



Designer and Manufacturer
of
Scientific and Industrial
Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 20204179/380642
Mfg. Ludlum Measurements, Inc. Model 2360 Serial No. 202403
Mfg. Ludlum Measurements, Inc. Model 43-68 Serial No. PR161781
Cal. Date 27-Jul-12 Cal Due Date 27-Jul-13 Cal. Interval 1 Year Meterface 202-855

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 32 % Alt 702.8 mm Hg

- New Instrument Instrument Received Within Toler. +10% 10-20% Out of Tol. Requiring Repair Other-See comments
- Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity
 F/S Resp. ck. Reset ck. Window Operation Geotropism
 Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC RS-232 Port OK
 Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 1575 V

HV Readout (2 points) Ref./Inst. 500 / 502 V Ref./Inst. 2000 / 2004 V

Firmware Version: 39010-24

Alpha Threshold: 120mV

Beta Threshold: 4 mV

Beta Window: 50 mV

Overload Checked BUT NOT SET.

Instrument calibrated with a 5ft cable.

High voltage set with detector NOT CONNECTED.

(EEPROM Settings)

User Time: 30.0

Alpha Alarm: 999999

Beta Alarm: 999999

A/B Alarm: 999999

Model 2360 Date: 7/27/2012

Calibration Date Due: 7/27/2013

COMMENTS:

Th230 SN:5020 Size: 10100dpm, Background: 3cpm, Counts: 3386cpm, 2pi Eff: 33.49%
Tc99 SN:5279 Size: 58300dpm, Background: 260cpm, Counts: 30768cpm, 2pi Eff: 52.32%
SrY90 SN:5281 Size: 68985dpm, Background: 260cpm, Counts: 34879cpm, 2pi Eff: 50.18%
Ni63 SN:4017 Size: 139417dpm, Background: 260cpm, Counts: 17064cpm, 2pi Eff: 12.05%
Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1000	400k cpm	<u>400</u>	<u>400</u>
x1000	100k cpm	<u>100</u>	<u>100</u>
x100	40k cpm	<u>400</u>	<u>400</u>
x100	10k cpm	<u>100</u>	<u>100</u>
x10	4k cpm	<u>400</u>	<u>400</u>
x10	1k cpm	<u>100</u>	<u>100</u>
x1	400 cpm	<u>400</u>	<u>400</u>
x1	100 cpm	<u>100</u>	<u>100</u>

*Uncertainty within ± 10% C.F. within ± 20%

ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout						
400kcpm	<u>39986(0)</u>	<u>39986(0)</u>				
40kcpm	<u>3998</u>	<u>3998</u>				
4kcpm	<u>400</u>	<u>400</u>				
400cpm	<u>40</u>	<u>40</u>				
40cpm	<u>4</u>	<u>4</u>				

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques.
The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897 Ra-226 S/N Y982
Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304

Alpha S/N Beta S/N Other

m 500 S/N 190566 Oscilloscope S/N Multimeter S/N 86250390

Calibrated By: [Signature] Date 27-July-12

Reviewed By: [Signature] Date 30 July 12



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Bench Test Data For Detector

Detector 43-68 Serial No. PR161781 Order #. 20204179/380642
 Customer CABRERA SERVICES Alpha Input Sensitivity 120 mV
 Counter 2360 Serial No. 202403 Beta Input Sensitivity 4 mV
 Count Time 1Minute Beta Window 50 mV
 Other _____ Distance Source to Detector Surface

High Voltage	Background		Isotope <u>Th230</u> Size <u>19800dpm</u>		Isotope <u>Tc99</u> Size <u>93200dpm</u>		Isotope <u>Sr90</u> Size <u>98550dpm</u>		Isotope <u>Ni63</u> Size <u>278834dpm</u>	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
<u>1550</u>	<u>1</u>	<u>178</u>	<u>3273</u>	<u>1380</u>	<u>22</u>	<u>30738</u>	<u>2</u>	<u>30303</u>	<u>1</u>	<u>16418</u>
<u>1575</u>	<u>3</u>	<u>260</u>	<u>3386</u>	<u>1429</u>	<u>40</u>	<u>30768</u>	<u>5</u>	<u>34879</u>	<u>1</u>	<u>17064</u>
<u>1600</u>	<u>3</u>	<u>280</u>	<u>3451</u>	<u>1261</u>	<u>131</u>	<u>28952</u>	<u>68</u>	<u>36761</u>	<u>0</u>	<u>16695</u>
<u>1625</u>	<u>2</u>	<u>318</u>	<u>3862</u>	<u>1152</u>	<u>787</u>	<u>24451</u>	<u>466</u>	<u>34820</u>	<u>3</u>	<u>14483</u>

Gas Proportional detector count rate decreased ≤ 10% after 15 hour static test using 39" cable.
 Gas proportional detector count rate decreased ≤ 10% after 5 hour static test using 39" cable and alpha/beta counter.

Signature Jan Fa Date 27-July-12