequencies}^{\text{FO}} \\ \hline \hline 45 \ \text{Hz to 1 kHz} & 3 \ \text{A to 11 A} & 13 \ \text{mA} \\ \hline 1 \ \text{kHz to 5 kHz} & 3 \ \text{A to 11 A} & 13 \ \text{mA} \\ \hline \text{Equipment to measure} \\ \text{AC Voltage}^{\text{FO}} & 10 \ \text{Hz to 20 Hz} & 5.3 \ \mu\text{V} \\ \hline 20 \ \text{Hz to 40 Hz} & 4.9 \ \mu\text{V} \\ \hline 10 \ \text{Hz to 20 kHz} & 5.2 \ \mu\text{V} \\ \hline 20 \ \text{kHz to 50 kHz} & 5.2 \ \mu\text{V} \\ \hline 50 \ \text{kHz to 100 kHz} & 7.1 \ \mu\text{V} \\ \hline 100 \ \text{kHz to 300 \ kHz} & 14 \ \mu\text{V} \\ \hline \end{array} \right) \\ \end{array} \right] \\ \begin{array}{c} \text{Fluke 5730A} \\ \text{Fluke 5730A} \\ \hline \end{array} \\ \begin{array}{c} \text{GIDEP / OEM} \\ \text{Manual} \\ \end{array} $					
$ \begin{array}{ c c c c c } \hline Equipment to Source AC Current \\ \hline At the listed frequencies FO \\ \hline 45 Hz to 1 kHz & 3 A to 11 A & 13 mA \\ \hline 1 kHz to 5 kHz & 3 A to 11 A & 13 mA \\ \hline 1 kHz to 5 kHz & 3 A to 11 A & 13 mA \\ \hline Equipment to measure \\ AC Voltage FO \\ up to 2.2 mV & \hline 10 Hz to 20 Hz & 5.3 \mu V \\ \hline 20 Hz to 40 Hz & 4.9 \mu V \\ \hline 40 Hz to 20 kHz & 4.9 \mu V \\ \hline 20 kHz to 50 kHz & 5.2 \mu V \\ \hline 50 kHz to 100 kHz & 7.1 \mu V \\ \hline 100 kHz to 300 kHz & 14 \mu V \\ \hline \end{array} $		1.1 A to 3.3 A	12 mA		
At the listed frequencies FO45 Hz to 1 kHz3 A to 11 A13 mA1 kHz to 5 kHz3 A to 11 A13 mAEquipment to measure AC Voltage FO up to 2.2 mV10 Hz to 20 Hz $5.3 \mu V$ 20 Hz to 40 Hz4.9 μV 40 Hz to 20 kHz4.9 μV 20 kHz to 50 kHz $5.2 \mu V$ 50 kHz to 100 kHz $7.1 \mu V$ 100 kHz to 300 kHz14 μV	1 kHz to 5 kHz	1.1 A to 3.3 A	14 mA		
$ \begin{array}{ c c c c c c c c } \hline 1 \ \text{kHz to 5 kHz} & 3 \ \text{A to 11 A} & 13 \ \text{mA} \\ \hline \text{Equipment to measure} \\ \text{AC Voltage}^{\text{FO}} & 10 \ \text{Hz to 20 Hz} & 5.3 \ \mu\text{V} \\ \hline 20 \ \text{Hz to 40 Hz} & 4.9 \ \mu\text{V} \\ \hline 40 \ \text{Hz to 20 kHz} & 4.9 \ \mu\text{V} \\ \hline 20 \ \text{kHz to 50 kHz} & 5.2 \ \mu\text{V} \\ \hline 20 \ \text{kHz to 50 kHz} & 5.2 \ \mu\text{V} \\ \hline 50 \ \text{kHz to 100 kHz} & 7.1 \ \mu\text{V} \\ \hline 100 \ \text{kHz to 300 kHz} & 14 \ \mu\text{V} \end{array} \end{array} \right. \\ \begin{array}{c} \text{Fluke 5730A} \\ Fluke 5730$	At the listed frequencies FO				
$ \begin{array}{ c c c c c } \hline Equipment to measure \\ AC Voltage FO \\ up to 2.2 mV \end{array} \begin{array}{ c c c c } 10 \ Hz to 20 \ Hz \\ \hline 20 \ Hz to 40 \ Hz \\ 40 \ Hz to 20 \ kHz \\ \hline 20 \ kHz to 50 \ kHz \\ \hline 50 \ kHz to 50 \ kHz \\ \hline 100 \ kHz to 300 \ kHz \\ \hline 14 \ \muV \end{array} \end{array} \begin{array}{ c c } Fluke 5730A \\ \hline Fluke 5730A \\ \hline Manual \\ \hline Manual \\ \hline Manual \\ \hline Manual \\ \hline \end{array}$	45 Hz to 1 kHz	3 A to 11 A	13 mA		
$ \begin{array}{c} AC \text{ Voltage }^{FO} \\ up \text{ to } 2.2 \text{ mV} \end{array} \begin{array}{c} 20 \text{ Hz to } 40 \text{ Hz} & 4.9 \mu\text{V} \\ 40 \text{ Hz to } 20 \text{ HHz} & 4.9 \mu\text{V} \\ 20 \text{ kHz to } 50 \text{ kHz} & 5.2 \mu\text{V} \\ 50 \text{ kHz to } 100 \text{ kHz} & 7.1 \mu\text{V} \\ 100 \text{ kHz to } 300 \text{ kHz} & 14 \mu\text{V} \end{array} \end{array} $	1 kHz to 5 kHz	3 A to 11 A	13 mA		
up to 2.2 mV 20 Hz to 10 Hz 10 μV 40 Hz to 20 kHz 4.9 μV 20 kHz to 50 kHz 5.2 μV 50 kHz to 100 kHz 7.1 μV 100 kHz to 300 kHz 14 μV			5.3 μV	Fluke 5730A	
40 Hz to 20 kHz 4.9 μV 20 kHz to 50 kHz 5.2 μV 50 kHz to 100 kHz 7.1 μV 100 kHz to 300 kHz 14 μV		20 Hz to 40 Hz	4.9 μV		Manual
50 kHz to 100 kHz 7.1 μV 100 kHz to 300 kHz 14 μV	up to 2.2 m v	40 Hz to 20 kHz	4.9 μV		
100 kHz to 300 kHz 14 μV		20 kHz to 50 kHz	5.2 μV		
		50 kHz to 100 kHz	7.1 μV		
300 kHz to 500 kHz 27 μV		100 kHz to 300 kHz	14 μV		
		300 kHz to 500 kHz	27 μV	1	
500 kHz to 1 MHz 30 μV		500 kHz to 1 MHz	30 µV	1	



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Electrical				
MEASURED INSTRUMECNT, 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
Equipment to measure AC	10 Hz to 20 Hz	11 µV	Fluke 5730A	GIDEP / OEM
Voltage ^{FO} 2.2 mV to 22 mV	20 Hz to 40 Hz	7.1 μV]	Manual
	40 Hz to 20 kHz	6.8 μV		
	20 kHz to 50 kHz	9.8 μV		
	50 kHz to 100 kHz	19 µV		
	100 kHz to 300 kHz	39 µV		
	300 kHz to 500 kHz	59 μV		
	500 kHz to 1 MHz	93 μV		
Equipment to measure AC	10 Hz to 20 Hz	75 μV]	
Voltage ^{FO} 22 mV to 220 mV	20 Hz to 40 Hz	32 µV		
	40 Hz to 20 kHz	23 µV		
	20 kHz to 50 kHz	39 μV		
	50 kHz to 100 kHz	99 μV		
	100 kHz to 300 kHz	0.19 mV		
	300 kHz to 500 kHz	0.39 mV		
	500 kHz to 1 MHz	0.74 mV		
Equipment to measure AC	10 Hz to 20 Hz	0.66 mV		
Voltage ^{FO} 220 mV to 2.2 V	20 Hz to 40 Hz	0.25 mV		
220 m v to 2.2 v	40 Hz to 20 kHz	0.12 mV		
	20 kHz to 50 kHz	0.19 mV		
	50 kHz to 100 kHz	0.25 mV		
	100 kHz to 300 kHz	0.95 mV		
X	300 kHz to 500 kHz	2.8 mV		
	500 kHz to 1 MHz	4.7 mV		
Equipment to measure AC	10 Hz to 20 Hz	13 mV		
Voltage ^{FO} 2.2 V to 22 V	20 Hz to 40 Hz	2.5 mV		
	40 Hz to 20 kHz	1.2 mV	_	
	20 kHz to 50 kHz	1.9 mV		
	50 kHz to 100 kHz	2.4 mV		
	100 kHz to 300 kHz	7.3 mV		
	300 kHz to 500 kHz	28 mV		
	500 kHz to 1 MHz	42 mV		



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Electrical MEASURED INSTRUMECNT, 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
Equipment to measure AC	10 Hz to 20 Hz	66 mV	Fluke 5730A	
Voltage ^{FO}	20 Hz to 40 Hz	25 mV		
22 V to 220 V	40 Hz to 20 kHz	15 mV	1	
	20 kHz to 50 kHz	22 mV	1	
	50 kHz to 100 kHz	42 mV	1	
Equipment to measure AC	15 Hz to 50 Hz	0.40 V		
Voltage ^{FO} 220 V to 1.1 kV	50 Hz to 1 kHz	99 mV]	
Equipment to Measure AC	10 Hz to 20 Hz	83 nA		
Current ^{FO}	20 Hz to 40 Hz	53 nA		
up to 220 µA	40 Hz to 1 kHz	37 nA		
	1 kHz to 5 kHz	87 nA		
	5 kHz to 10 kHz	0.36 μΑ	2	
Equipment to Measure AC Current ^{FO}	10 kHz to 30 kHz	11 μΑ	Fluke 5560A	
up to 1.2 mA				
Equipment to Measure AC	10 Hz to 20 Hz	0.69 μΑ	Fluke 5730A	
Current ^{FO} 220 µA to 2.2 mA	20 Hz to 40 Hz	0.45 μΑ		
220 μA to 2.2 IIIA	40 Hz to 1 kHz	0.31 µA	HUT	
	1 kHz to 5 kHz	0.65 μΑ		
	5 kHz to 10 kHz	3.6 µA		
Equipment to Measure AC Current ^{FO} 1.2 mA to 12 mA	10 kHz to 30 kHz	66 µA	Fluke 5560A	
Equipment to Measure AC	10 Hz to 20 Hz	6.9 μΑ	Fluke 5730A	
Current ^{FO} 2.2 mA to 22 mA	20 Hz to 40 Hz	4.6 μΑ		
2.2 IIIA 10 22 IIIA	40 Hz to 1 kHz	3.1 µA		
	1 kHz to 5 kHz	5.9 μΑ		
	5 kHz to 10 kHz	34 µA		
Equipment to Measure AC Current ^{FO} 12 mA to 120 mA	10 kHz to 30 kHz	0.66 mA	Fluke 5560A	
Equipment to Measure AC	10 Hz to 20 Hz	69 μA	Fluke 5730A	1
Current ^{FO}	20 Hz to 40 Hz	46 μA	1	
22 mA to 220 mA	40 Hz to 1 kHz	30 μA	1	
	1 kHz to 5 kHz	57 μA	1	
	5 kHz to 10 kHz	0.30 mA	1	



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Electrical		ine facility to perform the	,	
MEASURED INSTRUMECNT, 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
Equipment to Measure AC Current ^{FO} 120 mA to 1.2 A	10 kHz to 30 kHz	5.8 mA	Fluke 5560A	GIDEP / OEM Manual
Equipment to Measure AC	20 Hz to 1 kHz	0.68 Ma	Fluke 5730A	
Current ^{FO} 220 mA to 2.2 A	1 kHz to 5 kHz	1.3 mA		
220 IIIA to 2.2 A	5 kHz to 10 kHz	18 mA		
Equipment to Measure AC	3 Hz to 45 Hz	1.7 mA	Fluke 5560A	
Current ^{FO} 2.2 A to 3.1 A	45 Hz to 1 kHz	1.2 mA	Fluke 5560A	
2.2 A to 5.1 A	1 kHz to 5 kHz	1.5 mA		
	5 kHz to 10 kHz	7.4 mA		
Equipment to Measure AC	3 Hz to 45 Hz	5.3 mA		
Current ^{FO} 3.1 A to 12 A	45 Hz to 1 kHz	3.8 mA	-	
5.1 A to 12 A	1 kHz to 5 kHz	5.0 mA	0	
	5 kHz to 10 kHz	28 mA		
Equipment to Measure AC	3 Hz to 45 Hz	39 mA		
Current ^{FO} 12 A to 30.2 A	45 Hz to 1 kHz	28 mA		
Equipment to Source Frequency ^{FO}	1 mHz to 3 GHz	28 parts in 10^10	HP 53132A	
Equipment to Measure Frequency ^{FO}	1 mHz to 3 GHz	28 parts in 10^10	HP E4422B Signal Generator locked to FS725 Rubidium Frequency Standard HP 53132A	



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Electrical	RANGE	CALIBRATION AND	CALIBRATION	CALIBRATION
INSTRUMECNT, QUANTITY OR GAUGE	(AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	EQUIPMENT AND REFERENCE STANDARDS USED	MEASUREMENT METHOD OR PROCEDURES USED
Equipment to Source AC			HP 3458A Opt 002	GIDEP/OEM
At the listed frequencies F			with HP 34330A Shunt	Manual
45 Hz to 1 kHz	11 A to 20.5 A	13 mA		
1 kHz to 5 kHz	11 A to 20.5 A	13 mA		_
Equipment to Source	100 µH to 1 mH	17 μΗ	RLC GenRad 1689	
Inductance FO	1 mH to 10 mH	0.14 mH		
	10 mH to 100 mH	0.69 mH		
	100 mH to 1 H	6.9 mH	-	
	1 H to 10 H	69 mH		
Equipment to Measure	100 µH to 1 mH	0.24 μH	GR 1491D Decade	-
Inductance FO	1 to 10 mH	2.4 μH	Box	
	10 mH to 100 mH	24 μH		
	100 mH to 1 H	0.24 mH		
	1 H to 10 H	2.3 mH		
Equipment to Source	Up to 1 nF	0.64 pF	RLC GenRad 1689	
Capacitance FO	1 nF to 10 nF	2.4 pF		
	10 nF to 100 nF	26 pF		
	100 nF to 1 µF	0.41 nF		
	1 μF to 1.111 μF	0.44 nF		
Equipment to Measure Ca At the listed frequencies ^{FI}			1423A Decade Box	
20 Hz to 1 kHz	100 pF to 1 nF	0.67 pF		
20 Hz to 1 kHz	1 nF to 10 nF	42 pF		
20 Hz to 1 kHz	10 nF to 100 nF	74 pF		
20 Hz to 1 kHz	100 nF to 1 µF	0.62 nF		



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RANGE SPECIFICATION RE APPROPRIATE) F to 400 pF to 1.1 nF to 3.3 nF to 11 nF to 33 nF to 110 nF F to 330 nF	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±) 15 pF 18 pF 23 pF 44 pF 0.17 nF 0.44 nF	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED Fluke 5522A	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED GIDEP / OEM Manual
F to 400 pF to 1.1 nF to 3.3 nF to 11 nF to 33 nF to 110 nF F to 330 nF	18 pF 23 pF 44 pF 0.17 nF 0.44 nF	Fluke 5522A	
to 1.1 nF to 3.3 nF to 11 nF to 33 nF to 110 nF to 110 nF	18 pF 23 pF 44 pF 0.17 nF 0.44 nF	-	
to 3.3 nF to 11 nF to 33 nF to 110 nF to 110 nF	23 pF 44 pF 0.17 nF 0.44 nF	-	
to 11 nF to 33 nF to 110 nF F to 330 nF	44 pF 0.17 nF 0.44 nF	-	
to 33 nF to 110 nF E F to 330 nF	0.17 nF 0.44 nF	-	
to 110 nF F to 330 nF	0.44 nF	-	
F to 330 nF		-	
F to 330 nF		-	
	0.92 nF		
F to 1.1 μF	4.1 nF		
f to 3.3 μF	12 nF	0	
to 11 μF	44 nF		
to 33 μF	0.18 μF		
to 110 μF	0.7 μF		
F to 330 µF	2 μF		
F to 1.1 mF	12 μF		
F to 3.3 mF	20 µF		
F to 11 mF	89 µF		
to 33 mF	0.31 mF		
to 110 mF	1.4 mF		
10 Ω	1.6 mΩ	ESI RS925A	
το 100 Ω	3.1 mΩ		
to 1 kΩ	27 mΩ		
o 10 kΩ	0.26 Ω		
to 100 kΩ	2.6 Ω		
Ω to 1.1 M Ω	29 Ω		
10 Ω	1.6 mΩ	Fluke 5522A	
Ω to 3.3 MΩ	0.29 kΩ		
Ω to 11 MΩ	0.35 kΩ		
Ω to 33 M Ω	12 kΩ		
2 to 110 MΩ	66 kΩ		
I Ω to 330 M Ω	1.2 MΩ		
I Ω to 1.1 G Ω	18 MΩ		
	$to 3.3 \mu F$ $to 11 \mu F$ $to 33 \mu F$ $to 110 \mu F$ $F to 330 \mu F$ $F to 330 \mu F$ $F to 3.3 \mu F$ $F to 1.1 m F$ $F to 3.3 m F$ $F to 11 m F$ $T to 33 m F$ $T to 110 m F$ $T to 33 m F$ $T to 110 m F$ $T to 33 m F$ $T to 110 m F$ $T to 0 \Omega$ $to 100 \Omega$ $to 100 \Omega$ $to 100 k\Omega$ $to 100 k\Omega$ $\Omega to 3.3 M\Omega$ $\Omega to 3.3 M\Omega$ $\Omega to 110 M\Omega$ $\Omega to 330 M\Omega$ $\Omega to 1.1 G\Omega$	to $3.3 \ \mu\text{F}$ 12 nFto $11 \ \mu\text{F}$ 44 nFto $33 \ \mu\text{F}$ 0.18 \ \mu\text{F}to $110 \ \mu\text{F}$ 0.7 \ \mu\text{F}F to $330 \ \mu\text{F}$ 2 \ \mu\text{F}F to $330 \ \mu\text{F}$ 2 \ \mu\text{F}F to $3.3 \ \text{m}\text{F}$ 20 \ \mu\text{F}F to $1.1 \ \text{m}\text{F}$ 12 \ \mu\text{F}F to $3.3 \ \text{m}\text{F}$ 20 \ \mu\text{F}F to $3.3 \ \text{m}\text{F}$ 20 \ \mu\text{F}F to $11 \ \text{m}\text{F}$ 89 \ \mu\text{F}To $33 \ \text{m}\text{F}$ 0.31 \ m\text{F}to $110 \ \text{m}\text{F}$ 1.4 \ m\text{F}10 \Omega1.6 \ m\Omegao 100 \Omega2.1 \ m\Omegato $1 \ \text{k}\Omega$ 2.7 \ m\Omegao 100 \k\Omega2.6 \Omegato $1.0 \ \text{k}\Omega$ 2.6 \Omega10 \Omega1.6 \ m\Omega\Omega0.29 \ \mu\Omegato $1.1 \ \text{M}\Omega$ 0.35 \ \mu\Omega\Omega1.2 \ \mu\Omega\Omega1.2 \ \mu\Omega\Omega1.2 \ \mu\Omega\Omega1.3 \ \mu\Omega\Omega1.2 \ \mu\Omega\Omega1.2 \ \mu\Omega	to 3.3 μF 12 nF to 11 μF 44 nF to 33 μF 0.18 μF to 110 μF 0.7 μF F to 330 μF 2 μF F 5 F to 1.1 mF 12 μF F to 3.3 mF 20 μF F to 1.1 mF 12 μF F to 3.3 mF 20 μF F to 1.1 mF 89 μF to 33 mF 0.31 mF to 110 mF 1.4 mF 10 Ω 1.6 mΩ to 110 kΩ 2.6 Ω to 100 kΩ 2.6 Ω to 11.1 MΩ 29 Ω 10 Ω 1.6 mΩ Ω to 1.1 MΩ 0.35 kΩ Ω to 3.3 MΩ 0.29 kΩ Ω to 11 MΩ 0.35 kΩ Ω to 110 MΩ 66 kΩ Ω to 330 MΩ 1.2 MΩ



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Electrical				
MEASURED INSTRUMECNT, 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
Equipment to Source DC	Up to 10 Ω	0.31 mΩ	HP 3458A Opt 002	GIDEP / OEM
Resistance FO	10Ω to 100Ω	2.7 mΩ		Manual
	100Ω to $1 k\Omega$	18 mΩ		
	1 kΩ to 10 kΩ	0.18 Ω		
	10 k Ω to 100 k Ω	1.8 Ω		
	$100 \text{ k}\Omega$ to $1 \text{ M}\Omega$	25 Ω		
	1 MΩ to 10 MΩ	0.78 kΩ		
	10 MΩ to 100 MΩ	68 kΩ		
Oscilloscopes Amplitude –	DC FO		Fluke 5522A / SC1100	•
50 Ω	-6.6 V to 6.6 V	20 mV		
1 MΩ	-130 V to 130 V	15 mV		
Amplitude - Square Wave ¹	30			
50 Ω	1 mV to 6.6 V (p-p)	13 mV		
1 MΩ	1 mV to 130 V (p-p)	18 mV		
Frequency	10 Hz to 10 kHz	29 Hz		
Time Markers into	1 ns to 20 ms	8.2 µs		
50 Ω Load	50 ms to 5 s	29 ms		
Leveled Sine Wave	50 kHz reference	0.13 V		
(5 mV to 5.5 V) p-p	50 kHz to 100 MHz	0.1 V	1	
	100 MHz to 300 MHz	0.14 V		
	300 MHz to 600 MHz	0.26 V		
Leveled Sine Wave	600 MHz to 1.1 GHz	0.2 V		
(5 mV to 3.5 V) p-p Edge Characteristics into	Up to 300 ps	+0/-120 ps	-	
50Ω Load	4.5 mV to 2.75 V	63 mV	-	
Rise Time	1 kHz to 10 MHz	29 Hz	-	
Amplitude		27 112		
Frequency Wave Generator	1.8 mV to 55 V p-p	88 mV	-	
Square, Sine, Triangle	1.8 mV to 55 V p-p	2 V	-	
Amplitude	10 Hz to 100 kHz	0.29 Hz	-	
Into 50 Ω Load Into 1 M Ω Load				
Frequency				
Pulse – Generate	22 ms to 200 ns	6.1 ns	1	
50 Ω Load	45.5 Hz to 5 MHz			
Period Width	4 ns to 500 ns	1.2 ns		
W IUII				I



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Electrical MEASURED INSTRUMECNT, 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
Input Resistance Measurement FO	40 Ω to 60 Ω	56 mΩ	Fluke 5522A / SC1100	GIDEP/OEM Manual
	500 k Ω to 1.5M Ω	2.5 kΩ	-	Ivialiual
Oscilloscope Capacitance Measurement ^{FO}	5 pF to 50 pF	1.3 pF		
Electrical Simulation of	600 °C to 800 °C	0.53 °C	Fluke 5522A	
Thermocouple Indicators Type B ^{FO}	800 °C to 1 000 °C	0.42 °C		
Турс Б	1 000 °C to 1 550 °C	0.37 °C		
	1 550 °C to 1 820 °C	0.4 °C		
Electrical Simulation of	0 °C to 150 °C	0.35 °C		
Thermocouple Indicators	150 °C to 650 °C	0.31 °C		
Type C ^{FO}	650 °C to 1 000 °C	0.38 °C	1	
	1 000 °C to 1 800 °C	0.59 °C		
	1 800 °C to 2 316 °C	0.98 °C	\sim	
Electrical Simulation of	-250 °C to -100 °C	0.58 °C		
Thermocouple Indicators	-100 °C to -25 °C	0.19 °C		
Type E ^{FO}	-25 °C to 350 °C	0.17 °C		
	350 °C to 650 °C	0.19 °C		
	650 °C to 1 000 °C	0.25 °C		
Electrical Simulation of	-210 °C to -100 °C	0.33 °C		
Thermocouple Indicators	-100 °C to -30 °C	0.2 °C	-	
Type J ^{FO}	-30 °C to 150 °C	0.17 °C		
	150 °C to 760 °C	0.21 °C		
	760 °C to 1 200 °C	0.27 °C		
Electrical Simulation of	-200 °C to -100 °C	0.39 °C		
Thermocouple Indicators	-100 °C to -25 °C	0.22 °C		
Type K ^{FO}	-25 °C to 120 °C	0.19 °C		
	120 °C to 1 000 °C	0.31 °C		
	1 000 °C to 1 372 °C	0.48 °C	-	
Electrical Simulation of	-200 °C to -100 °C	0.44 °C		
Thermocouple Indicators	-100 °C to 800 °C	0.32 °C	-	
Type L ^{FO}	800 °C to 900 °C	0.22 °C		
Electrical Simulation of	-200 °C to -100 °C	0.47 °C	1	
Thermocouple Indicators	-100 °C to -25 °C	0.26 °C	1	
Type N ^{FO}	-25 °C to 120 °C	0.23 °C	1	
	120 °C to 410 °C	0.22 °C	1	
	410 °C to 1 300 °C	0.33 °C	1	
Issue: 11/2024	This supplement	is in conjunction with certific	ate #L24-897-1	Page 14 of 22



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

Electrical measured instrumecnt, 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
Electrical Simulation of	0 °C to 250 °C	0.67 °C	Fluke 5522A	GIDEP/OEM
Thermocouple Indicators Type R ^{FO}	250 °C to 400 °C	0.42 °C		Manual
Гуре К	400 °C to 1 000 °C	0.4 °C		
	1 000 °C to 1 767 °C	0.48 °C		
Electrical Simulation of	0 °C to 250 °C	0.56 °C		
Thermocouple Indicators Type S ^{FO}	250 °C to 1 000 °C	0.43 °C		
Type S	1 000 °C to 1 400 °C	0.44 °C		
	1 400 °C to 1 767 °C	0.54 °C		
Electrical Simulation of	-250 °C to -150 °C	0.74 °C		
Thermocouple Indicators Type T ^{FO}	-150 °C to 0 °C	0.3 °C		
Type 1	0 °C to 120 °C	0.19 °C		
	120 °C to 400 °C	0.17 °C		
Electrical Simulation of	-200 °C to 0 °C	0.66 °C		
Thermocouple Indicators Type U ^{FO}	0 °C to 600 °C	0.33 °C		
Electrical Simulation of	-200 °C to -80 °C	0.06 °C		
RTD Indicators	-80 °C to 0 °C	0.06 °C		
Pt 385, 100 Ω ^{FO}	0 °C to 100 °C	0.09 °C		
	100 °C to 300 °C	0.11 °C		
	300 °C to 400 °C	0.12 °C		
	400 °C to 630 °C	0.14 °C		
	630 °C to 800 °C	0.27 °C		
Electrical Simulation of	-200 °C to -80 °C	0.05 °C		
RTD Indicators Pt 385, 200 Ω ^{FO}	-80 °C to 0 °C	0.05 °C		
Pt 385, $200 \Omega^{10}$	0 °C to 100 °C	0.05 °C		
	100 °C to 260 °C	0.06 °C		
	260 °C to 300 °C	0.15 °C		
	300 °C to 400 °C	0.18 °C		
	400 °C to 600 °C	0.18 °C	1	
	600 °C to 630°C	0.19 °C	1	
Electrical Simulation of	-200 °C to -80 °C	0.05 °C	1	
RTD Indicators	-80 °C to 0 °C	0.06 °C	1	
Pt 385, 500 Ω ^{FO}	0 °C to 100 °C	0.06 °C	1	
	100 °C to 260 °C	0.07 °C	1	
	260 °C to 300 °C	0.09 °C	1	



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Electrical	en cantanon is granica to	ine jucility to perform the	jono milg canor anom.	
MEASURED INSTRUMECNT, 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
Electrical Simulation of	300 °C to 400 °C	0.09 °C	Fluke 5522A	GIDEP/OEM
RTD Indicators Pt 385, 500 Ω ^{FO}	400 °C to 600 °C	0.11 °C		Manual
11 383, 300 \$2	600 °C to 630 °C	0.13 °C		
Electrical Simulation of	-200 °C to -80 °C	0.04 °C		
RTD Indicators Pt 385, 1000 Ω ^{FO}	-80 °C to 0 °C	0.04 °C		
Pt 385, 1000 Ω ¹⁰	0 °C to 100 °C	0.08 °C		
	100 °C to 260 °C	0.06 °C		
	260 °C to 300 °C	0.07 °C		
	300 °C to 400 °C	0.08 °C	-	
	400 °C to 600 °C	0.08 °C	-	
	600 °C to 630 °C	0.27 °C	-	
Phase Angle - Measure (0 to 360)° ^{FO}	65 Hz to 500 Hz	0.29 °	\sim	
Equipment to Source RF P	ower			
at listed Frequencies ^{FO} 150 kHz to 1.3 GHz	-20 dBm to 30 dBm		HP 8902A / HP	_
150 KHZ 10 1.5 GHZ	-20 dBm to 30 dBm	0.21 dBm	11722A	
1.3 GHz to 18 GHz	-70 dBm to 10 dBm	0.23 dBm	AGILENT E4418B /	_
	10 dBm to 20 dBm	0.16 dBm	E4412A	
Tuned RF Absolute	-20 dBm to 10 dBm	0.15 dBm	HP 8902A / HP	_
Power – Measure 2.5	-40 dBm to -20 dBm	0.16 dBm	11722A	
MHz to 1.3 GHz FO	-50 dBm to -40 dBm	0.11 dBm		
	-60 dBm to -50 dBm	0.07 dBm		
	-70 dBm to -60 dBm	0.11 dBm		
	-80 dBm to -70 dBm	0.11 dBm	_	
	-90 dBm to -80 dBm	0.07 dBm		
	-100 dBm to -90 dBm	0.07 dBm	-	
	-110 dBm to -100 dBm	0.16 dBm		
	-120 dBm to -110 dBm	0.13 dBm		
	-127 dBm to -120 dBm	0.13 dBm		



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Electrical	6 7	actury to perform the foll	6	
MEASURED INSTRUMECNT, 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
Equipment to Measure Amplitud			HP 8902A	GIDEP/OEM
at the listed Frequencies and Rate			-	Manual
Frequency: 150 kHz to 10 MHz	5 % to 99 %	2.3 %		
Rate: 50 Hz to 10 kHz			-	
Frequency: 150 kHz to 10 MHz	Up to 99 %	3.5 %		
Rate: 20 Hz to 10 kHz		1.0.0/	-	
Frequency: 10 MHz to 1.3 GHz	5 % to 99 %	1.2 %		
Rate: 50 Hz to 50 kHz	I 4- 00 0/	3.5 %	-	
Frequency: 10 MHz to 1.3 GHz Rate: 20 Hz to 100 kHz	Up to 99 %	3.3 %		
Equipment to Source Frequency	Modulation		HP 8902A	-
at the listed Frequencies and Rate	FO		nr 0902A	
Frequency: 250 kHz to 10	0 Hz to 4 kHz	0.12 kHz	-	
MHz	4 kHz to 40 kHz	1.1 kHz		
Rate: 20 Hz to 10 kHz	4 K112 10 40 K112			
\leq 40 kHz peak			1	
Frequency: 10 MHz to 1.3	0 Hz to 4 kHz	0.18 kHz		
GHz	4 kHz to 40 kHz	0.64 kHz		
Rate: 50 Hz to 100 kHz \leq 400 kHz peak	40 kHz to 400 kHz	4.8 kHz		
Frequency: 10 MHz to 1.3	0 Hz to 4 kHz	0.3 kHz		
GHz	4 kHz to 40 kHz	2.5 kHz		
Rate: 20 Hz to 200 kHz	40 kHz to 400 kHz	24 kHz		
\leq 400 kHz peak		24 KIIZ	-	
Equipment to Source Phase Mod	ulation			
at the listed Frequencies ^{FO}			-	
150 kHz to 10 MHz	0 to 2π rad	0.32 rad		
10 MHz to 1.3 GHz	0 to 2π rad	0.56 rad		



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

Thermodynamic				
MEASURED	RANGE	CALIBRATION AND	CALIBRATION	CALIBRATION
INSTRUMENT,	(AND SPECIFICATION	MEASUREMENT	EQUIPMENT AND	MEASUREMENT
QUANTITY OR GAUGE	WHERE APPROPRIATE)	CAPABILITY EXPRESSED	REFERENCE	METHOD OR
		AS AN UNCERTAINTY (±)	STANDARDS USED	PROCEDURES USED
Equipment to measure	Up to 10 % RH	1.4 %	Vaisala HMT 333 /	SOP-16
Humidity ^{FO}	10 % RH to 95 % RH	0.71 %	HMP75	Temperature and
			Thunder Scientific 2500	Humidity
				Calibration
Equipment to measure	-196 °C	0.021 °C	Liquid Nitrogen	SOP-03
Temperature ^{FO}	-95 °C to -20 °C	0.021 °C	Temperature Bath	Temperature
			Fluke 5628 PRT	Calibration
	-20 °C to 150 °C	0.017 °C	HP 3458A Opt 002	
	150 °C to 660 °C	0.062 °C	1 1	

Time and Frequency

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			
Equipment to Measure Frequency ^{FO}	1 MHz to 3 GHz	29 parts in 10 ¹⁰	HP E4422B Signal Generator locked to FS725 Rubidium Frequency Standard	GIDEP/OEM Manual			
Equipment to Source Frequency ^{FO}	0.1 GHz to 3 GHz	28 parts in 10 ¹⁰	HP 53132A				
Equipment to measure	Up to 10 000 rpm	0.06 rpm	HP 53132A				
Rotational Speed ^{FO}	10 000 rpm to 100 000 rpm	1.2 rpm					
Timers and Stopwatches ^F	Up to 3 600 s	0.007 2 s	HP 5313	NIST 960-12			
	3 600 s to 10 800 s	0.059 s	HP 53132a				
	Up to 24 Hours	0.25 s					

Mechanical				
MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Equipment to Measure	-1 psig to 1 psig	0.000 24 psig	Fluke 7250LP	SOP-07 Pressure
Pressure ^{FO}	1 psig to 5 psig	0.000 15 psig	Fluke PG7601 Deadweight Tester, 10 kPa/kg 6270A Pressure	and Vacuum Calibration
	5 to 10 psig	0.000 24 psig		Calibration
	10 to 15 psig	0.000 31 psig		
	15 to 30 psig	0.000 37 psig	Controller	
	30 to 50 psig	0.000 58 psig]	



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Mechanical	Accreanation is graniea	to the facility to perform	the jollowing cultor allon.	
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
Equipment to Measure	50 to 100 psig	0.001 9 psig	Fluke PG7601 Deadweight	SOP-07 Pressure
Pressure FO	100 to 150 psig	0.002 7 psig	Tester, 200 kPa/kg 6270A Pressure Controller	and Vacuum Calibration
	150 to 200 psig	0.004 2 psig	0270A Pressure Controller	Calibration
	200 to 300 psig	0.005 9 psig		
	300 to 400 psig	0.007 4 psig		
	400 to 600 psig	0.011 psig]	
	600 psig to 20 000 psig	0.012 % of reading	Fluke P3116-PSI Deadweight Tester	
	20 000 psig to 40 000 psig	47 psig	Additel ADT681	
Equipment to measure Vacuum ^F	Up to 5 psia	0.000 15 psia	Fluke PG7601 Deadweight Tester, 10 kPa/kg	SOP-07 Pressure and Vacuum
	5 to 10 psia	0.000 24 psia	Fluke PG7601 Deadweight Tester, 10 kPa/kg	Calibration
	10 to 14.7 psia	0.000 31 psia	Fluke PG7601 Deadweight Tester, 10 kPa/kg	
Equipment to measure	0.5 sccm to 50 sccm	0.31 % of reading	Mesa Labs ML-800-3	SOP-03 Mass
Mass Flow FO	50 sccm to 5 000 sccm	0.16 % of reading	Mesa Labs ML-800-24	Flowmeter Calibration /OEM Manual
	5 slpm to 100 slpm	0.18 % of reading	Mesa Labs ML-800-75	
	100 slpm to 5 000 slpm	0.28 % of reading	Fluke molbox+ mass flow terminal and Fluke 5E2-S, 2E3-S, or 1E4-S molbloc.	
Equipment to measure Liquid Flow ^{FO}	1 gpm to 60 gpm	0.45 % of reading	Cox Liquid Flow Standard	SOP-34 Liquid Flow
Equipment to measure Liquid Flow ^F	60 GPM to 225 GPM	0.74% of Reading	Hoffer HO2X2A Flow Meter	Calibration / OEMManual
Equipment to measure Torque ^{FO}	1 in-oz to 500 in-lb 41.6 ft-lb to 800 ft-lb	0.1 % of reading	Torque Arms, F Class Weights	SOP-28 Torque Transducers / OEM Manual
Torque Tools FO	2 in oz to 1.25 in-lb	0.6 % of reading	Mountz BMX20Z	SOP-04 Torque
	1.25 in-lb to 10 in-lb	0.59 % of reading	Mountz TL10i	Tool Calibration /
	10 in-lb to 500 in-lb	0.3 % of reading	Norbar 50621	OEM Manual
	42 ft-lb to 75 ft-lb	0.31 % of reading	Norbar 50593	
	75 ft-lb to 750 ft-lb	0.31 % of reading	Norbar 50597	
Accelerometers / Vibrat	ion ^{FO}		Modal Shop 9100D / PCB	GIDEP/OEM
10 Hz – 30Hz	Up to 20 g pk	4.6 % of reading	9105D	Manual
30 Hz – 2 000 Hz	Up to 20 g pk	3.8 % of reading	1	
2 000 Hz – 10 kHz	Up to 20 g pk	5.3 % of reading]	



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MEASURED INSTRUMENT, QUANTITY OR GAUGE	Weighing Devices RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOI OR PROCEDURES USED
Equipment to measure	Up to 10 lbf	0.003 lbf	Class F Weights	SOP-13 Force
Force-Compression and	10 to 100 lbf	0.017 lbf	-	Calibration
Tension ^F	100 to 200 lbf	0.029 lbf	-	
	200 to 500 lbf	0.1 lbf	-	
Force - Compression &	Up to 500 lbf	0.1 lbf	Class F Weights	_
Tension FO	500 lbf to 1 000 lbf	0.63 lbf	Load Cells	-
	1 000 lbf to 2 500 lbf	2.1 lbf	-	
	2 500 lbf to 5 000 lbf	2.7 lbf	-	
	5 000 lbf to 7 500 lbf	5.3 lbf	_	
	7 500 lbf to 10 000 lbf	6.3 lbf	_	
	10 000 lbf to 25 000 lbf	22 lbf	-	
	25 000 lbf to 50 000 lbf		_	
		31 lbf		
Laboratory and Precision Balances ^{FO}	Up to 20 g (0.001 mg)	14 µg	Class 1 Weights	SOP-10 Balance and Scale Calibration
Dalances	20 g to 40 g	30 µg		
	(0.01 mg)	50 46		
	40 g to 60 g	39 µg		
	(0.01 mg)			
	60 g to 80 g (0.01 mg)	45 μg		
	80 g to 100 g	71 µg		
	(0.01 mg)			
	100 g to 200 g	77 µg		
	(0.01 mg)	0.80 ma		
	200 g to 500 g (0.1 mg)	0.89 mg		
	500 kg to 1 kg	2.6 mg	-	
	(1 mg)			
	1 kg to 2 kg	2.8 mg		
	(1 mg)		_	
	2 kg to 4 kg	4.3 mg		
	(1 mg) 4 kg to 5 kg	14 mg	-	
	Res.= (1 mg)	1 + 1115		
Scale ^{FO}	5 kg to 10 kg	24 mg	-	
	Res.= (1 mg)		_	
	10 kg to 15 kg	99 mg		
	Res.=(1 mg)	0.11 ~	-	
	15 kg to 20 kg Res.= (0.1 g)	0.11 g		
	20 kg to 25	0.12 g	Class F Weights	SOP-10 Balance and
	Res.= (0.1 g)	0		Scale Calibration



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

Mass Force	and Weighing Devices	fuctury to perform the fou	owing canor anon.	
MEASURED INSTRUMENT, QUANTITY OR GAUGE	(AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Scale ^{FO}	25 kg to 100 kg	0.15 g	Class F Weights	SOP-10 Balance
	Res.= (0.1 g)		-	and Scale
	100 kg to 200 kg	0.21 g		Calibration
	Res.= (0.1 g)	0.02	-	
	200 kg to 255 kg Res.= (0.1 g)	0.23 g		
	Up to 20 lb	0.001 1 lb	-	
	Res.= (0.001 lb)	0.001110		
	20 lb to 50 lb Scale Calibration	0.007 4 lb	1	
	Res.= (0.01 lb)	A		
	50 lb to 100 lb	0.009 6 lb		
	Res.= (0.01 lb)		_	
	100 lb to 600 lb	0.077 lb		
	$\frac{\text{Res.}=(0.1 \text{ lb})}{600 \text{ lb to } 1\ 000 \text{ lb}}$	0.12 lb	7	
	Res.= (0.1 lb)	0.12 10		
	1 000 lb to 2 000 lb	0.17 lb		
	Res.= (0.1 lb)			
	2 000 lb to 3 000 lb	0.37 lb		
	Res.= (0.5 lb)			
	3 000 lb to 4 000 lb	0.48 lb		
Pipettes ^{FO}	Res.= (0.5 lb)	0.076I	Micro-Balance	SOP-33 Pipettes
Pipettes	0.5 μL to 2 μL	0.076 µL	мисто-ватапсе	SOP-55 Pipelles
	2 µL to 10 µL	0.078 µL	-	
	10 μL to 20 μL	0.08 µL	_	
	20 μL to 100 μL	0.094 μL		
	100 μL to 200 μL	0.16 µL		
	200 μL to 500 μL	0.4 μL		
	500 μL to 1 000 μL	0.51 μL		
	1 000 μL to 5 100 μL	2.5 μL	1	
Mass FO	Up to 2 g	0.002 mg	Class 0 Weights	SOP-42 Mass
	2 g to 20 g	0.009 mg	with:	Calibration
	20 g to 200 g	0.046 mg	Micro Balance Semi-Micro	
	200 g to 1 000 g	0.17 mg	Balance	
	1 000 g to 3 000 g	1.1 mg	Analytical Balance	
	3 000 g to 5 000 g	3.4 mg	Medium Precision Balance	
	5 000 g to 10 000 g	6.5 mg	Heavy Precision	
	10 kg to 30 kg	0.15 g	Balance	
	30 kg to 60 kg	0.74 g	1	



Certificate of Accreditation: Supplement

Total Calibration Solutions, INC

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	Chemical				
	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
(Conductivity Meters ^F	1 μS/cm	0.56 µS/cm	Compared to Standard	SOP-44
		10 µS/cm	0.59 μS/cm	Solutions	Conductivity /
		100 µS/cm	2.4 μS/cm	•	OEM Manual
		1 000 μS/cm	6.9 μS/cm		
		10 000 µS/cm	190 µS/cm		
		100 000 µS/cm	2 400 µS/cm	1	

- 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. 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.
- 6. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.