Sample Number: 522940
Project Code: HW-SX
Agency Number:
Date Collected: 8/23/2012
Time Collected: 1500
Date Received: 8/29/2012
Date Completed: 09/14/2012
Collected By: RF
PWS Id:
Location Code:
Station:
Facility:
Report Date: 9/17/2012

To: RACHEL FRANKS/LPD

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
STATE ENVIRONMENTAL LABORATORY
707 N. ROBINSON
OKLAHOMA CITY
OKLAHOMA, 73102-6010
General Inquiries: 1-866-412-3057
or sels.ok.gov

Report of Analysis by Metals

EPA Drinking Water Certification #OK00013

CC: FILE COPY

Name	Qualifier	Value	Units	Analyzed	Method	Prep Type
Magnesium, Sediment		269000	MG/KG	09/14/12	6010	3050
Chromium, Sediment		187	MG/KG	09/14/12	6010	3050
Manganese, Sediment		13000	MG/KG	09/14/12	6010	3050
Molybdenum, Sediment		12.0	MG/KG	09/14/12	6010	3050
Aluminum, Sediment		30700	MG/KG	09/14/12	6010	3050
% Solids		66.4	%	09/14/12	CLP 05.3	3050

Summary

Labs performing analysis on this Sample:
Metals

SOURCE: BROKEN ARROW LANDFIL

SAMPLERS COMMENTS:
BA-02; AOC#B2

ANALYST'S COMMENTS:

Greg Goode
Greg Goode
State Environmental Laboratory

* **ANALYST** _____

Sample Number: 522939
Project Code: EW-SX
Agency Number:
Date Collected: 8/23/2012
Time Collected: 1430
Date Received: 8/29/2012
Date Completed: 09/14/2012
Collected By: RF
PWS Id:
Location Code:
Station:
Facility:
Report Date: 9/17/2012

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
STATE ENVIRONMENTAL LABORATORY
707 N. ROBINSON
OKLAHOMA CITY
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Report of Analysis by Metals

EPA Drinking Water Certification #OK00013

To: RACHEL FRANKS/LPD

CC: FILE COPY

Name	Qualifier	Value	Units	Analyzed	Method	Prep Type
Magnesium, Sediment		222000	MG/KG	09/14/12	6010	3050
Chromium, Sediment		325	MG/KG	09/14/12	6010	3050
Manganese, Sediment		8510	MG/KG	09/14/12	6010	3050
Molybdenum, Sediment		20.5	MG/KG	09/14/12	6010	3050
Aluminum, Sediment		34300	MG/KG	09/14/12	6010	3050
% Solids		75.2	%	09/14/12	CLP 05.3	3050

Summary

Labs performing analysis on this Sample:

Metals

SOURCE: BROKEN ARROW LANDFIL

SAMPLERS COMMENTS:
BA-01; AOC#B1

ANALYST`S COMMENTS:

Greg Goode
Greg Goode
State Environmental Laboratory

* * ANALYST

Sample Number: 522941
Project Code: BW-SX
Agency Number:
Date Collected: 8/23/2012
Time Collected: 1445
Date Received: 8/29/2012
Date Completed: 09/14/2012
Collected By: RF
PWS Id:
Location Code:
Station:
Facility:
Report Date: 9/17/2012

To: RACHEL FRANKS/LPD

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
STATE ENVIRONMENTAL LABORATORY
707 N. ROBINSON
OKLAHOMA CITY
OKLAHOMA, 73102-6010
General Inquiries: 1-866-412-3057
or sels.ok.gov

Report of Analysis by Metals

EPA Drinking Water Certification #OK00013

CC: FILE COPY

Name	Qualifier	Value	Units	Analyzed	Method	Prep Type
Magnesium, Sediment		153000	MG/KG	09/14/12	6010	3050
Chromium, Sediment		193	MG/KG	09/14/12	6010	3050
Manganese, Sediment		5520	MG/KG	09/14/12	6010	3050
Molybdenum, Sediment		8.90	MG/KG	09/14/12	6010	3050
Aluminum, Sediment		36100	MG/KG	09/14/12	6010	3050
% Solids		82.2	%	09/14/12	CLP 05.3	3050

Summary

Labs performing analysis on this Sample:
Metals

SOURCE: BROKEN ARROW LANDFIL

SAMPLERS COMMENTS:
BA-03; CONTRACTOR SPOILINGS; AOC B3

ANALYST'S COMMENTS:

Greg Goode

* * **ANALYST** Greg Goode
State Environmental Laboratory

Sample Number: 522942
Project Code: HW-SX
Agency Number:
Date Collected: 8/23/2012
Time Collected: 1600
Date Received: 8/29/2012
Date Completed: 09/14/2012
Collected By: RF
PWS Id:
Location Code:
Station:
Facility:
Report Date: 9/17/2012

To: RACHEL FRANKS/LPD

CC: FILE COPY

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
STATE ENVIRONMENTAL LABORATORY
707 N. ROBINSON
OKLAHOMA CITY
OKLAHOMA, 73102-6010
General Inquiries: 1-866-412-3057
or sels.ok.gov

Report of Analysis by Metals

EPA Drinking Water Certification #OK00013

Name	Qualifier	Value	Units	Analyzed	Method	Prep Type
Magnesium, Sediment		178000	MG/KG	09/14/12	6010	3050
Chromium, Sediment		146	MG/KG	09/14/12	6010	3050
Manganese, Sediment		7280	MG/KG	09/14/12	6010	3050
Molybdenum, Sediment	<	5.00	MG/KG	09/14/12	6010	3050
Aluminum, Sediment		31700	MG/KG	09/14/12	6010	3050
% Solids		75.3	%	09/14/12	CLP 05.3	3050

Summary

Labs performing analysis on this Sample:

Metals

SOURCE: BROKEN ARROW LANDFIL

SAMPLERS COMMENTS:
BA-04; AOCA#1

ANALYST'S COMMENTS:

Greg Goode

*** * ANALYST** Greg Goode
State Environmental Laboratory

ATTACHMENT 2

SURVEY INSTRUMENT DATA SHEETS

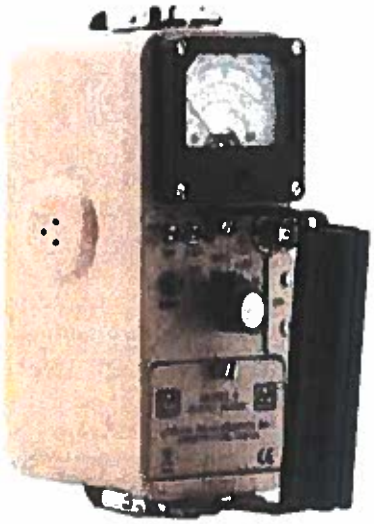
Model 3
General Purpose Ratemeter

Radiation Detection for a Safer World

Ludlum Measurements, Inc.

FEATURES

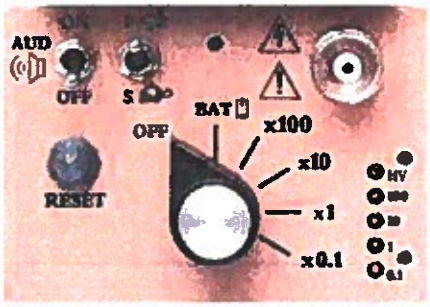
- Supports GM, Proportional & Scintillation Detectors
- Rugged Construction & Low Price
- 4-Decade Analog Ratemeter
- Greater than 2000 Hour Battery Life
- Audio On-Off, BAT CHECK
- Options & Accessories for Multiple Applications



Part Number: 48-1605

Introduction

This is Ludlum's best selling, general purpose, handheld analog ratemeter known for accuracy and long-lasting dependability. The analog meter comes in a variety of measurement ranges and units to support the external radiation detector selected.
The aluminum cast instrument housing with its separate battery compartment and accompanying metal handle offer an industrial robustness and quality that promote long-lasting protection and instrument life. The front-panel controls include a rotary switch for selecting the four-decade range, instrument shut-off, and battery test, an audio on/off switch, a fast/slow response switch, and a count reset button.
A one meter (39 in.) straight type detector cable with "C" style connector is included in the price of the instrument.

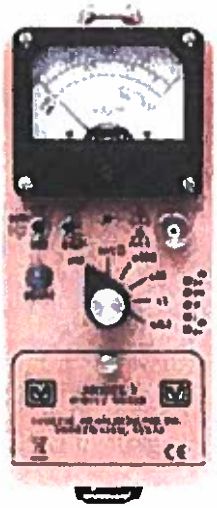


Specifications

COMPATIBLE DETECTORS: GM, proportional, scintillation
HIGH VOLTAGE: adjustable from 400 to 1500 Vdc
THRESHOLD: fixed at 40 mV ± 10 mV
LINEARITY: within 10% of true value
CONTROLS:

- Rotary Selector Switch: off, battery check, range selections for x0.1, x1, x10, x100
- Reset: pushbutton to zero meter
- Response Switch: toggles between FAST (4 seconds) or SLOW (22 seconds) from 10% to 90% of final reading
- Audio Switch: on/off, built-in unimorph speaker, 60 dB at 61 cm (2 ft)
- Calibration Controls: accessible from front of instrument (protective cover provided)

CONSTRUCTION: cast and drawn aluminum with beige powder coating
METER DIAL: 0–2 mR/hr, or 0–500 kcpm, BAT TEST (others available)
DETECTOR CONNECTOR: type "C" series (others available)
TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F)
May be certified for operation from -40 to 65 °C (-40 to 150 °F)
POWER: two each "D" cell batteries (housed in externally accessible sealed compartment)
BATTERY LIFE: typically greater than 2000 hours with alkaline batteries (battery condition can be checked on meter)
SIZE: 16.5 x 8.9 x 21.6 cm (6.5 x 3.5 x 8.5 in.) (H x W x L)
WEIGHT: 1.6 kg (3.5 lb), including batteries



Model 3 face view

Also Available:

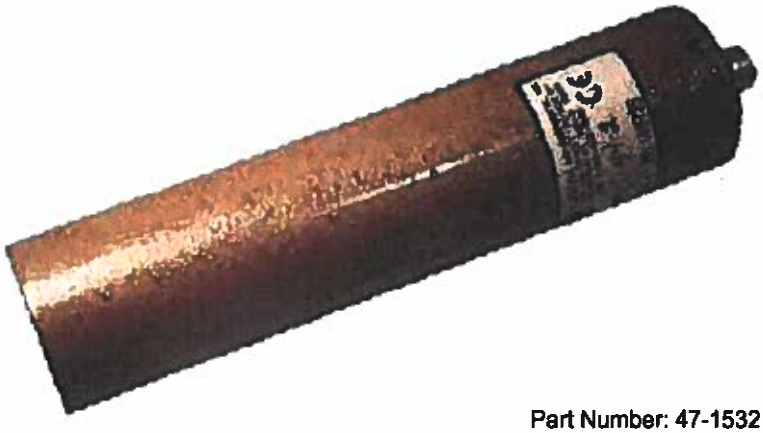
Model 3A: Identical to Model 3, but with built-in audible and visual alarms (Part No. 48-1408)
Model 3-IS: Intrinsic safety rating for operating in hazardous areas (Part No. 48-3581)
Model 14C: Includes internal GM detector with range of 0–20 mSv/h (0–2000 mR/hr) (Part No. 48-1611)

P.O. Box 810, Sweetwater, Texas 79556 / http://www.ludlums.com
Tel: 800-622-0828 / 325-235-5494 / Fax: 325-235-4672 / E-mail: ludlum@ludlums.com

Jan 2013

Model 44-2
Gamma Detector

Radiation Detection for a Safer World



Part Number: 47-1532

Specifications

INDICATED USE: low-level, wide-energy gamma survey
SUGGESTED INSTRUMENTS: general purpose survey meters, ratemeters, and scalers
DETECTOR TYPE: scintillator, 2.5 x 2.5 cm (1 x 1 in.) (Dia x thickness)
SENSITIVITY: typically 175 cpm/µR/hr (^{137}Cs gamma)
BACKGROUND: 1800 cpm
RECOMMENDED ENERGY RANGE: 50 KeV–1.5 MeV
ENERGY RESPONSE: energy dependent
PHOTOMULTIPLIER TUBE: 2.9 cm (1.1 in.) diameter, magnetically shielded
OPERATING VOLTAGE: typically 500–1200 volts
CONSTRUCTION: aluminum housing with beige powder coat finish
TEMPERATURE RANGE: -15 to 50 °C (5 to 122 °F); may be certified to operate from -40 to 65 °C (-40 to 150 °F)
CONNECTOR: series "C" (others available)
SIZE: 5.1 X 18.5 cm (2 x 7.3 in.) (Dia x L)
WEIGHT: 0.5 kg (1 lb)

Options: **Model 180-1, Model 180-1L,** and **Model 180-24 Sample Holders** provide repeatable geometry for counting wipes, filter paper, or slides at user-selectable spacing of 0.32, 0.64, 1.3, 2.5, and 5.1 cm (0.125, 0.25, 0.5, 1, and 2 in.) from the detector.
Model 180-1: anodized aluminum frame, sample tray, and collimator (P/N 47-1675)
Model 180-1L: as above, but with 0.64 cm (0.25 in.) painted lead collimator (P/N 47-2988)
Model 180-24: anodized aluminum frame and sample tray (no collimator) (P/N 47-2631)
Planchets: 5.1 cm x 3.2 mm (2.0 x 0.125 in.) (Dia x thickness) in stainless steel or aluminum Stainless Steel (P/N 7525-371-01); Aluminum (P/N 7525-371) Minimum order quantity of 500
Model L-4002-227: lead shielding/collimator for 5.1 cm (2 in.) OD detectors (P/N 4002-227)

Ludlum Measurements, Inc.

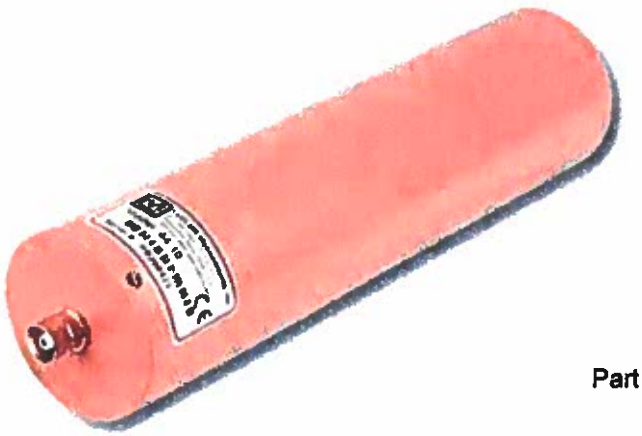
P.O. Box 810, Sweetwater, Texas 79556 / http://www.ludlums.com
Tel: 800-622-0828 / 325-235-5494 / Fax: 325-235-4672 / E-mail: ludlum@ludlums.com

Jan 2013

Model 44-10 Gamma Detector

Radiation Detection for a Safer World

Ludlum Measurements, Inc.



Part Number: 47-1540

Specifications

INDICATED USE: low-level, wide-energy gamma detection
ENERGY RESPONSE: energy dependent
SUGGESTED INSTRUMENTS: general purpose survey meters, ratemeters, and scalers
OPERATING VOLTAGE: 500–1200 volts
SCINTILLATOR: 5.1 x 5.1 cm (2 x 2 in.) (Dia x L) NaI
SENSITIVITY: typically 900 cpm/µR/hr (^{137}Cs gamma)
BACKGROUND: 9750 cpm
RECOMMENDED ENERGY RANGE: 50 KeV–3.0 MeV
PHOTOMULTIPLIER TUBE: 5.1 cm (2 in.) diameter, magnetically shielded
CONNECTOR: series "C" (others available)
TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F), may be certified to operate from -40 to 65 °C (-40 to 150 °F)
CONSTRUCTION: aluminum housing with beige polyurethane paint
SIZE: 6.6 x 27.9 cm (2.6 x 11 in.) (Dia x L)
WEIGHT: 1.0 kg (2.3 lb)

Options

Model 180-7 and Model 180-9 Sample Holders provide repeatable geometry for counting wipes, filter paper, or slides at user-selectable spacings of 0.32, 0.64, 1.3, 2.5, and 5.1 cm (0.125, 0.25, 0.5, 1, and 2 in.) from the detector.
Model 180-7 anodized aluminum frame, sample tray, and collimator (P/N 47-1675)
Model 180-9: has 3.81 cm (1.5 in.) thick lead housing with beige powder coat (P/N 47-1591)
Collimator: 7.9 x 6.6 cm (3.125 x 2.6 in.) (Dia x L), 0.56 cm (0.22 in.) thickness (P/N 4260-076)
Collimator: 7.9 x 15.2 cm (3.125 x 6 in.) (Dia x L), 0.56 cm (0.22 in.) thickness (P/N 4260-079)
Planchets: 5.1 cm x 3.2 mm (2.0 x 0.125 in.) (Dia x thickness) in stainless steel or aluminum
Stainless Steel (P/N 7525-371-01); Aluminum (P/N 7525-371) Minimum order quantity of 500

P.O. Box 810, Sweetwater, Texas 79556 / http://www.ludlums.com
Tel: 800-622-0828 / 325-235-5494 / Fax: 325-235-4672 / Email: ludlum@ludlums.com

Jan 2013

A & M ENGINEERING & ENVIRONMENTAL SERVICES, INC.
10010 E. 16TH STREET
TULSA, OKLAHOMA 74128-4713
ENGINEERING • ENVIRONMENTAL • CONSTRUCTION
(918) 665-6575 • FAX (918) 665-6576
EMAIL: aandm@aandmengineering.com

RECEIVED
MAY 13 2014
LAND PROTECTION DIVISION
DEPARTMENT OF ENVIRONMENTAL QUALITY

May 9, 2014

Ms. Rachel Francks
Environmental Programs Specialist
Land Protection Division
Brownfields Program
Oklahoma Department of Environmental Quality
707 North Robinson
P.O. Box 1677
Oklahoma City, OK 73101-1677

RE: Radiation Survey Report of Findings
Former City of Broken Arrow Landfill Site
Wagoner County, OK

Dear Ms. Francks:

Attached for review is one copy of the Report of Findings for the Radiation Survey conducted on the above referenced site. The Results of Investigation are being submitted on behalf of the current landowner, JM Assets LP.

If you have any questions on this matter, or if you require any additional information, please do not hesitate to call.

Sincerely,
A&M Engineering and Environmental Services, Inc.

Thomas A. Trebonik, P.G.
Senior Project Manager

218524 CD___ #c___ c/o Linda