FLUKE®

Biomedical

Radiation Safety

Product Catalog

2011/2012

451P Pressurized µR Ion Chamber Survey Meter

190N Portable Neutron Survey Meter

ASM-990 Advanced Survey Meter

05-443 PRIMALERT® Digital Area Monitors

VICTOREEN

Featuring industry-standard Victoreen technology

Fluke Biomedical.

Better products. More choices. One company.

Radiation Safety Product Catalog
2011/2012

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Biomedical

Providing solutions, not just products
Today, biomeds, physicists, RSO's, other medical personnel must meet increasing regulatory pressures, higher quality standards, and rapid technological growth, while performing their work faster and more efficiently than ever. Fluke Biomedical provides a diverse range of software and hardware tools to meet today's challenges.

Service
Fluke Biomedical is dedicated to providing the best service within the healthcare industry. Equipped with the best-credentialed facilities, onsite experts, and full asset-management capabilities, Fluke Biomedical's service team is always on call to take care of its customers. Fluke Biomedical's world-class staff leads the industry in post- and pre-sale support, including helping customers choose the best products and accessories for their needs, technical support, product calibration, and repairs.

Regulatory compliance
Fluke Biomedical's benchmark quality operates to the most rigorous standards in the industry, including compliance with ISO 9001:2000, ISO 13485:2003, QSR, and NRC/Part 50, Appendix B/Part 21 and adheres to ISO 17025:2005, ANSI Z540, Mammography MQSA and CNSC. Many of the Fluke Biomedical products are CE-marked and CSA-certified. In addition, the Global Calibration Laboratory holds its NVLAP Lab Code 200566-0 certification and is traceable to both the NIST & PTB.

Legacy
You may be familiar with some of our legacy brand names, including:
- Victoreen®
- Nuclear Associates
- Keithley
- Metron
- DNI Nevada
- Bio-Tek Instruments

Fluke Biomedical has taken the best elements and products of these former brands and have incorporated them into the Fluke Biomedical culture and product line available today.

Our newest catalog
Our Radiation Safety catalog contains a variety of survey meters and probes, area monitors, and other monitoring accessories that can help Radiation Safety Officers (RSOs), Health Physicists, Emergency Responders and other radiation-minded professionals manage diagnostic imaging QA, regulatory compliance and radiation emergencies.

If you are interested in receiving catalogs or information about any of Fluke Biomedical's other product-lines, please visit **www.flukebiomedical.com/catalogs**.

Catalogs are also available for the following product lines:
- Biomedical Test
- Imaging and Therapy QA

About Fluke Biomedical
Fluke Biomedical leads the world in the manufacture of biomedical test and simulation products, including standalone electrical safety testers to fully integrated and automated performance testing and documentation systems. Fluke Biomedical also provides some of the most trusted and accurate radiation safety, medical imaging, and oncology quality-assurance solutions for regulatory compliance.

About Fluke Corporation
Fluke Biomedical is a division of Fluke Corporation. Fluke Corporation is the world leader in the manufacture, distribution, and service of electronic test tools and software and is a wholly owned subsidiary of Danaher Corporation (NYSE:DHR).

Radiation Safety Product Catalog

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Fluke Biomedical CarePlans

Priority services to keep you up and running

Look for the CarePlans logo in this catalog for products with available extended service and support plans. Fluke Biomedical's CarePlan packages offer comprehensive priority service and support to help you get the most out of your test equipment investments. Our CarePlan members enjoy priority bench service, extended warranties, value pricing on services, VIP technical support, expedited return shipping, productivity consultation services, educational training, and more. Take advantage of CarePlan priority service and support and let us take care of you.

priority Gold Instrument CarePlans Biomedical Products Silver Bronze

priority Gold Biomedical Products Instrument CarePlan

Silver Biomedical Products Instrument CarePlan

Bronze Biomedical Products Instrument CarePlan

Choose the best plan for you

	Gold	Silver	Bronze
First-on-bench priority service	•	•	•
Reminder notifications 60 and 30 days prior to expiration of calibration	•	•	•
Discounts on additional service requests	•	•	•
VIP access to technical support hotline	•	•	•
Turn-around time for repair	3-day	3-day	5-day
Turn-around time for calibration	1-day	3-day	5-day
Operational upgrades	•	•	
Accredited calibration to manufacturer's specifications	•	•	
OEM onsite calibration (where available) ensuring manufacturer's specifications	•	•	
One-year extended warranty beyond your original factory warranty. No-cost repair service.	•		•
1-day turnaround time for calibration	•		
No-cost loaner units during extended repair	•		
24x7 web user training	•		
Protocol development to increase productivity	•		

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451B
Ion Chamber Survey Meter with Beta Slide

The auto-ranging 451B measures radiation rate and accumulated dose from beta, gamma and x-ray radiation sources. The 451B's site surveying capabilities make it well suited for a wide range of end users, including: police and fire departments, x-ray manufacturers, government agencies, state inspectors, emergency response and HAZMAT teams, nuclear medicine labs, hospital radiation safety officers, and nuclear power workers.

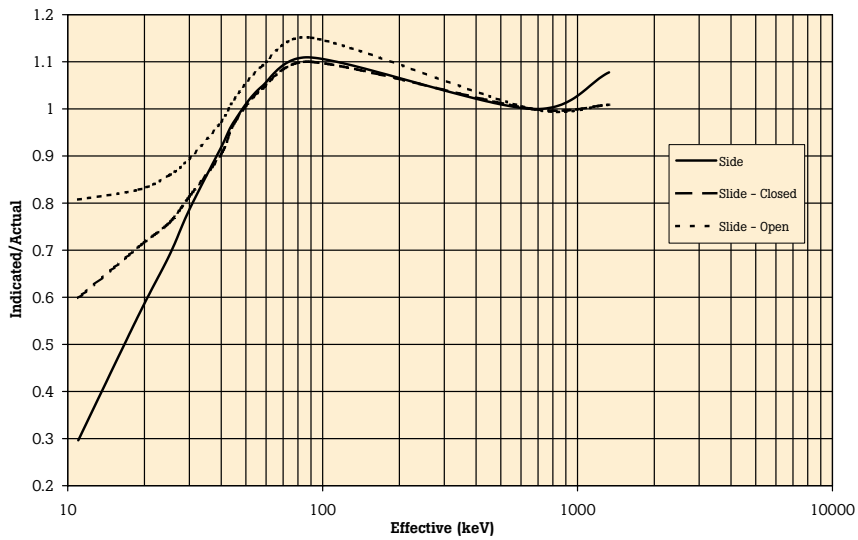
The ion-chamber detector allows for a fast response time to radiation from leakage, scatter beams and pinholes. Additionally, the low-noise chamber bias supply provides for fast background settling time. A sliding beta shield serves as an equilibrium thickness for photon measurements and enables beta discrimination.

The digital display features an analog bar graph, 2.5 digit digital readout, low battery and freeze ("peak hold") mode indicators, and an automatic backlight function. User controls consist of an ON/OFF button and a MODE button. The case is constructed of lightweight, high-strength materials and is sealed against moisture. The RS-232 interface can be connected directly to a computer for use with the Excel add-in for Windows® (451EXL), enhancing the functionality of the instrument. This software allows for data retrieval, user parameter selection and provides a virtual instrument display with audible (requires sound card) and visual alarm indication.

Key features

- High sensitivity measurement of rate and dose simultaneously, with the capability to record peak rate
- Auto-ranging and auto-zeroing
- RS-232 communications interface with optional Windows-based Excel add-in for data logging
- Ergonomic, anti-fatigue handle with replaceable grip, wrist strap and tripod mount
- Programmable flashing LCD display and audible alarm
- Easily-accessible battery door (operated by two 9-volt alkaline batteries) on the outside of the bottom case
- Available with dose equivalent energy response (SI units)
- Shoulder strap and handle which can be easily decontaminated (Nuclear Power plant specific unit)

Typical energy dependence



451B
Ion Chamber Survey Meter with Beta Slide

FLUKE Biomedical

Specifications

Radiation detected	Beta above 100 keV, and Gamma above 7 keV	
Operating ranges		
	0 to 5 mR/h or 0 to 50 µSv/h	
	0 to 50 mR/h or 0 to 500 µSv/h	
	0 to 500 mR/h or 0 to 5 mSv/h	
	0 to 5 R/h or 0 to 50 mSv/h	
	0 to 50 R/h or 0 to 500 mSv/h	
Accuracy	Within 10 % of reading between 10 % and 100 % of full scale indication on any range, exclusive of energy response. Calibration source is ^{137}Cs.	
Detector		
Chamber	349 cc volume air ionization	
Chamber wall	246 mg/cm^2 thick phenolic	
Chamber window	6.6 mg/cm^2 mylar, protected by steel mesh, 46 cm^2 detection area	
Beta slide	440 mg/cm^2	
451B-DE-SI	In order to achieve energy response consistent with measurements of H*(10) as required by ICR4-47, aluminum has been added to the back wall, 38 % of the side wall area, and to the beta slide. With the Beta Shield open, the 451B can measure skin dose at H*(0.07), and Deep Dose H*(10) with Beta Shield closed.	
Controls	ON/OFF and MODE	
Automatic features	Auto-zeroing, auto-ranging, and auto-backlight	
Response time	**Range**	**Response**
	0 to 5 mR/h (0 to 50 µSv/h)	8 s
	0 to 50 mR/h (0 to 500 µSv/h)	2.5 s
	0 to 500 mR/h (0 to 5 mSv/h)	2 s
	0 to 5 R/h (0 to 50 mSv/h)	2 s
	0 to 50 R/h (0 to 500 mSv/h)	2 s
Display LCD analog/digital with backlight		
Analog	100 element bar graph 6.4 cm long. Bar graph is divided into 5 major segments, each labeled with the appropriate value for the range of the instrument.	
Digital	2.5 digit display is followed by a significant zero digit depending on the operating range of the instrument. The units of measurement are indicated on the display at all times. Digits are 6.4 mm (0.25 in) high. Low battery and freeze indicators are also provided on the display.	
Modes		
Integrate mode	Operates continuously 30 seconds after the instrument has been turned on. Integration is performed even if the instrument is displaying in mR/h or R/h.	
Freeze mode	Will place a tick mark on the bar graph display to hold on the peak displayed value. The unit will continue to read and display current radiation values.	
Environmental		
Power requirements	Two 9 V alkaline, 200 hours operation	
Warm-up time	One minute	
Temperature range	-20 °C to 70 °C (-4 °F to 158 °F)	
Relative humidity	0 % to 100 %, @ 60 °C	
Geotropism	Less than 1 %	
Dimensions (WxDxH)	10 cm x 20 cm x 15 cm (4 in x 8 in x 6 in)	
Weight	1.11 kg (2.5 lb)	

Optional accessories

451EXL 451 Assistant for Excel, includes RS-232 interface cable

190HPS Single Unit Carrying Case

450UCS Check Source, ^{238}Uranium, 0.064 µCi, impregnated 2 x 2 in yellow card

62-103 Check Source, ^{137}Cs, 10 µCi. Flat disc, 1 inch diameter

Due to recent international airline shipping policies/restrictions, radioactive "Check Source" will not be shipped with the main unit outside US.

Ordering information

451B-RYR Ion Chamber Survey Meter with Beta Slide and standard chamber

451B-DE-SI-RYR Ion Chamber Survey Meter with Beta Slide and dose equivalent chamber

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451P
Pressurized µR Ion Chamber Survey Meter

The auto-ranging 451P features a pressurized ion chamber, providing enhanced sensitivity (µR resolution) and improved energy response to measure radiation rate and dose from x-ray and gamma sources. Originally designed to measure leakage and scatter around diagnostic x-ray and radiation therapy suites, the 451P's site surveying capabilities make it well-suited for a wide range of end users, including: x-ray manufacturers, government agencies, state inspectors, biomedical technicians, and maintenance technicians for airport baggage scanners.

The ion chamber detector allows for a fast response time to radiation from leakage, scatter beams and pinholes. Additionally, the low noise chamber bias supply provides for fast background settling time.

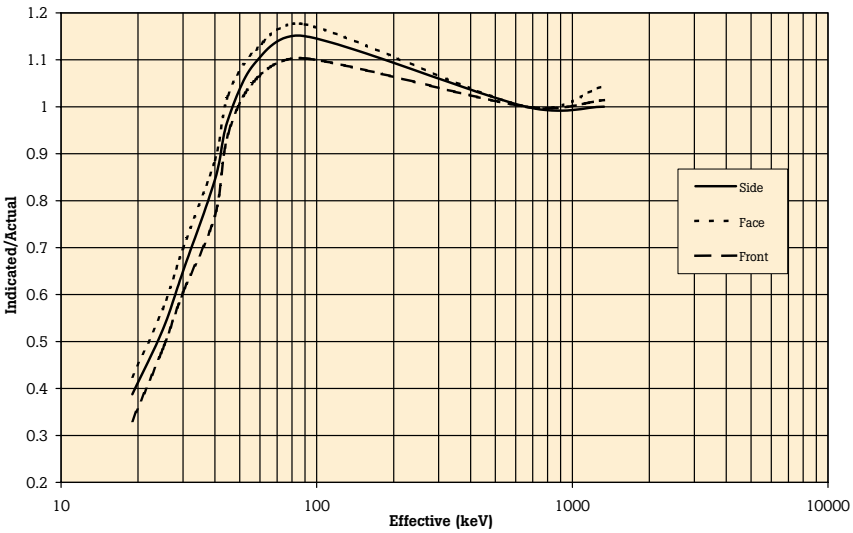
The digital display features an analog bar graph, 2.5 digit digital readout, low battery and freeze ("peak hold") mode indicators, and an automatic backlight function. User controls consist of an ON/OFF button and a MODE button. The case is constructed of lightweight, high strength materials and is sealed against moisture. The RS-232 interface can be connected directly to a computer for use with the Excel add-in for Windows (451EXL), enhancing the functionality of the instrument. This software allows for data retrieval, user-parameter selection and provides a virtual instrument display with audible (requires sound card) and visual alarm indication.

Key features

- High sensitivity µR measurements of rate and dose simultaneously, with the capability to record peak rate
- Ergonomic, anti-fatigue handle with replaceable grip, wrist strap and tripod mount
- Easily-accessible battery door (operated by two 9-volt alkaline batteries) on the outside of the bottom case
- RS-232 communications interface with optional Windows-based Excel add-in for data logging
- Available with dose equivalent energy response (SI units)
- Shoulder strap and handle which can be easily decontaminated (Nuclear Power plant specific unit)

Typical energy dependence

^{16}Nitrogen gamma rays are 110 % to 120 % of indicated readings as determined at the University of Lowell.



451P
Pressurized µR Ion Chamber Survey Meter

FLUKE Biomedical

Specifications

Radiation detected	Beta above 1 MeV, Gamma and x-rays above 25 keV	
Operating ranges		
	0 to 500 µR/h or 0 to 5 µSv/h	
	0 to 5 mR/h or 0 to 50 µSv/h	
	0 to 50 mR/h or 0 to 500 µSv/h	
	0 to 500 mR/h or 0 to 5 mSv/h	
	0 to 5 R/h or 0 to 50 mSv/h	
Accuracy	Within 10 % of reading between 10 % and 100 % of full scale indication on any range, exclusive of energy response. Calibration source is ^{137}Cs	
Detector		
Chamber	230 cc volume pressurized air ionization chamber to 8 atmospheres or 125 psi	
Controls	ON/OFF and MODE	
Automatic features	Auto-zeroing, auto-ranging, and auto-backlight	
Response time Analog response time from 10 % to 90 % of reading for a full scale step increase is dependent on operating range. Response time for a step increase in radiation exposure rate from background:	**Step increase, background to**	**Time to reach 90 % of final value**
	400 µR/h	4.8 s
	4 mR/h	3.3 s
	10 mR/h	4.3 s
	40 mR/h	4.5 s
	100 mR/h	2.7 s
	1 R/h	2 s
	4 R/h	2.7 s
This table shows time measured from 10 % to 90 % of final value for a step increase or decrease in exposure rate such that a range change does not occur. These values are the response times for the various ranges:	**Range**	**10 % to 90 %**
	0 to 500 µR/h (5 µSv/h)	5 s
	0 to 5 mR/h (50 µSv/h)	2 s
	0 to 50 mR/h (500 µSv/h)	1.8 s
	0 to 500 mR/h (5 mSv/h)	1.8 s
	0 to 5 R/h (50 mSv/h)	1.8 s
Analog/Digital display LCD with backlight		
Analog	100 element bar graph 6.4 cm (2.5 in) long. Bar graph is divided into five major segments, each labeled with the appropriate value for the range of the instrument.	
Digital	2.5 digit display is followed by a significant zero digit depending on the operating range of the instrument. The units of measurement are indicated on the display at all times. Digits are 0.25 inches (6.4 mm) high. Low battery and freeze indicators are also provided on the display.	
Modes		
Integrate mode	Operates continuously 30 seconds after the instrument has been turned on. Integration is performed even if the instrument is displaying in mR/h or R/h.	
Freeze mode	Will place a tick mark on the bar graph display to hold on the peak displayed value. The unit will continue to read and display current radiation values.	
Environmental		
Power requirements	Two 9 V alkaline, 200 hours operation	
Warm-up time	Less than two minutes for initial operation when the instrument is in equilibrium with ambient temperature.	
Temperature range	-20 °C to 50 °C (-4 °F to 122 °F)	
Relative humidity	0 to 100 %	
Geotropism	Negligible	
Dimensions (WxDxH)	10 cm x 20 cm x 15 cm (4 in x 8 in x 6 in)	
Weight	1.07 kg (2.4 lb)	

Optional accessories

451EXL 451 Assistant for Excel, includes RS-232 interface cable
190HPS Single Unit Carrying Case
62-103 Check Source, ^{137}Cs, 10 µCi. Flat disc, 1 inch diameter

Due to recent international airline shipping policies/restrictions, radioactive "Check Source" will not be shipped with the main unit outside US.

Ordering information

451P-RYR Pressurized µR Ion Chamber Survey Meter with standard chamber
451P-DE-SI-RYR Pressurized µR Ion Chamber Survey Meter with dose equivalent chamber

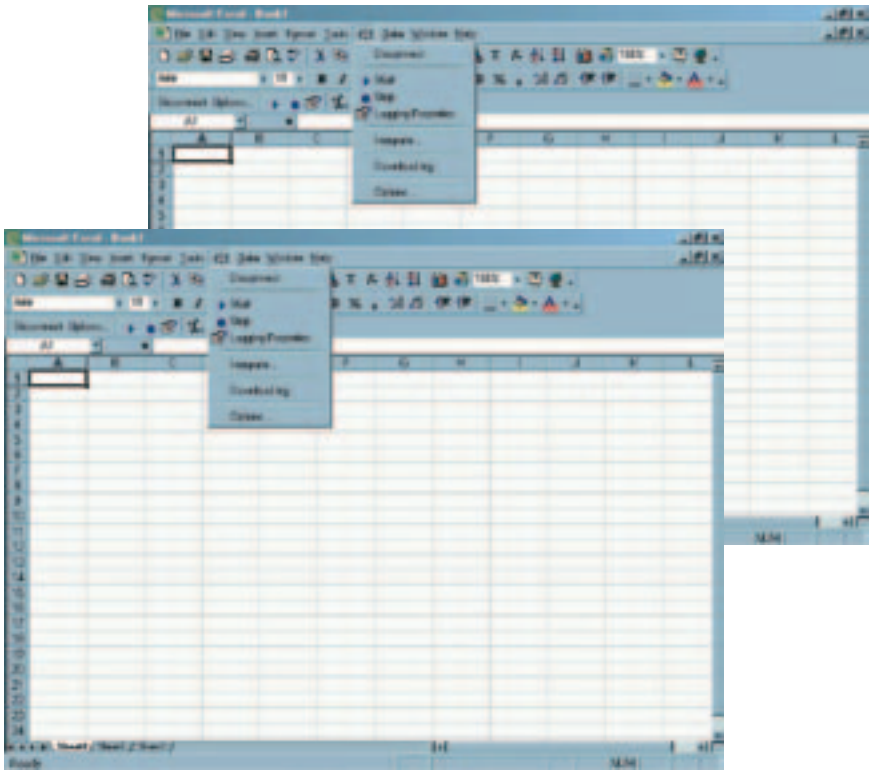
Note: Due to the pressurized ion chamber, the 451P is considered U.S. Department of Transportation (DOT) "Dangerous Goods" and must be shipped via IAW DOT special permit DOT-SP 13187.

451EXL
Assistant for Excel

FLUKE® Biomedical

The 451EXL provides remote control for many of the 451B and 451P functions via a Microsoft® Excel-based user interface, including real-time data logging with user-defined alarm parameters, upload of the internal data log into Excel worksheet, real-time virtual instrument display, and accumulated dose measurement over a user-defined integration period. This information management software is ideal for the facility Radiation Safety Officer or anyone responsible for maintaining a permanent record of spills and accidents for adherence to state and NRC requirements.

The 451EXL's data logging function automatically records real-time measured data into an Excel worksheet. The 451 Assistant provides user-configurable audible and visual alarms for the real-time-logged data, including the color coding of each data entry for quick identification for radiation levels and alarm acknowledgment status. This 451EXL information management software program is ideal for the facility radiation safety officer or anyone responsible for maintaining a permanent record of spills and accidents for adherence to state and NRC requirements.



Key features

- Real time data logging and uploading of 451 internal data log into protected Excel worksheet
- Virtual instrument display with user-defined audible and visual alarm indication
- Compatible with Windows® 2000 and above, and Excel 97, 2000
- Package includes manual, diskette set, and 25 ft RS-232 cable, Model 1020039000

System requirements

- Windows 2000 and above
- Microsoft Excel 97 or 2000
- One serial port (COM1 through COM4)

Ordering information

451EXL 451 Assistant for Excel

440RF/D
Low Energy RF Shielded Survey Meter

FLUKE Biomedical

The 440RF/D is a highly sensitive, low energy, RF shielded survey meter suited for fast, accurate measurements of background and other low radiation levels. In particular, the 440RF/D is used to measure radiation exposure in the color television industry (cathode-ray tube leakage), radar and transmission towers where RF may be present, and surveying applications in high RF fields.

Approved by the Electronic Industries Alliance, the 440RF/D is designed to meet the radiation sensitivity and measurement requirements for television receivers set forth by the US Department of Health and Human Services. Entitled "Performance Standard for Televisions Receivers" (21 CFR 1020.10), this standard requires that "radiation exposure rates produced by a television receiver shall not exceed 0.5 milliroentgens per hour at a distance of five centimeters from any point on the external surface of the receiver."

Key features

- Meets US Dept. HHS radiation survey requirements for Television Receiver and Cabinet X-ray Systems requirements (21 CFR 1020.10 and 21 CFR 1020.40, respectively)
- Insensitive to 10 mW/cm2 RF fields
- Resolves 0.02 mR/h from 15 kV x-rays
- Measures low energy radiation exposure down to 12 keV
- Auto-zeroing
- Batteries accessible from outside instrument

Ordering information

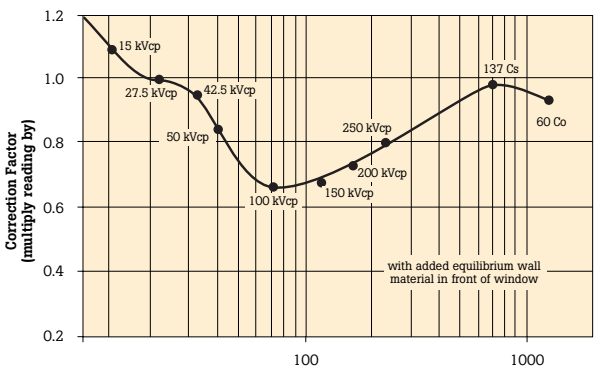
440RF/D Low Energy RF Shielded Survey Meter

Due to recent international airline shipping policies/restrictions, radioactive "Check Source" will not be shipped with the main unit outside US.

Specifications

Radiation detected	Beta above 150 keV; gamma and x-ray above 12 keV
RF response	No response in RF fields up to 10 mW/cm2
Accuracy	Within 10 % of reading between 10 % and 100 % of full scale indication on any range, exclusive of energy response. Calibration at 21 keV x-ray (27.5 KVCP, 0.9 mmA/HVL).
Geotropism	Within 2 % of full scale in any orientation
Temperature range	20 °C to 40 °C (68 °F to 104 °F)
Relative humidity	0 to 95 %, non-condensing
Pressure dependence	Pressure transducer and temperature sensor automatically apply standard air density correction factors from 70 to 106 kPa to the unsealed ion chamber
Initial stabilization	Approximately 30 seconds
Detector	Internal ionization chamber 3.56 cm diameter by 5.87 cm long, cross sectional area 10 cm^2 volume, with 1.5 mg/cm^2 aluminized mylar window and an external magnesium window 13 mg/cm^2 thick. Center of ion chamber volume is 5 cm from the plane determined by the tips of three plastic bumpers.
Display	9.5 cm (3.7 in) meter scale, marked 0 to 3 and 0 to 10
Power requirements	Five 9 V batteries; 200 hours operation. Three in parallel configuration for electronic supplies and 2 in series configuration for—18 V chamber bias.
Controls	Single rotary switch and spring-loaded check source switch
Zero adjust	Auto-zeroing
Check source	Built-in operational uranium check source
Housing material	All metal, splash-proof
Dimensions (WxDxH)	12.7 cm x 20.3 cm x 27.6 cm (5 in x 8 in x 10.8 in)
Weight	3.2 kg (6.8 lb)
Shipping vol/wt	0.071 m^3 (2.5 cu ft) 6.05 kg (13.3 lb)

Operating ranges	
440RF/D exposure rate in five overlapping ranges: 0 to 1, 0 to 3, 0 to 10, 0 to 30, and 0 to 100 mR/h	
440RF/D-SI dose equivalent rate in five overlapping ranges: 0 to 10, 0 to 30, 0 to 100, 0 to 300, and 0 to 1000 µSv/h	
Response time 90 % of final indication in:	
Range	**Response**
0 to 1 mR/h (0 to 10 µSv/h)	7 sec
0 to 3 mR/h (0 to 30 µSv/h)	7 sec
0 to 10 mR/h (0 to 100 µSv/h)	5 sec
0 to 30 mR/h (0 to 300 µSv/h)	5 sec
0 to 100 mR/h (0 to 1000 µSv/h)	5 sec



Typical energy dependence
X-ray and gamma ray: Within 10 % from 12.5 keV to 42 keV. Maximum response peak of +40 % at 100 keV. Within 10 % at ^{137}Cs and ^{60}Co with added equilibrium wall.

ASM-990 Series
Advanced Survey Meter

FLUKE® Biomedical

The ASM-990 Series Advanced Survey Meter can detect alpha, beta, gamma, or x-ray radiation within an operating range of 1 µR/hr to 1 R/hr (1 to 5,000,000 CPM), depending on the selected probe (Geiger-Mueller, neutron, proportional counter, scintillation). With the proper probe combination, this meter can be used as a general survey meter, an area monitor, a wipe-test counter, and a contamination monitor.

Designed to meet the high- technology requirements of health physics, medical physics, and nondestructive testing applications, the ASM-990 Series is well-suited for a wide range of end users, including: radiation safety officers, nuclear medicine laboratories, diagnostic x-ray and hospital emergency-room technicians, environmental-health physicists, and emergency responders.

The unit, with purchased probe, is shipped calibrated and ready-to-use and includes a MHV connector to ensure compatibility with all Fluke Biomedical probes. The 992 includes a fully-calibrated internal energy-compensated 1 R/hr GM detector. The 993 features a fully-calibrated internal pancake detector as well as an internal energy-compensated 1 R/hr GM detector.

Key features

- Simultaneous auto-scaling measurement of rate and dose with the capability to record peak rate
- Up to five different probes can be calibrated with one unit
- Data-logging survey mode feature allows user to store up to five separate survey sequences
- Saved data can be uploaded to a PC via included Infrared Data (IrDA) transmitter
- Easy-to-use multifunction keypad for intuitive menu navigation
- Backlit analog/digital LCD display with full-range audio output capability
- Barcode scanner (optional)
- Auto power-down feature extends battery life

Specifications

ASM-990 and ASM-992

Operating modes	• Rate • Integrate	• Scaler (dual option: "based on measurement" or "based on time")	• Timed Peak Hold • Data Logging
Operating rate ranges (dependent on selected probe)	**µR/hr**	**mR/hr**	**R/hr**
	µrem/hr	mrem/hr	rem/hr
	µSv/hr	mSv/hr	Sv/hr
	CPM	CPS	
	DPM ^{99m}Tc	DPS ^{131}I	
	Bq ^{125}I	kBq ^{123}I	MBq ^{201}Tl
	µCi ^{67}Ga	mCi ^{18}F	Ci ^{57}Co
	µR	**mR**	**R**
	µrem	mrem	rem
Complementary units in the integrate mode with the integrated time value in seconds	µSv	mSv	Sv
	C (counts)	kC	MC
	D (distintigrations)	kD ^{99m}Tc	MC ^{131}I
Accuracy (dependent on selected probe)	Within 10 % of reading between 10 % to 100 % of full scale indication on any range, exclusive of typical energy dependence		
Detector	Accepts GM detectors and scintillation probes operating at high voltages between 500 volts and 1300 volts		
Temperature range	-10 °C to 50 °C (14 °F to 122 °F)		
Relative humidity	0 % to 95 %, non-condensing		
Warm up time	5 second diagnostic check		
Check source	Natural uranium, mounted on the case		
Power requirements	Two "D" cells, 150 hours operation, automatically indicates when battery is low		
Housing material	Proprietary polycarbonate, splash-proof case		
Display	Liquid crystal display, 5.6 cm x 5.6 cm (2.2 in x 2.2 in)		

ASM-990 Series
Advanced Survey Meter

FLUKE Biomedical

Data logging modes
The ASM-990 Series Log Data feature can easily be accessed via the setup sub-menu. The unit can log/save a maximum of 500 data points in any of three separate modes (manual and survey modes can utilize the optional barcode scanner.)

Manual: Individual rate data points can be saved by pressing the Start/Stop/Rst/Save button.

Timed: Data points automatically saved at user-selectable time intervals in the range of 1 second to 255 seconds.

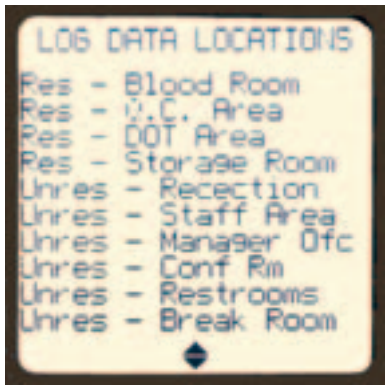
Survey: Programmed sequences accessed via the menu system. Pressing the Start/Stop/Rst/Save button saves the current reading and displays the next survey location.

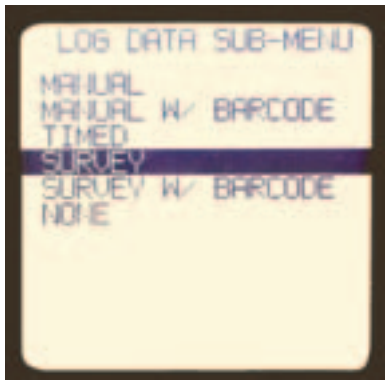
Programming of survey sequences, as well as retrieval of logged data, is accomplished via the built-in IrDA port.

Label names up to 20 characters can be programmed into the unit to identify the individual survey locations.

Probe connector: The unit is available with a MHV connector. The unit can be used with multiple probes (5 total) by selecting the appropriate probe from the main menu. All calibration data for each probe is stored in the unit's EEPROM.

Data logging screens



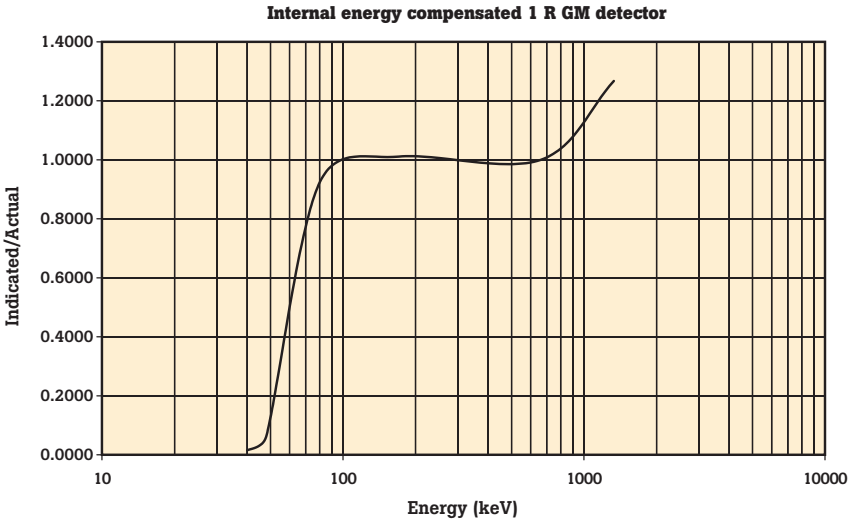


Specifications

Internal Energy Compensated GM Tube

Range	0.1 mR/hr to 1 R/hr
Radiation detected	Gamma above 60 keV
Accuracy	± 10 % of reading between 10 % and 100 % of full scale on any range, exclusive of energy dependence
Weight (without probe)	ASM 990, 992: 0.95 kg (2.1 lb) ASM 993: 1.09 kg (2.4 lb)
Dimensions (WxDxH)	10.47 cm x 27.71 cm x 6.35 cm (4.125 in x 10.91 in x 2.5 in)

Typical energy dependence



ASM-990 Series
Advanced Survey Meter

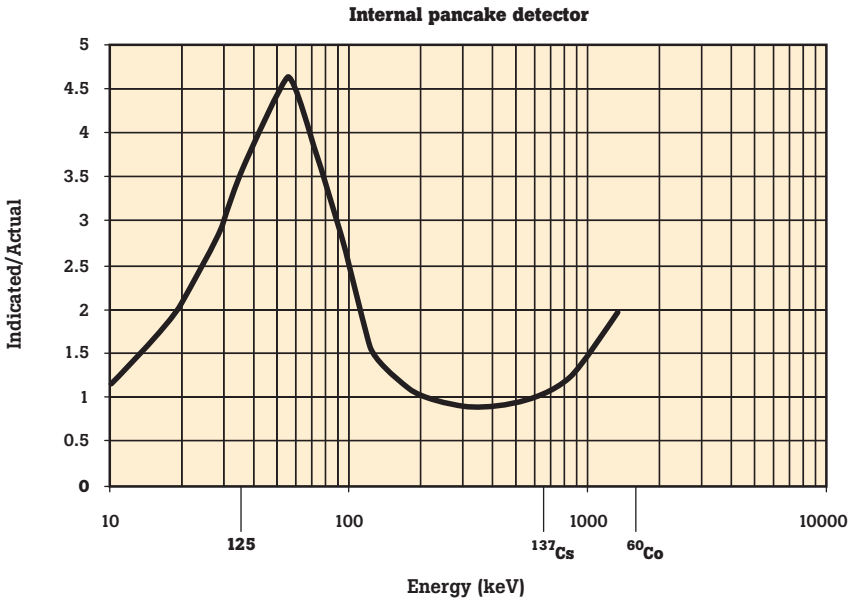
FLUKE® Biomedical

Specifications

Internal Pancake GM Tube

Radiation detected	Alpha above 3.5 MeV, beta above 35 keV and gamma above 6 keV	
Range	Background to 80 mR/hr	
Window	15 cm^2 (1.75 in Ø) mica, 1.4 mg/cm^2 to 2.0 mg/cm^2	
Typical background	30 CPM	
Protective screen	Stainless steel, hexagonal pattern providing 86 % open area	
Accuracy	± 10 % of reading between 10 % and 100 % of full scale on any range, exclusive of energy dependence (protective cover open)	
Efficiency The internal pancake detector efficiency is shown below. In a recent performance check, the numbers shown represent typical results obtained: **Note:** The efficiency formula used to calculate the %Efficiency is: Eff. % = (CPM x 100)/DPM	**Isotope**	**%Efficiency**
	^{14}C	4 %
	^{99}Tc	12 %
	^{137}Cs	19 %
	^{90}Sr	51 %
	^{36}Cl	19 %
	^{241}Am	9 %
	^{129}I	1 %
	^{239}Pu	14 %

Typical energy dependence



Model comparison

Model	Advanced survey meter	Barcode reader	Internal energy compensated 1 R/hr GM detector	Internal pancake detector
990	•			
990BC	•	•		
992	•		•	
992BC	•	•	•	
993	•		•	•
993BC	•	•	•	•

Optional accessories

990-IR-USB USB Port IrDA Adapter

990CC Carrying Case

Note: The ASM-990 Series, with the customer-selected probe is calibrated to NIST standards. The ASM-990 series with GM probe standard calibration is in R, Sv, and rems. Scintillation detectors are calibrated in counts. Radionuclide-specific efficiency calibrations are available upon request. For probe selection and calibration services, see next page.

Due to recent international airline shipping policies/restrictions, radioactive "Check Source" will not be shipped with the main unit outside US.

Ordering information

990 Advanced Survey Meter

990BC Advanced Survey Meter with barcode reader

992 Advanced Survey Meter with an internal 1 R GM detector

992BC Advanced Survey Meter with an internal 1 R GM detector and barcode reader

993 Advanced Survey Meter with an internal 1 R GM detector and internal pancake detector

993BC Advanced Survey Meter with an internal 1 R GM detector, internal pancake detector, and barcode reader

489-110D
GM Pancake Probe

Designed for use in conjunction with the ASM-990 Series and other standard GM survey meters, the 489-110D can detect alpha, beta, and gamma radiation. It is configured for operating convenience in table-top and floor surveys as well as surveys of personnel and equipment. Prime applications for this probe include nuclear medicine counter tops and frisker stations, leakage detection for low energy diagnostic x-ray machines, geological and environmental surveys or any place where there exists the suspicion that some form of radiation is present, especially emergency response teams.

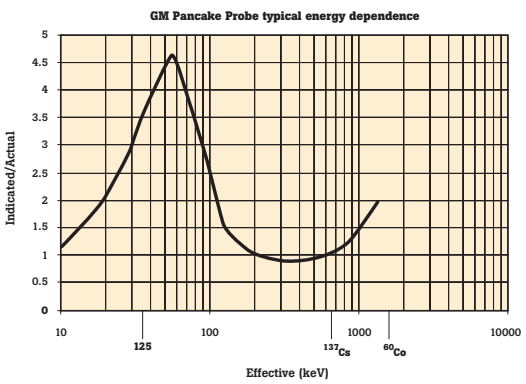
For storage and carrying ease, the probe fits into the standard handle clip on a survey meter.

The GM probe comes in two configurations: 489-110D with an ABS plastic housing, MHV connector, and foam grip, or 489-110E with a BNC connector. This selection of connectors provides the ability to attach the GM probe to most GM survey meters on the market. Replacement foam grip handles are available: 489-130-44. This same probe design is available in a rugged metal housing as 489-110C.

Specifications

Detector	Halogen-quenched "Pancake" GM tube
Radiation detected	Alpha above 3.5 MeV, beta above 35 keV and gamma above 6 keV
Operating voltage	900 V; compatible with all GM survey meters
Window	15 cm^2 (1.75 in Ø) mica, 1.4 to 2 mg/cm^2 thick
Typical background	30 CPM
Sensitivity	3500 CPM/mR/hr
Protective screen	Stainless steel, hexagonal pattern providing 86 % open area
Housing material	ABS plastic housing and foam grip handle
Cable	Shielded cord; approximately 4.5 ft long MHV coaxial connector or BNC connector
Dimensions	Detector housing (WxDxH): 6.36 cm x 2.2 cm x 10.8 cm (2.50 in x 0.875 in x 4.25 in) Handle (excluding connector): 2.5 cm Ø x 16.5 cm dia. (1 in Ø x 6.25 in dia.)
Weight (pancake probe only)	0.28 kg (0.625 lb)

Typical energy dependence



Key features

- All purpose GM Pancake Probe detects alpha, beta, gamma, and x-ray radiations
- High detection efficiency
- Lightweight, ergonomic design
- Detachable probe cable
- BNC or MHV connector
- Easy to decontaminate

Replacement parts

489-130-44 Foam Grip Handle

Ordering information

489-110D GM Pancake Probe with ABS plastic housing, MHV connector, and foam grip handle

489-110E GM Pancake Probe with ABS plastic housing, BNC connector, and foam grip handle

489-110C GM Pancake Probe with metal housing, MHV connector, and foam grip handle

Efficiency

489-110D GM Pancake Probe efficiency is shown below. In a recent performance check, the numbers shown represent typical results obtained:

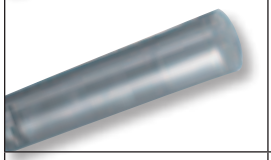
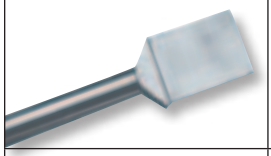
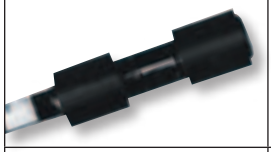
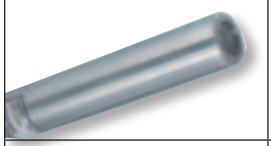
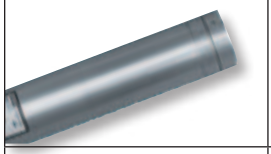
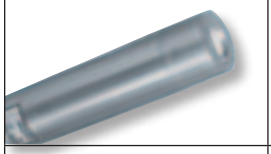
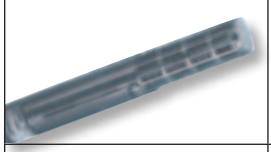
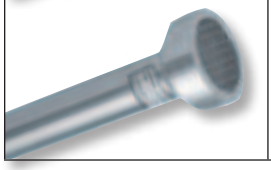
Isotope	%Efficiency
^{14}C	4
^{99}Tc	12
^{137}Cs	19
^{90}Sr	51
^{36}Cl	19
^{241}Am	9
^{129}I	1
^{239}Pu	14

Note: The efficiency formula used to calculate the % Efficiency is: Eff. % = (CPM x 100)/DPM

489-XXX, 90-12, 425-XXX

Geiger-Mueller and Scintillation Probe Selection Guide

FLUKE® Biomedical

	**489-110D GM Pancake Probe** • Alpha above 3.5 MeV • Beta above 35 keV • Gamma and x-ray > 6 keV • To 80 mR/hr (800 µSv/hr)
	**489-50 Gamma Scintillation Probe** • Gamma and x-ray > 60 keV • 1 in x 1 in, 1.5 in x 1.5 in and 2 in x 2 in NaI (Tl) detectors available
	**489-200 Scintillation Pancake Probe** • Beta above 100 keV • Gamma and x-ray > 25 keV • NaI (Tl) rectangular
	**90-12 Energy Compensated GM Probe** • Beta above 200 keV • Gamma and x-ray > 12 keV • Up to 1 R/hr (10 mSv/hr)
	**489-35 Thin End Window GM Probe** • Alpha above 4 MeV • Beta above 70 keV • Gamma and x-ray > 6 keV • Up to 80 mR/hr (800 µSv/hr)
	**489-60 Alpha Scintillation Probe** • Alpha above 4 MeV • 1.5 in Ø ZnS (Ag)
	**425-110 Low Energy Gamma Scintillation Probe** • Gamma and x-ray > 10 keV • NaI (Tl) 1 mm thick
	**491-40 Utility 1 R/hr GM Probe** • Beta above 200 keV • Gamma and x-ray > 12 keV • Up to 1 R/hr (10 mSv/hr)
	**425-200 Alpha/Beta Scintillation Probe** • Alpha above 350 keV • Beta above 14 keV • Plastic scintillator

Key features

- Rugged and reliable designs
- GM probes are available in pancake style, energy compensated and with beta discrimination
- Scintillators are test selected and optically coupled to photomultiplier tubes

GM probes for qualitative radiation detection—the Geiger-Mueller (GM) detectors fulfill a wide variety of radiation measurement needs for alpha, beta, gamma and x-ray sources. Some probes have are provided with a 360° shield to permit discrimination between penetrating and non-penetrating radiation.

The GM detectors have a field-proven design to ensure dependable performance, reliability and ruggedness. Standard MHV type connectors readily allow interchange of all detector probes. The life expectancy of the counters ranges from 108 total counts to unlimited life depending on the type of quench gas utilized. Enhanced sensitivity to low-level alpha, beta, gamma and x-ray radiation is achieved when using the unique 498-110D Pancake GM Probe.

The following probe selection guide lists various probes and suggested applications. Applications include nuclear medicine counter-top surveys, leakage detection from diagnostic x-ray and linear accelerators, geological surveys, scrap metal yards and unknown wells.

489-XXX, 90-12, 425-XXX

Geiger-Mueller and Scintillation Probe Selection Guide

FLUKE® Biomedical

Scintillation probes for quantitative radiation assessment (counts/minute) – The scintillation detectors are optically coupled to photomultiplier tubes, which are then both magnetically shielded with mu-metal and specially shock-mounted to provide trouble-free performance. The entire detector, crystal and photomultiplier, are secured in a sturdy cylindrical aluminum housing. Where appropriate, a thin window has been utilized to provide alpha or low energy gamma response.

Applications outlined in this guide include nuclear medicine labs, HAZMAT spills, radiation safety office surveys, industrial hygiene, industrial x-ray manufacturing, and geological surveys.

Specifications

Scintillation probes

Model	489-50	489-55	489-120	489-60	425-110	425-200	489-200
Type	NaI (Tl) Sodium Iodide 1 x 1, scintillator optically coupled to PMT	NaI (Tl) Sodium Iodide 1.5 x 1.5, scintillator optically coupled to PMT	NaI (Tl) Sodium Iodide 2 x 2, scintillator optically coupled to PMT	ZnS (Ag) Alpha, scintillator optically coupled to PMT	NaI (Tl) Thin Scintillator for Low Energy Gamma, scintillator optically coupled to PMT	NE 102A Plastic Scintillator Flashlight Probe, scintillator optically coupled to PMT	NaI (Tl) Pancake, scintillator optically coupled to PMT
Radiation detected	Gamma and x-ray above 60 keV	Gamma and x-ray above 60 keV	Gamma and x-ray above 60 keV	Alpha above 4 MeV	Gamma and x-ray above 10 keV	Alpha above 350 keV, beta above 14 keV	Gamma and x-ray above 25 keV, beta above 100 keV
Applications	• Nuclear medicine • Industrial hygiene • Industrial x-ray manufacturing • Geological surveys • Radiation safety office		• Nuclear medicine seed finder	• Alpha detection Uranium, Plutonium • HAZMAT • RSO	• Primary probe for nuclear medicine • Low energy x-ray manufacturing • Industrial hygiene	• Alpha, beta counting of filter paper • HAZMAT spills • Nuclear medicine missing sources	• Beta, gamma frisker for nuclear medicine is 10 times more sensitive than GM probe • Environmental surveys
Typical background (CPM)	1750	5000	6000	20	200	38	3000
Nominal sensitivity	160,000 CPM/mR/hr ^{137}Cs	350,000 CPM/mR/hr ^{137}Cs	700,000 CPM/mR/hr ^{137}Cs	300,000 CPM/µCi ^{241}Am	3,000,000 CPM/µCi ^{129}I	0.0012 CPM/DPM/100 cm^2 ^{63}Ni	650 CPM/µR/hr ^{137}Cs
Wall material	0.04 in Al, 1 mm thick	0.04 in Al, 1 mm thick	0.04 in Al, 1 mm thick	0.04 in Al, 1 mm thick	0.04 in Al, 1 mm thick	0.04 in Al, 1 mm thick	0.04 in Al, 1 mm thick
Window	108 mg/cm^2 Al	108 mg/cm^2 Al	108 mg/cm^2 Al	3 mg/cm^2 Al Mylar	8 mg/cm^2 Al	0.25 mg/cm^2 Plastic	130 mg/cm^2 Al
Sensitive area	5 cm^2	11.4 cm^2	20 cm^2	11.4 cm^2	5 cm^2	20.3 cm^2	59.2 cm^2
Crystal dim.	2.5 cm x 2.5 cm (1 in x 1 in)	3.8 cm x 3.8 cm (1.5 in x 1.5 in)	5.1 cm x 5.1 cm (2 in x 2 in)	3.8 cm Ø (1.5 in Ø)	2.5 cm Ø (1 in Ø)	5.1 cm Ø (2 in Ø)	5.1 cm x 5.1 cm x 1.3 cm (2 in x 2 in x 0.5 in)
Probe dia.	5.1 cm (2 in)	5.1 cm (2 in)	5.7 cm (2.25 in)	5.1 cm (2 in)	5.1 cm (2 in)	6.7 cm (2.625 in)	5.7 cm x 1.8 cm (2.25 in x 0.69 in)
Probe length	22.2 cm (8.75 in)	23.2 cm (9.125 in)	24.5 cm (9.625 in)	18.4 cm (7.25 in)	20.6 cm (8.125 in)	20.3 cm (8 in)	28 cm (11 in)
Cable length	122 cm (48 in)	122 cm (48 in)	122 cm (48 in)	122 cm (48 in)	122 cm (48 in)	122 cm (48 in)	122 cm (48 in)
Operating voltage	900 V						
Calibration	^{137}Cs 2 pts/scale to 10 mR/hr	^{137}Cs 2 pts/scale to 100 mR/hr	^{137}Cs 2 pts/scale to 10 mR/hr	Sensitivity to ^{241}Am	Sensitivity to ^{129}I	Sensitivity to ^{90}Sr, ^{99}Tc, ^{137}Cs, ^{14}C	Sensitivity to ^{99m}Tc
Cal. tolerance	± 10 %						
Efficiency	^{137}Cs 6 % ^{57}Co 9 % ^{133}Ba 6 % ^{60}Co 2 %	^{137}Cs 13 %	^{137}Cs 26 %	^{239}Pu 13 % ^{241}Am 8 %	^{90}Sr 22 % ^{36}Cl 8 % ^{241}Am 8 % ^{133}Ba 34 %	^{90}Sr 7 % ^{99}Tc 3 % ^{137}Cs 5 % ^{14}C 1 %	^{90}SR 5 % ^{137}Cs 11 % ^{133}Ba 34 % ^{60}Co 16 %
Humidity range	0 to 95 %						
Operating temp	–40 °C to + 50 °C (–40 °F to +120 °F), maximum temperature increase of 20 °F/hr						
Weight (approx.)	0.68 kg (1.5 lb)	0.68 kg (1.5 lb)	0.91 kg (2.0 lb)	0.68 kg (1.5 lb)	0.68 kg (1.5 lb)	0.35 kg (0.78 lb)	0.35 kg (0.78 lb)

489-XXX, 90-12, 425-XXX

Geiger-Mueller and Scintillation Probe Selection Guide

FLUKE® Biomedical

Specifications

Geiger-Mueller probes

Model	489-110C/D/E*	90-12	489-35	493-50	491-40	491-30
Type	Pancake alpha, beta, gamma, and x-ray with thin pancake window	Energy compensated beta, gamma, and x-ray with 360° linear movement shield for beta discrimination	Alpha, beta, gamma, and x-ray with 0.875 inch thin end window	Beta, gamma, and x-ray with sliding 360° metal shield for beta discrimination	Beta, gamma, and x-ray with sliding 360° metal shield for Beta discrimination	Beta, gamma, and x-ray with sliding 360° metal shield for beta discrimination
Radiation detected	Alpha above 3.5 MeV, beta above 35 keV, gamma and x-ray above 6 keV	Beta above 200 keV and gamma above 12 keV	Alpha above 4 MeV, beta above 70 keV, and gamma and x-ray above 6 keV	Gamma above 12 keV and beta above 200 keV	Gamma above 12 keV and beta above 200 keV	Gamma above 12 keV and beta above 200 keV
Applications	• All-purpose sensitive alpha, beta, and gamma and x-ray probe • Nuclear medicine counter tops • Detects leakage from diagnostic x-ray machines, especially mammography • Geological surveys • Scrap metal yards • HAZMAT	• Energy compensated to eliminate low energy over response • Convenient size to fit in small spaces around linear accelerators • X-ray tube manufacturers	• Ultra sensitive alpha, beta, gamma probe with directional focus • Nuclear medicine • Emergency response	• Rugged probe with beta discrimination • Scrap metal yards • Rugged to drop down wells • Nuclear medicine		• Beta, gamma probe is more sensitive than 491-40 or 493-50, but has max. rate of 100 mR/hr
Typical background (shielded)	30 CPM	15 CPM	50 CPM	15 CPM	15 CPM	20 CPM
Maximum exposure rate	80 mR/h (800 µSv/hr)	1 R/h (10 mSv/hr)	80 mR/h (800 µSv/hr)	1 R/h (10 mSv/hr)	1 R/h (10 mSv/hr)	100 mR/h (1 mSv/hr)
Nominal sensitivity to 1 mR/hr of ^{60}Co	3500 CPM	720 CPM	3900 CPM	720 CPM	720 CPM	2200 CPM
Replacement GM tube part number	P-115	35-166	489-76	35-166	35-166	35-150
Wall material	Stainless steel with mica window	Stainless steel	Stainless steel with mica window	Stainless steel	Stainless steel	Stainless steel
Wall thickness	1.5 to 2.0 mg/cm^2	40 to 60 mg/cm^2	1.4 to 2.0 mg/cm^2	40 to 60 mg/cm^2	40 to 60 mg/cm^2	30 to 40 mg/cm^2
Active length	38 mm (1.5 in Ø)	19.1 mm (0.75 in)	102 mm (4 in)	19.1 mm (0.75 in)	19.1 mm (0.75 in)	57.2 mm (2.25 in)
Quenching gas	Neon and halogen	Neon and halogen	Neon and halogen	Neon and halogen	Neon and halogen	Neon and halogen
Diameter of probe	68 mm (2.6875 in)	35 mm (1.375 in)	33.4 mm (1.3125 in)	32 mm (1.25 in)	30 mm (1.1875 in)	30 mm (1.1875 in)
Length of probe	248 mm (9.75 in)	170 mm (6.7 in)	191 mm (7.5 in)	84 mm (3.3125 in)	136 mm (5.375 in)	136 mm (5.375 in)
Cable length	122 cm (48 in)	122 cm (48 in)	122 cm (48 in)	122 cm (48 in)	122 cm (48 in)	122 cm (48 in)
Weight (approx.)	0.45 kg (1.0 lb)	0.26 kg (0.59 lb)	0.45 kg (1.0 lb)	0.45 kg (1.0 lb)	0.45 kg (1.0 lb)	0.45 kg (1.0 lb)
Operating voltage	900 V	900 V	900 V	900 V	900 V	900 V
Humidity range	0 to 95 %	0 to 95 %	0 to 95 %	0 to 95 %	0 to 95 %	0 to 95 %
Operating temperature range	-56 °C to +85 °C (-65 °F to +185 °F)	-56 °C to +85 °C (-65 °F to +185 °F)	-56 °C to +85 °C (-65 °F to +185 °F)	-56 °C to +85 °C (-65 °F to +185 °F)	-56 °C to +85 °C (-65 °F to +185 °F)	-56 °C to +85 °C (-65 °F to +185 °F)
Pressure range	To 5 psig	To 15 psig	To 5 psig	To 15 psig	To 15 psig	To 15 psig

Ordering information

489-110D GM Pancake Probe
489-50 Gamma Scintillation Probe
489-55 Gamma Scintillation Probe
489-120 Gamma Scintillation Probe
489-200 Scintillation Pancake Probe
90-12 Energy Compensated GM Probe
489-35 Thin End Window GM Probe
489-60 Alpha Scintillation Probe
425-110 Low Energy Gamma Scintillation Probe
491-40 Utility 1 R/hr GM Probe
493-50 Utility 1 R/hr GM Probe
491-30 Utility 100 mR/hr GM Probe
425-200 Alpha/Beta Scintillation Probe

190N
Portable Neutron Survey Meter

FLUKE Biomedical

The self-contained 190N Portable Neutron Survey Meter measures mRem in accordance with the classical Anderson and Braun design. The neutron probe can be attached to either a 190 Survey Meter or a 190F Frisker for continuous neutron surveys or area monitoring.

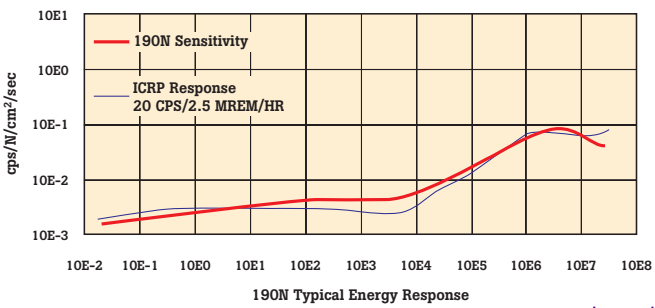
Key features

- Auto-scaling measurement of rate and dose (integrate mode includes dose and time accumulation)
- True Rem readings recorded across a wider (lower and higher) rate range
- Ergonomic, portable design: adjustable shoulder strap and rugged handle with padded grip
- Flexible detector assembly, 190 can be removed for remote readings
- Available in SI units

Specifications

Readout	Programmable features of a standard 190 Survey Meter. Refer to the 190 data sheet for complete details
Detector assembly, RP-N	The detector assembly is a polyethylene cylinder, 9.5 in L x 8.5 in dia., containing a BF3 proportional counter and neutron energy compensating materials. It is based upon the standard reliable Anderson and Braun design for neutron energy response. The handle is padded for ease of gripping. An adjustable shoulder strap is provided
BF_3 operating characteristics	The BF_3 proportional counter operates at 1150 V. Active length is 5.08 cm (2 in). Fill gas is enriched BF_3, 96 % Boron 10. Gas pressure is 20 cm Hg. Resolving time is 1 microsecond, plateau slope is 2 % per 100 V and tube life expectancy is greater than 10^{10} counts
Typical neutron sensitivity	Nominal 2000 counts per mRem
Range	Rate: 0 µRem/h to 75 Rem/h 0 µSv/R to 0.75 Sv/h 0 CPM to 2.5 x 10^6 CPM 0 CPS to 41,660 CPS
	Integrate: 0 µRem to 1000 Rem 0 µSv to 10 Sv 0 to 10^9 counts
Gamma sensitivity/rejection	No response in ^{137}Cs gamma radiation in fields up to 500 R/h
Accuracy	10 % of theoretical ICRP dose rate
Dimensions	31.75 Ø x 26 cm dia. (12.50 Ø x 10.25 in dia.)
Miscellaneous	Detector assembly cable length: 1.37 m (4.5 ft). An optional 9.14 m (30 ft) cable is available.
Weight	9.52 kg (21 lb) (total 190 + detector assembly)
Directionality	Less than 20 % in three orthogonal directions
Temperature range	190 operating range: –10 °C to +40 °C (14 °F to 104 °F) Detector assembly operating range: –80 °C to +80 °C (–112 °F to 176 °F)
Power requirements	Four 9 V alkaline batteries supplied, 100 hours operation
Calibration	190N is calibrated against a NIST traceable "Tissue Equivalent Proportional Counter" and uses Radium/Beryllium neutrons at a distance of 100 cm

Typical energy dependence



190N Typical Energy Response

Ordering information

190N Portable Neutron Survey Meter
190N-SI Portable Neutron Survey Meter, SI Unit

FLUKE Biomedical

190F
Area Monitor/Frisker Count Rate Meter

The easy-to-use, auto-ranging 190F is compatible with GM detectors, neutron probes, proportional counters, and scintillation probes operating from 300 volts to 1,300 volts. Depending on probe selection, the 190F detects alpha, beta, gamma, x-ray or neutron radiation within an operating range of 1 µR/h to 1 R/h (1 CPM to 1,000,000 CPM). The unit is available with either an MHV or a BNC connector.

Visual indication of selected parameters, as well as measured values, are displayed on the analog/digital display.

The 190F Area Monitor/Frisker Count Rate Meter, with purchased probe, is shipped calibrated and ready-to-use.

Key features

- Auto-scaling measurement of rate and dose simultaneously
- Adjustable Alarm
- Backlit analog/digital LCD display with bar graph and operational units
- Interchangeable probe adapter module
- Data logging

Ordering information

190F Area Monitor/Frisker Count Rate Meter

Due to recent international airline shipping policies/restrictions, radioactive "Check Source" will not be shipped with the main unit outside US.

Specifications

Accuracy	Within 10 % of reading between 10 % to 100 % of full scale indication on any range, exclusive of energy dependence. Accuracy is probe dependent.
Detector	Accepts GM detectors, neutron probes, scintillation probes, and propor-tional counters operating at high voltages between 300 V and 1300 V.
Adapter module	Contains calibration data and high voltage settings for a specified probe. The module is available with an MHV or a BNC connector. Specify the type of connector with order. **Note:** Additional adapter modules can be purchased for use with multiple probes: Specify 190060 for MHV adapter module and 190070 for BNC adapter module. By using multiple replaceable probe adaptor modules, each module can be assigned to a specific probe. The module's EEPROM stores the calibration factors for a specific probe. When plugged into a 190F Area Monitor and Count Rate Meter, it automatically sets the high voltage and activates the calibration data set for the specific probe. By using modules married to specific probes, the user has the convenience of using only one 190F with multiple probes for survey work.
Log	Logs 211 data points and sequentially labels data points. (Data retrieval requires the 190-1A Infrared Communicator). With the communicator, alphanumerics up to 16 characters can be programmed into the 190F to name the locations of individual data points to be collected. The location name is displayed when the Log button is pressed. Press the Log button again, and the data point is stored.
Power requirements	9 V dc regulated power converter
Batteries	Three 9 V batteries, 150 hours operation, automatically indicates when battery is low
Warm up time	15 second diagnostic check
Check source	Natural uranium, mounted on the case
Temperature range	-10 °C to +60 °C (14 °F to 140°F)
Relative humidity	0 to 95 %, non-condensing
Housing material	Molded ABS plastic, splash-proof case. Probe fits into side-mounted ABS plastic probe holder with Velcro® straps.
Dimensions (WxDxH)	9.2 cm x 23.4 cm x 5 cm (3.75 in x 9.2 in x 2.1 in)
Weight (without probe)	0.70 kg (1.56 lb)

Operating ranges (dependent on selected probe)

Toggles and selects rate units:

µR/hr	mR/hr	R/hr
CPM	CPS	
µSv/hr	mSv/hr	
DPM	Bq/cm²	µCi/cm²

and the complementary units in the integrate mode:

µR	mR	R
CTS	D	
µSv	mSv	
Bq	µCi	

with the integrated time value in seconds

05-437
PRIMALERT® 35 Area Radiation Monitor

The PRIMALERT 35 Area Radiation Monitor contains an energy-compensated GM detector and has six range indicators (1, 2, 4, 8, 16, and 32 mR/hr) that can clearly display an increase or decrease in radiation levels. The visible and audible alarms can be set at any of the six levels by a front-panel, screwdriver-adjustable control. When each preset radiation level is exceeded, personnel are alerted by bright flashing red lights (visible over a 180° field) and a loud intermittent audio signal. The alarms stop automatically when the radiation level falls below each of the preset values. This permits instant radiation-level recognition not readily distinguishable on meter-type instruments.

Fail-safe operation is assured by a light which continuously indicates background radiation and provides visual proof that the unit is functioning. The monitor will not jam or show false readings in high radiation fields. A mounting bracket and a 110 V ac adapter/power converter are also included.

Specifications

Power requirements	105 V to 125 V/60 Hz/8 W
Dimensions (WxHxT)	9 cm x 15 cm x 4 cm (3.5 in x 6 in x 1.5 in)
Weight	0.9 kg (2 lb)

Key features

- Provides continuous visual indication of radiation levels and produces audible and/or visual alarms at any of six programmable radiation levels
- Assures reliable, continuous monitoring wherever radioactive materials are present
- Displays the radiation level in bright color-coded lights
- Optional Primalarm Remote Alarm, which functions up to 100 feet from monitor

Optional accessories

62-103 Check Source, ^{137}Cs, 10 µCi. Flat disc, 1 in diameter

Ordering information

05-437 Primalert 35 Area Radiation Monitor

Included accessories
AC adapters, specify with order
14-314 110 V ac 12 V dc 500 mA (USA, Japan)
14-400 230 V ac 12 V dc 500 mA (Europe)
14-436 230 V ac 12 V dc 580 mA (Australia)

05-443 and 05-444

PRIMALERT® Digital Area Monitors

FLUKE® Biomedical

The PRIMALERT Digital Area Monitors are designed for a wide range of gamma radiation area monitoring applications. Two self-contained configurations are available, each with an internal energy compensated GM detector (detection range in parentheses): 05-443 (0.1 mR/h to 1 R/h) and 05-444 (1 mR/h to 4 R/h). Both models are ac powered with an internal battery backup, have user-settable low and high alarms, and are available with an optional remote alarm for added security.

The versatile PRIMALERT Digital Area Monitors can be used in industrial applications, medical settings, or wherever there is a need to warn personnel of increasing radiation levels and/or to limit the accumulated exposure of personnel to gamma radiation.

Key features

- Simple installation and setup (calibration controls easily accessed through front panel)
- Anti-jam circuitry prevents erroneous readings at tube saturation
- LED digital display with Detector Fail indicator
- Programmable low and high alarm indicators, with an optional remote alarm available
- Data output/RS-232

Ordering information

05-443 PRIMALERT Digital Area Monitor with internal energy compensated 0.1 mR/hr to 1 R/hr GM detector

05-443-2200 PRIMALERT Digital Area Monitor with internal energy compensated 1 µSv to 10 mSv/hr GM detector, 220 V ac operation

05-446 Remote Display

Specifications

Indicated use	Radiation area monitoring
Internal GM detector range	05-443: 0.1 mR/hr to 1 R/hr; 05-444: 1 mR/hr to 4 R/hr
Display	4 digit LED display with 2 cm (0.8 in) character height; display range: 000.0 to 9999
Display units	Can be made to display in µR/hr, mR/hr, R/h, µSv/h, mSv/h, Sv/h, cpm, cps and others
Linearity	Reading within ± 10 % of true value with detector connected
Response	Typically 3 seconds from 10 % to 90 % of final reading
Status (green light)	Indicates the instrument is functioning properly
Low alarm	Indicated by a yellow light and slow beep (1 per sec) audible tone (can be set at any point from 0.0 to 9999)
High alarm	Indicated by a red light and fast beep (4 per sec) audible tone (can be set at any point from 0.0 to 9999)
Detector fail	Red light and audible tone; > 68 dB at 2 ft indicates detector overload, no count from detector, or instrument failure
Low battery (yellow)	Indicates < 2 hours of battery power remaining
Calibration controls	Accessible from front of instrument (protective cover provided)
High voltage	Adjustable from 200 V to 2500 V
Threshold	Adjustable from 2 mV to 100 mV
Dead time	Adjustable to compensate for dead time of the detector and electronics (can be read on the display)
Overload	Senses detector saturation (indicated by display reading "-OL")
Overrange	Indicates the radiation field being measured has exceeded the counting range of the instrument (indicated by display reading "----")
Data output	9 pin connector providing 5 decade log output, RS-232 output, signal ground connection, FAIL and Alarm signals (current sink), and direct connection to battery and ground
Power requirements	95 V ac to 135 V ac (178 V ac to 240 V ac available), 50 Hz to 60 Hz single phase (< 100 mA), 6 V sealed lead acid rechargeable battery (built-in)
Battery life	Typically 48 hours in non-alarm condition, 12 hours in alarm condition
Battery charger	Battery is continuously trickle charged when instrument is connected to line power and turned on
Housing material	Aluminum housing with white polyurethane enamel paint
Temperature range	-20 °C to 50 °C (-4 °F to 122 °F). May be certified for operation from -40 °C to 65 °C (-40 °F to 150 °F).
Dimensions (WxDxH)	24.6 cm x 6.4 cm x 18.7 cm (9.7 in x 2.5 in x 7.4 in)
Weight	2.3 kg (6.5 lb)

Note: audible indicators can be configured as a single beep if desired.

05-450
PRIMALERT® Digital Doorway Monitor

FLUKE® Biomedical

The highly sensitive 05-450 PRIMALERT Digital Doorway Monitor is designed to detect low levels of gamma radiation that pass through an entryway. Common installations of the 05-450 include hospital entrances, emergency rooms, laundry rooms, nuclear medicine labs and procedure rooms, waste disposal chutes and any other area of the hospital where radiation contamination could be a concern.

The system consists of a digital monitor, two shielded NaI (Tl) scintillation detectors with NEMA enclosures, associated cabling and a 10 µCi ^{137}Cs check source. The system is AC powered with internal battery backup and user-selectable alarm settings.

Key features

- Dual detectors—highly sensitive lead shielded NaI (Tl) scintillators
- Configuration with NEMA enclosures
- Fast response time with LED digital display
- Audio and visual alarms
- Battery backup

Ordering information

05-450 PRIMALERT Digital Doorway Monitor, Sv/hr, 220 V power
05-450-2200 PRIMALERT Digital Doorway Monitor, Sv/hr, 220 V power

Specifications

Detectors	Two 3 in Ø x 1 in thick (7.6 cm x 2.5 cm) shielded NaI (Tl) scintillation detectors with up to 200 ft cables (NEMA 4x enclosures included)
Connectors	BNC (others available on request)
Sensitivity	Detects an unshielded 40 µCi 137Cs source at 10 ft and unshielded 10 µCi 137Cs source at 5 ft from the detector
Check source	0.875 in Ø 10 µCi ^{137}Cs check source
Display	4 digit LED display with 2 cm (0.8 in) character height
Display units	Can be made to display in µR/hr, mR/hr, R/hr, µSv/h, mSv/h, Sv/h, µrem/hr, mrem/hr, rem/hr, cpm, cps and others
Linearity	Reading within ± 10 % of true value with detector connected
Response	Typically 3 seconds from 10 % to 90 % of final reading
Status	(green light) Indicates the instrument is functioning properly
Low alarm	Indicated by a yellow light and slow beep (1 per sec) audible tone (can be set at any point from 0.0 to 9999)
High alarm	Indicated by a red light and fast beep (4 per sec) audible tone (can be set at any point from 0.0 to 9999)
Note: Audible indicators can be configured as a single beep if desired.	
Detector fail	Indicates overload, no count from detector, or instrument failure (red light and audible tone; > 68 dB at 2 ft)
Low battery	Yellow light indicates < 2 hours of battery power remaining
High voltage	Adjustable from 200 V to 2500 V
Threshold	Adjustable from 2 mV to 100 mV
Dead time	Adjustable to compensate for dead time of the detector and electronics (can be read on the display)
Overload	Senses detector saturation (indicated by display reading "-OL")
Overrange	Radiation field being measured exceeds the counting range of the instrument (indicated by display reading "----")
Data output	9 pin connector providing 5 decade log output, RS-232 output, signal ground connection, FAIL and Alarm signals (current sink), and direct connection to battery and ground
Power requirements	95 V ac to 135 V ac (178 V ac to 240 V ac available), 50 Hz to 60 Hz single phase (< 100 mA), 6 V sealed lead acid rechargeable battery (built-in)
Battery life	Typically 48 hours in non-alarm condition, 12 hours in alarm condition
Battery charger	Battery is continuously trickle-charged when instrument is connected to line power and turned on
Battery dependence	< 3 % change in readings to battery endpoint
Temperature range	-20 °C to 50 °C (-4 °F to 122 °F). May be certified for operation from -40 °C to 65 °C (-40 °F to 150 °F)
Dimensioins (WxDxH)	Electronics: 24.6 cm x 6.4 cm x 18.7 cm (9.7 in x 2.5 in x 7.4 in)
	Detectors: 43.2 cm x 21.6 cm x 33 cm (17 in x 8.5 in x 13 in)
Weight	Electronics: 2.3 kg (6.5 lb)
	Detectors: 14.5 kg (32 lb)

05-106
Bleeper mR Radiation Monitor

The slim, compact Bleeper mR is the ideal personal monitoring device for alerting personnel to the presence of radiation in medical, industrial or research settings. It accurately measures and displays the radiation dose received.

The only control is a switch to turnoff and reset the instrument, making Bleeper mR extremely easy to use. For added safety, the switch is recessed. An easy-to-read LCD display provides a continuous indication of accumulated dose. The loud "bleep" sounds every 15 to 30 minutes on background and becomes more frequent as dose rate increases, becoming a continuous sound in high radiation fields. A series of quiet "clicks" indicates it is properly functioning. Bleeper mR is an enhanced version of the highly popular Bleeper III and utilizes the same proven technology.

Key features

- Continuously monitors radiation exposure and provides instant, accurate readings
- Measures "x" and gamma radiation
- Display can be easily read with the instrument in-pocket
- Sturdy casing with pocket clip protects against damage
- Features visible and audible "battery low" indicators
- Good energy and polar response…reliable readings match those from TLDs and film badges
- Recessed switch ensures the Bleeper mR cannot be turned off accidentally

Ordering information

05-106 Bleeper mR Radiation Monitor

05-106-2200 Bleeper µSv Radiation Monitor

Specifications

Bleep rates for background radiation	Approx. 1 bleep every 15 to 30 minutes *1 mR/h:* approx. 1 bleep every 20 seconds *100 mR/h and above:* continuous signal to at least 60 Sv/h (6000 R/h)
Energy range	45 keV to 6 MeV (± 25 %)
Doserate response	Linear to 5 R/h (± 20 %)
Display	LCD 0.1 mR to 999,999.9 mR
Battery	Three alkaline batteries, size AAA. Typical battery life is one year
Temperature range	-20 °C to 50 °C (-4 °F to 122 °F)
Dimensions (WxD)	3.56 cm x 15.24 cm (1.4 in x 6 in)
Display area	1.52 cm x 2.29 cm (0.6 in x 0.9 in)
Weight	0.11 kg (0.25 lb)

06-007
Direct Reading Pocket Dosimeters

FLUKE Biomedical

Direct-Reading Pocket Dosimeters are rugged, precision instruments designed specifically for measuring accumulated quantities of gamma and x radiation. In use, the dosimeter is normally clipped to a pocket or to the outside of a lead apron. By checking the dosimeter reading periodically, the wearer is able to determine the exposure received during specific procedures. By knowing where and when greater-than-normal exposures occur, the wearer can identify the source and take quick, corrective action. We currently offers five dosimeters. Each dosimeter has a color-coded clip that signifies its range. This will help the user to identify the dosimeter (i.e. black clip = 0 to 200 mR, blue clip = 0 to 5 R, etc.), and ensure that the intended dosimeter is utilized.

Direct-Reading Pocket Dosimeters are extremely easy-to-use. To read the integrated exposure, the user looks through the dosimeter eyepiece while pointing the unit toward any external light source. The exposure is determined by the position of a hairline fiber against a graduated scale.

Key features

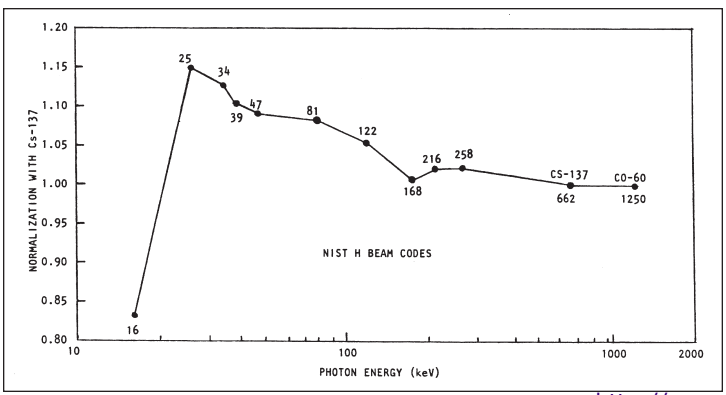
- Low leakage: measures background
- Superior energy response: 20 keV to 2 MeV
- Rugged: meets ANSI specifications N13.5 and N322
- Highly resistant to shock and vibration
- Available in a wide selection of ranges to meet all of your requirements

Ordering information

06-007 Direct-Reading Pocket Dosimeter, 0 to 200 mR; Black Clip
06-007-2200 Direct-Reading Pocket Dosimeter, 0 to 2 mSv; Black Clip
06-638 Direct-Reading Pocket Dosimeter, 0 to 200 R; Yellow Clip
06-686 Direct-Reading Pocket Dosimeter, 0 to 600 R; Red Clip
06-912 Dosimeter Charger

Specifications

Radiation detected	Gamma and x-radiation from 20 keV to 2 MeV
Ranges	0 mR to 200 mR to 600 R
Energy response (see response curve)	160 keV to 2 MeV: ± 10 % 40 keV to 160 keV: 20 %, -10 % 20 keV to 40 keV: 20 %, -30 %
Accuracy	Within ± 10 % of true exposure
Rate response	Dose rate independent for gamma and x-radiation
Electrical leakage	Less than 0.5 % of full scale for 24 hours at 50 °C
Relative humidity	Up to 90 %
Detector	Fiber electrometer mounted in an electrically-conducting plastic ion chamber
Material	Detector housing: very low permeability plastics; hermetically-sealed Clip: glass fiber-filled, high-strength plastic
Dimensions	1.5 cm x 12.4 cm (0.6 in Ø x 4.5 (l))
Weight	0.03 kg (0.06 lb)



A Dosimeter Charger (Model 06-912) is used to re-zero the dosimeter.

The 0 to 200 mR Low-Energy Dosimeter is the most popular type for measuring personal radiation doses in hospital applications including fluoroscopy, portable radiography and angiography. Our dosimeters are ideal for nuclear medicine and health physics applications. All Direct-Reading Pocket Dosimeters are hermetically-sealed using state-of-the-art plastics and epoxy resins. These reliable, high-quality devices meet ANSI specifications N13.5 and N322, as well as military requirements.

Service and Calibration

World-class facility. World-class service.

Fluke Biomedical's Global Calibration Lab is NVLAP Lab Code 200566-0 accredited, adheres to ISO 17025:2005, ANSI Z540, Mammography MQSA, and CNSC, and is traceable to national and international standards.

Fluke Biomedical offers a variety of Service Options to meet your needs. These options include Asset-Management for pools larger than 150 units, On-Site calibration and Care Plan Options.

Asset-Management: Takes over your grueling task of instrument tracking and allows you to use your time more productively. Proper protocols are strictly followed, eliminating the problems with inspectors and audits that can result when other less-qualified labs perform the calibrations.

On-Site Calibrations: Minimizes downtime and is scheduled when convenient for you. Calibrations are to OEM requirements, completed OEM upgrades, and Automatic OEM updates.

Care Plan Options: Fluke Biomedical's Care Plan packages offer comprehensive priority service and support to help you get the most out of your test equipment investments. As a member enjoy priority service, extended warranties, value pricing on service, VIP technical support, xpedited return shipping, and more.

Calibrate the following

- Area Monitors
- Barometers
- Blood Pressure Simulators
- Defibrillators/External Pace Maker Analyzers
- Densitometers
- Diode Detectors
- Dosimeters
- Electrical Safety Analyzers
- Incubator Analyzers
- Ion Chambers
- IV Pump Analyzers
- kVp Meters
- mAs Meters
- Electrical Multimeters
- Oscilloscopes
- Patient Simulators
- Pressure Meters/Parameter Testers
- Radiation Multimeters
- Sensitometers
- SpO_2 Simulators/Analyzers
- Thermometers
- Test Lungs
- Ultra Sound Analyzers
- Velometers
- Ventilators/Gas flow Analyzers

Contact information

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Fluke Biomedical a division of Fluke Electronics
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Toll free: 800-850-4608 ext 2564
Email: globalcal@flukebiomedical.com

Service Center/Repair/Calibration Europe
Fluke Biomedical Europe
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Fax: +31 (40) 267 5436
Email: servicedesk@fluke.nl

www.flukebiomedical.com/service

Calibration Beam Specifications

Radionuclide Calibrations		
Radionuclide Sources	Minimum Rate	Maximum Rate
2000 Ci Cs-137	0.02 R/hr	850 R/hr
20 Ci Cs-137	0.1 mR/hr	4 R/hr
4 Ci Cs-137	0.5 mR/hr	1 R/hr
500 mCi Cs-137	0.04 mR/hr	150 mr/hr
1300 Ci Co-60	0.01 R/hr	450 R/hr
Collimated 2200 Ci Co-60	2575	3530

Publications

The following Fluke Biomedical catalogs are also available

Fluke Biomedical Imaging and Therapy QA

The Imaging and Therapy QA catalog is a comprehensive source book of solutions for the Imaging QA Technologist, Physicist, Biomedical/ Clinical Engineer, or Service Engineer, and Radiation Oncology Physicist, Therapist, and Dosimetrist. The catalog contains information about the test devices, phantoms, and accessories, and linear accelerator instruments and radiation oncology chambers needed to manage imaging and therapy QA and maintain regulatory-compliance.

For more information, contact sales@flukebiomedical.com

Fluke Biomedical Biomedical Test

The Biomedical Test catalog emphasizes the complete line of biomedical test and simulation products for Biomedical/Clinical Engineers and Technicians. The catalog contains information about Fluke Biomedical's test and simulation products, including standalone electrical safety testers, patient simulators, and performance analyzers, as well as fully integrated and automated performance-testing and documentation systems.

For more information, contact sales@flukebiomedical.com

Fluke Biomedical.
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