

# Certificate of Calibration

**Certificate Number: 20200123-67770**



Manufacturer: **IET Labs, Inc.**

Model: **1491-G**

Description: **Decade Inductor, 1491-G**

Serial Number: **A1-19491090**

Customer Designation:

IET Item ID # 55801

IET Labs, Inc. hereby certifies that the above-referenced instrument meets or exceeds its published specifications. IET Labs, Inc. hereby certifies that its measurement and calibration procedures are compliant with DIS10012, ISO9001, ISO/IEC17025, ANSI/NCSL Z540-1-1994, and MIL-STD-45662A. The calibration and measurement procedures are defined in Quality Policy Manual QM-100 and associated procedures. The calibration and measurement procedures use primary or secondary standards whose calibration is traceable, through NIST or other National Standards Institutes, to the International System of Units (SI) or to accepted intrinsic standards of measurement, or whose accuracy have been determined by ratio-type calibration techniques. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. Except where noted, IET Labs maintains at least a 4:1 Test Uncertainty Ratio. The reported data is valid only at the time of test and does not take into account the effects of voltage/current, humidity, long-term drift, transportation or other factors that may affect the stability of the tested device.

- Condition Received**
- New unit
  - Out of tolerance
  - Physical Damage (see Details of Damage)
  - Met manufacturer's specifications
  - Inoperative
- Condition Returned**
- Calibrated/Certified to manufacturer's specifications
  - Repaired
  - Other (see Condition Returned Notes)

## Calibration Procedure

The instrument listed above was calibrated by IET Labs, according to Calibration Procedure 1491-TP, Rev B1.

## Decision Rules

RDS (Root Difference Square) rule: PASS if MEASURED value  $\leq$  Test limit  $<(\text{Specification Limit}^2 - \text{Measurement Uncertainty}^2)^{0.5}$   
This gives a PFA (Probability of False Accept) of  $< 0.6\%$ .

A PASS\* indicates the MEASURED value is  $\geq$ Test Limits and  $<$ Specification Limits.

For TL = SL this gives a PFA of  $<1\%$  at a TUR of 4:1.

The user should determine conformity, when PASS\* is indicated based upon the desired rule of; RDS in which case PASS\* is a FAIL or TL = SL in which case PASS\* is a PASS.

## Measurement Uncertainty - Inductance

Measurement uncertainty = 0.02% for all inductance readings.

## Associated Test Reports

Report #	Date	Test Description
117989	23-Jan-2020	As Built

## Standards And Tools Used

Manufacturer	Model	Description	Serial Number	Cal Date	Due Date
GenRad	1482-B	Standard Inductor, 100 $\mu$ H	9452	15-May-2015	15-May-2025
QuadTech, Inc.	1482-E	Standard Inductor, 1 mH	A1-00411014	02-Apr-2014	02-Apr-2024
GenRad	1482-H	Standard Inductor, 10 mH	13063	22-May-2018	22-May-2028
GenRad	1482-P	Standard Inductor, 1 H	12946	03-Apr-2014	03-Apr-2024
GenRad	1689-9700	Precision RLC Digibridge	KW3281	24-Sep-2019	24-Sep-2020

**Calibration Facility:** IET Labs, Inc.  
1202 VFW Parkway  
West Roxbury, MA 02132

**Calibration Date:** 23-Jan-20  
**Next Recommended Calibration Date:**

Authorized Signature MJT



# Certificate of Calibration

**Certificate Number: 20200123-67770**



Manufacturer: **IET Labs, Inc.**  
 Model: **1491-G**  
 Description: **Decade Inductor, 1491-G**  
 Serial Number: **A1-19491090**  
 Customer Designation:

IET Item ID # 55801

## Test Report Number: 117989

TestDataRpt\_0002

**Test Description: As Built**

**Environmental Conditions:** Temp (Deg C): 23.3      **Test Date:** 23-Jan-2020      **Test Version:** 7.4  
 RH (%): 20.8      **Tech:** MJT

Test Conditions:	SPECIFICATION LIMITS	TEST LIMITS
Schedule @:	<2.000 uH	<2.000 uH
Schedule A:	±2.0000% with Zero Subtraction @ 1.00 kHz, 0.01 Vac	±2.0000% with Zero Subtraction @ 1.00 kHz, 0.01 Vac
Schedule B:	±2.0000% @ 1.00 kHz, 0.01 Vac	±2.0000% @ 1.00 kHz, 0.01 Vac
Schedule C:	±1.6000% @ 0.50 kHz, 0.02 Vac	±1.6000% @ 0.50 kHz, 0.02 Vac
Schedule D:	±0.8000% @ 0.20 kHz, 0.02 Vac	±0.8000% @ 0.20 kHz, 0.02 Vac
Schedule E:	±0.8000% @ 0.10 kHz, 0.04 Vac	±0.8000% @ 0.10 kHz, 0.04 Vac

COLUMN LEGEND - SCH: Schedule applied for particular measurement.      NOMINAL: Expected/ideal value.  
 READING: Value reported by the measurement equipment.  
 LOWER LIM: The minimum acceptable value.  
 MEASURED: Represents the calibrated value. If ZERO SUBTRACTION is specified in Schedule, this is the reading minus the measured ZERO.  
 UPPER LIM: The maximum acceptable value.  
 P/F: PASS or FAIL; Pass if MEASURED is >=LOWER LIM. AND <=UPPER LIM., otherwise FAIL.  
 % ERROR: Percent error between the NOMINAL and the MEASURED values.  
 =[(MEASURED-NOMINAL)/NOMINAL]\*100  
 ABS. ERROR: Absolute error between the NOMINAL and MEASURED values.  
 =(MEASURED-NOMINAL)

Series: 149x - GenRad  
 Model: 1491-G

SCH	NOMINAL (H)	READING (H)	LOWER LIM (H)	MEASURED (H)	UPPER LIM (H)	% ERROR	ABS.ERROR	P/F
@	0.0000	1.4400u	0.0000	1.4400u	2.0000u	+72.0000%	+1.440u	PASS
A	100.00u	102.08u	98.000u	100.64u	102.00u	+0.6400%	+640.000n	PASS
A	200.00u	201.18u	196.00u	199.74u	204.00u	-0.1300%	-260.000n	PASS
A	300.00u	300.08u	294.00u	298.64u	306.00u	-0.4533%	-1.360u	PASS
A	400.00u	399.16u	392.00u	397.72u	408.00u	-0.5700%	-2.280u	PASS
A	500.00u	502.80u	490.00u	501.36u	510.00u	+0.2720%	+1.360u	PASS
A	600.00u	603.59u	588.00u	602.15u	612.00u	+0.3583%	+2.150u	PASS
A	700.00u	702.49u	686.00u	701.05u	714.00u	+0.1500%	+1.050u	PASS
A	800.00u	801.56u	784.00u	800.12u	816.00u	+0.0150%	+120.000n	PASS
A	900.00u	900.47u	882.00u	899.03u	918.00u	-0.1078%	-970.000n	PASS
A	1.0000m	1.0013m	980.00u	999.86u	1.0200m	-0.0140%	-140.000n	PASS



# Certificate of Calibration

**Certificate Number: 20200123-67770**



Manufacturer: **IET Labs, Inc.**

Model: **1491-G**

Description: **Decade Inductor, 1491-G**

Serial Number: **A1-19491090**

Customer Designation:

IET Item ID # 55801

## Test Report Number: 117989

TestDataRpt\_0002

SCH	NOMINAL (H)	READING (H)	LOWER LIM (H)	MEASURED (H)	UPPER LIM (H)	% ERROR	ABS.ERROR	P/F
B	1.0000m	1.0107m	980.00u	1.0107m	1.0200m	+1.0700%	+10.700u	PASS
B	2.0000m	1.9950m	1.9600m	1.9950m	2.0400m	-0.2500%	-5.000u	PASS
B	3.0000m	3.0064m	2.9400m	3.0064m	3.0600m	+0.2133%	+6.400u	PASS
B	4.0000m	3.9911m	3.9200m	3.9911m	4.0800m	-0.2225%	-8.900u	PASS
B	5.0000m	5.0280m	4.9000m	5.0280m	5.1000m	+0.5600%	+28.000u	PASS
B	6.0000m	6.0376m	5.8800m	6.0376m	6.1200m	+0.6267%	+37.600u	PASS
B	7.0000m	7.0205m	6.8600m	7.0205m	7.1400m	+0.2929%	+20.500u	PASS
B	8.0000m	8.0334m	7.8400m	8.0334m	8.1600m	+0.4175%	+33.400u	PASS
B	9.0000m	9.0168m	8.8200m	9.0168m	9.1800m	+0.1867%	+16.800u	PASS
B	10.000m	10.025m	9.8000m	10.025m	10.200m	+0.2500%	+25.000u	PASS
C	10.000m	10.078m	9.8400m	10.078m	10.160m	+0.7800%	+78.000u	PASS
C	20.000m	20.003m	19.680m	20.003m	20.320m	+0.0150%	+3.000u	PASS
C	30.000m	30.165m	29.520m	30.165m	30.480m	+0.5500%	+165.000u	PASS
C	40.000m	40.090m	39.360m	40.090m	40.640m	+0.2250%	+90.000u	PASS
C	50.000m	50.150m	49.200m	50.150m	50.800m	+0.3000%	+150.000u	PASS
C	60.000m	60.223m	59.040m	60.223m	60.960m	+0.3717%	+223.000u	PASS
C	70.000m	70.109m	68.880m	70.109m	71.120m	+0.1557%	+109.000u	PASS
C	80.000m	80.320m	78.720m	80.320m	81.280m	+0.4000%	+320.000u	PASS
C	90.000m	90.209m	88.560m	90.209m	91.440m	+0.2322%	+209.000u	PASS
C	100.00m	100.28m	98.400m	100.28m	101.60m	+0.2800%	+280.000u	PASS
D	100.00m	100.39m	99.200m	100.39m	100.80m	+0.3900%	+390.000u	PASS
D	200.00m	200.48m	198.40m	200.48m	201.60m	+0.2400%	+480.000u	PASS
D	300.00m	300.69m	297.60m	300.69m	302.40m	+0.2300%	+690.000u	PASS
D	400.00m	400.82m	396.80m	400.82m	403.20m	+0.2050%	+820.000u	PASS
D	500.00m	500.23m	496.00m	500.23m	504.00m	+0.0460%	+230.000u	PASS
D	600.00m	600.66m	595.20m	600.66m	604.80m	+0.1100%	+660.000u	PASS
D	700.00m	700.80m	694.40m	700.80m	705.60m	+0.1143%	+800.000u	PASS
D	800.00m	801.13m	793.60m	801.13m	806.40m	+0.1412%	+1.130m	PASS
D	900.00m	901.14m	892.80m	901.14m	907.20m	+0.1267%	+1.140m	PASS
D	1.0000	1.0016	992.00m	1.0016	1.0080	+0.1600%	+1.600m	PASS
E	1.0000	1.0020	992.00m	1.0020	1.0080	+0.2000%	+2.000m	PASS
E	2.0000	2.0089	1.9840	2.0089	2.0160	+0.4450%	+8.900m	PASS
E	3.0000	3.0163	2.9760	3.0163	3.0240	+0.5433%	+16.300m	PASS
E	4.0000	4.0247	3.9680	4.0247	4.0320	+0.6175%	+24.700m	PASS
E	5.0000	5.0008	4.9600	5.0008	5.0400	+0.0160%	+800.000u	PASS
E	6.0000	6.0021	5.9520	6.0021	6.0480	+0.0350%	+2.100m	PASS
E	7.0000	7.0142	6.9440	7.0142	7.0560	+0.2029%	+14.200m	PASS
E	8.0000	8.0170	7.9360	8.0170	8.0640	+0.2125%	+17.000m	PASS
E	9.0000	9.0307	8.9280	9.0307	9.0720	+0.3411%	+30.700m	PASS
E	10.000	10.032	9.9200	10.032	10.080	+0.3200%	+32.000m	PASS

No Failures Recorded.



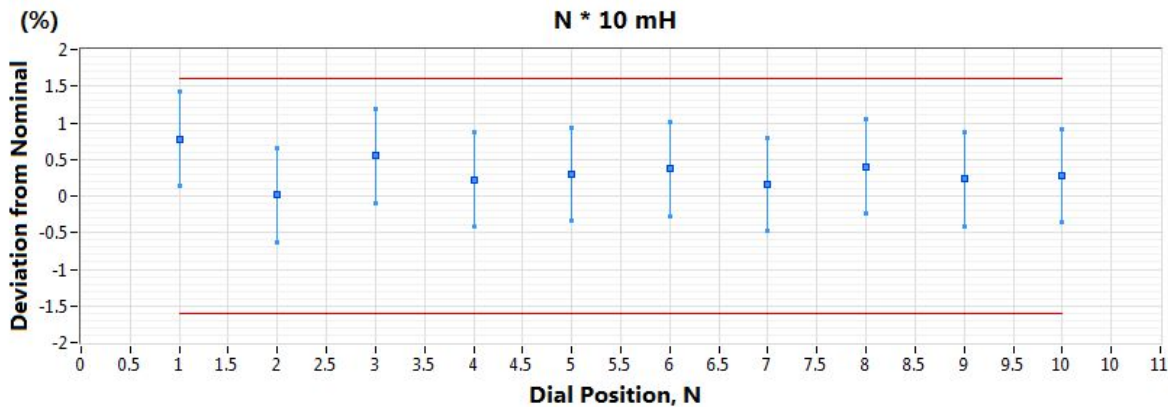
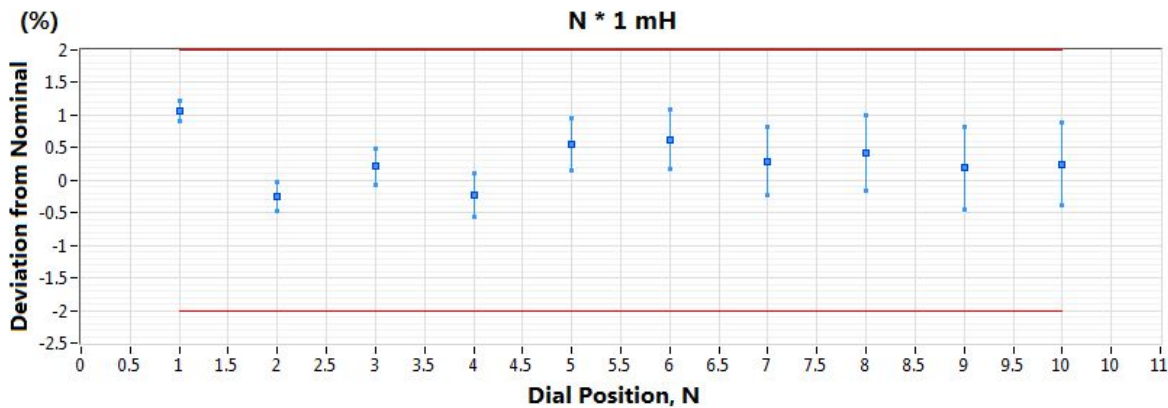
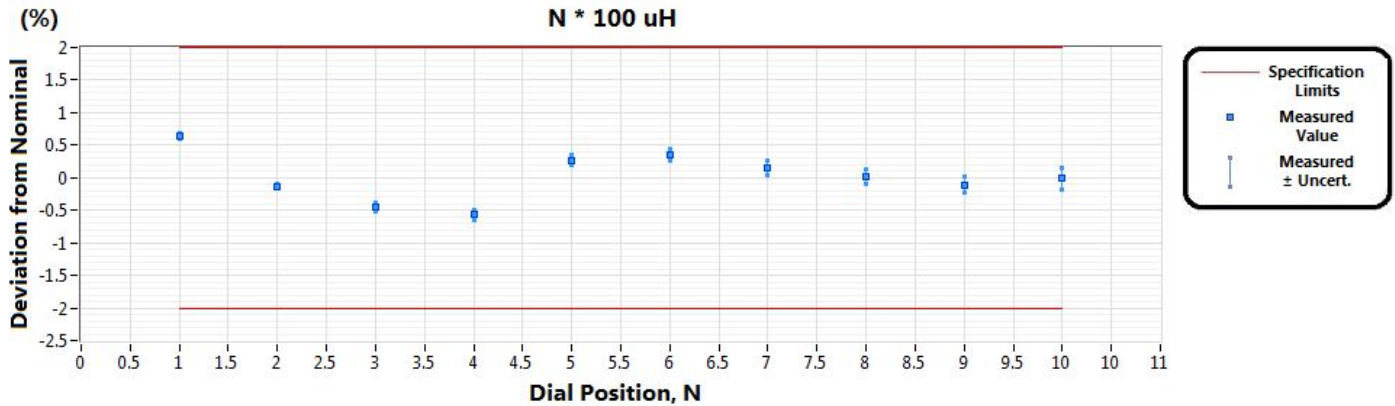
# Appendix to Certificate

Certificate Number: 20200123-67770



Manufacturer: IET Labs, Inc.  
Model: 1491-G  
Description: Decade Inductor, 1491-G  
Serial Number: A1-19491090

## As Built - Test Seq: 117989



# Appendix to Certificate

Certificate Number: 20200123-67770



Manufacturer: IET Labs, Inc.  
Model: 1491-G  
Description: Decade Inductor, 1491-G  
Serial Number: A1-19491090

## As Built - Test Seq: 117989

