

GM Pancake Probe

Victoreen® Model 489-110D

- All purpose GM Pancake Probe detects alpha, beta, gamma, and x-ray radiations
- Used in nuclear medicine, diagnostic x-ray, and geological and environmental surveys
- Ideal for emergency response teams



Features

- High detection efficiency
- Ergonomic design
- Lightweight
- Detachable probe cable
- BNC or MHV connector
- Easy to decontaminate

Introduction

The Victoreen Geiger-Mueller (GM) Pancake Probe (Model 489-110D) is a hand-held, thin-window detector designed for alpha, beta, and gamma radiation measurements. It is designed for use in conjunction with the Victoreen Models 990, 190, 290, and other standard GM survey meters, and is configured for operating convenience in table top and floor surveys as well as surveys of personnel and equipment. For storage and carrying ease, the probe fits into the standard handle clip on a survey meter.

To use the probe, attach the connector to the probe input on the survey meter and place the window in proximity to the surface to be surveyed. A screen protects the thin mica window to facilitate rapid frisking of flat surfaces. The open area of the hexagonal stainless steel screen is 86%.

The GM probe comes in two configurations: Model 489-110D with an ABS plastic housing, MHV connector, and foam grip, or Model 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. Specify model number when ordering. Replacement foam grip handles are available: Model 489-130-44. This same probe design is available in a rugged metal housing as Model 489-110C.

Applications

This all purpose GM Pancake Probe is used in a wide range of applications where alpha, beta, gamma and x-ray detection is required. 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.

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 cm² (1.75 in Ø) mica, 1.4 to 2.0 mg/cm²

Typical background 30 CPM

Sensitivity 3500 CPM/mR/hr

Protective screen Stainless steel, hexagonal pattern providing 86% open area

Construction ABS plastic housing and foam grip handle

Cable Shielded cord, approximately 4.5 ft long MHV coaxial connector or BNC connector

Dimensions

Detector housing

2.5 (w) x 4.25 (d) x 0.875 in (h) (6.36 x 10.8 x 2.2 cm)

Handle

1 in Ø x 6.25 in (d) (2.5 x 16.5 cm) (excluding connector)

Weight 0.63 lb (0.28 g) without cable

Replacement part

Foam Grip Handle (Model 489-130-44)

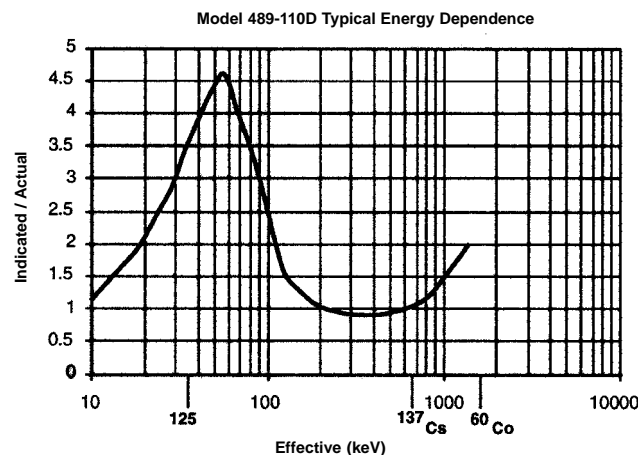
Available model(s)

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

Typical energy dependence



Efficiency The GM Pancake Probe efficiency is shown below. In a recent performance check, the numbers shown represent typical results obtained

Isotope	%Efficiency
¹⁴ C	5
⁹⁹ Tc	12
¹³⁷ Cs	24
⁹⁰ Sr	59
³⁶ Cl	26
²⁴¹ Am	8
¹²⁹ I	2
²³⁰ Th	15
²³⁹ Pu	12

NOTE: The efficiency formula used to calculate the % Efficiency is:

$$\text{Eff. \%} = (\text{CPM} \times 100) / (\mu\text{Ci} \times 3.7 \times 10^4 \times 60 / 2)$$

For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA. Specifications are subject to change without notice.

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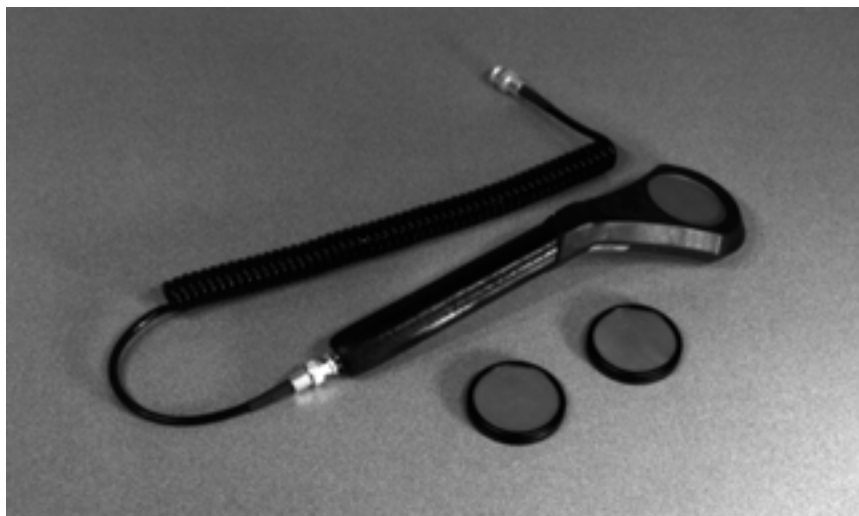
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489-110D-ds rev 3 12 mar 03

GM Pancake Probe with Filter Set

Victoreen® Model 489-110FS

- Energy compensation filter set to determine true dose rate
- High detection efficiency
- Ergonomic design
- Detachable probe cable
- Easy to decontaminate



Features

- The GM Pancake Probe adapted to accept compensation filter set
- Set of energy compensation filters to determine true exposure rate
- Available as complete kit 190-110KT which includes GM Pancake Probe Filter Set (Model 489-110FS), Survey Meter (Model 190), instruction manual, and carrying case

Introduction

The Model 489-110FS used in combination with the Model 190 Survey Meter is especially useful for radiation leakage measurements encountered with x-ray emitting laboratory instruments or industrial research equipment, such as electron microscopes, and ion implanters. For service personnel and laboratory technicians, the Model 190 and 489-110FS combination is invaluable for performing “as found” and “final check out” radiation leakage surveys, which are of major importance in any Quality Assurance or personnel safety program. The Model 190 and 489-110FS probe are excellent for gross counting surveys. Once a leak has been found, energy compensating filters can be employed to determine the true exposure rate.

Applications

The Victoreen Model 489-110FS consists of an GM Pancake Probe which is a hand held, thin window detector designed for use with the Model 190 Survey Meter, and is configured for operating convenience during table top and floor surveys, as well as surveys of personnel and equipment.

The Model 489-110FS includes the GM Pancake Probe, filter set, connecting cable, operating instructions and calibration certificate. If the Model 489-110FS is purchased as a second detector for the Model 190 Survey Meter, a Model 190060 Calibration Module is also required.

The GM Pancake Probe has been modified to accept a set of two “screw on” energy compensation filters which permit actual energy compensated exposure rates to be determined.

A screen protects the thin mica probe window to facilitate rapid frisking of surfaces with reduced risk of window damage.

The open area of the hexagonal stainless steel screen is 86%. Replacement foam grip handles are available: Model 489-130-44.

A complete kit: Model 190-110KT (shown on next page) is available which includes the Model 489-110FS Probe, one filter set, the Model 190 Survey Meter, connecting cable with module, calibration certificate, operating instructions, and carrying case.

Specifications

Detector Halogen-quenched "Pancake" GM tube

Radiation detected Alpha above 3.5 MeV, beta above 35 keV, and gamma / x-ray above 6 keV, without filters

Operating voltage for 190 900 V

Window 15 cm² (1.75 in Ø) mica, 1.4 to 2.0 mg/cm²

Overall accuracy Within ± 20% for x-rays and gamma rays; 30 to 300 keV for probe and filters; within ± 10% 300 keV to ⁶⁰Co unfiltered

Typical background 30 CPM

Sensitivity 3500 CPM/mR/hr

Protective screen Stainless steel, hexagonal pattern providing 86% open area

Construction Probe housing is ABS plastic with foam grip handle

Filters Set of two metal filters, housed in threaded aluminum holders; Tin 3.5 mm and Copper 3.0 mm thick

Cable Shielded cord; approximately 4.5 ft long, terminated with a MHV connector

Dimensions

Detector housing

2.50 (w) x 4.25 (d) x 0.88 in (h) (6.36 x 10.8 x 2.2 cm)

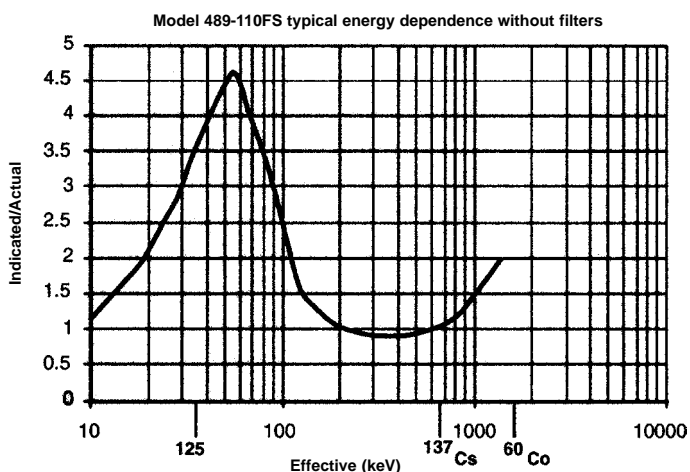
Handle

1 in Ø x 6.25 in (d) (2.54 x 16.5 cm) (excluding connector)

Weight 0.63 lb (0.28 kg) without cable or filters

Model 190 and 489-110FS combination Calibrated to within ± 10% accuracy full scale for ¹³⁷Cs energies up to 80 mR/h exposure rates. Overall accuracy of 190/489-110FS / filters within 20% in the 30 to 300 keV energy range

Typical energy dependence



Efficiency The Victoreen Model 489-110FS Pancake Probe efficiency is shown below, without filters. In a recent performance check, the numbers shown represent typical results obtained:

Isotope	%Efficiency
¹⁴ C	5
⁹⁹ Tc	12
¹³⁷ Cs	24
⁹⁰ Sr	59
³⁶ Cl	26
²⁴¹ Am	8
¹²⁹ I	2
²³⁰ Th	15
²³⁹ Pu	12

NOTE: The efficiency formula used to calculate the % Efficiency is:

$$\text{Eff. \%} = (\text{CPM} \times 100) / (\mu\text{Ci} \times 3.7 \times 10^4 \times 60 / 2)$$

Replacement part

Foam Grip Handle (Model 489-130-44)

Available model(s)

489-110FS GM Pancake Probe with Filter Set

190-110KT Kit, consists of the Model 489-110FS GM Pancake Probe with Filter Set, the Model 190 Survey Meter, connecting cable with module, calibration certificate, instruction manual, and carrying case



Model 190-110KT

For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA.

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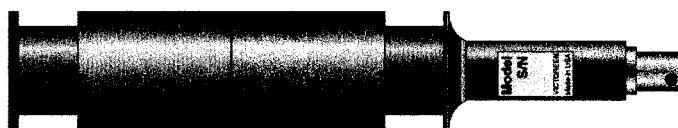
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489-110FS-ds rev 2 12 mar 03

Energy Compensated GM Probe

Victoreen® Model 90-12

- Energy compensated GM probe provides flat energy response for reduced GM tube over-response at low energy dose rates
- Beta shield discriminates between beta rays and gamma/x-ray radiation



Slide Closed



Slide Opened

Features

- 360° beta shield
- 2 beta windows expose 180° for optimum sweet spot
- Rugged ABS plastic housing
- Exposure rates up to 200 mR/hr

Introduction

The Model 90-12 is a rugged, light weight, energy compensated, general purpose Geiger-Mueller (GM) tube based hand held probe, with beta shields. This probe is designed to fulfill a variety of radiation measurement needs. The adjustable beta shield is a 360° shield with a linear movement to permit discrimination between penetrating and non-penetrating radiation. The two windows expose an angle of 180° total in the most sensitive area of the GM tube. With the shield open, the probes measure beta, x-rays, and gamma rays. With the beta shield closed, the probes measure penetrating x-rays and gamma rays. A coiled coaxial cable connects these probes to a wide variety of Victoreen survey meters.

The energy compensation feature permits accurate exposure rate measurements from low to high energies, at rates less than 1 R/hr. The probe is calibrated up to 1 R/hr at ^{137}Cs .

Applications

The Victoreen Model 90-12 Energy Compensated GM probe when married with the Victoreen Model 190 Count Rate Survey Meter is ideal for applications where discrimination of beta and gamma/x-rays is useful information. Typical applications for this probe include Nuclear Medicine laboratories and environmental surveys.

Specifications

Radiation detected Beta above 200 keV, Gamma above 12 keV

Operating voltage 900 V

Plateau length 100 V (min)

Plateau slope 0.1%/V (max)

Temperature range - 40° to + 167°F (- 40° to + 75°C)

Relative humidity 0 to 95%, non-condensing

Wall thickness 30 mg/cm² (tube)

Wall material Stainless steel

Maximum background 15 CPM

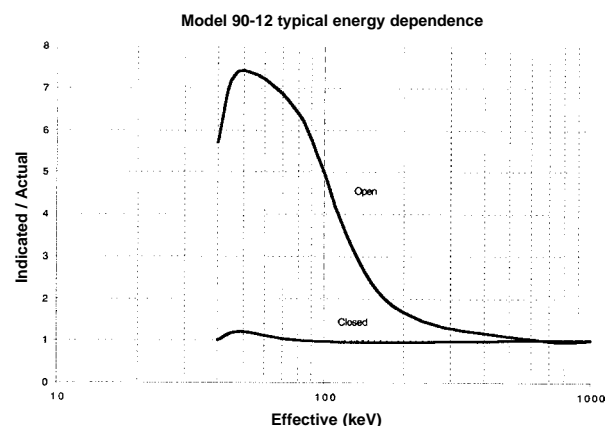
Nominal sensitivity 720 CPM/mR/hr*

Maximum exposure rate 1 R/hr

Housing material ABS plastic

Connector MHV

Typical energy dependence



Beta shield density 1890 mg/cm²

Beta window density 30 mg/cm²

Dimensions 1.38 in Ø x 6.7 in (l) (3.5 x 17 cm)

Weight 0.58 lb (0.26 kg)

Available model(s)

90-12 Energy Compensated GM Probe

For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA.

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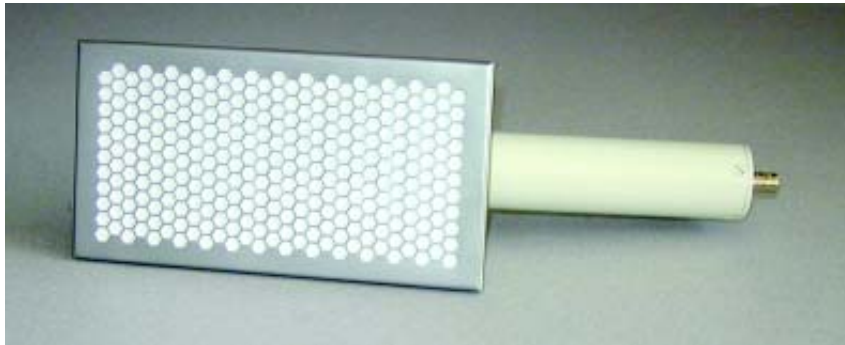
* Calibrated to ^{137}Cs .

100 cm² Beta/Gamma Scintillation Probe

Model 190-100BGS



Radiation Safety



- Large detector area
- Plastic scintillator
- Model 190 Survey Meter compatibility
- Detects beta particles and low energy gamma radiation
- Lightweight, rugged aluminum housing
- High efficiency HEX protective grill

Introduction

The Model 190-100BGS is a large area scintillation detector suitable for measurement of beta particles and low energy gamma radiation. When used in combination with the Model 190 or 190F, it is an excellent choice for surveying of large surfaces, frisker applications, and environmental assessments where regulations, or common practice, require the use of a large area detector.

The probe has high efficiencies for key isotopes used in the nuclear medicine field. This detector, coupled with the Model 190, makes a particularly effective measurement solution.

Applications

The Model 190-100BGS is designed to measure isotopes that are typically found in hospital nuclear medicine departments, radiopharmaceutical production facilities, and environmental surveying applications where large surface area Beta/Gamma detectors are required. The 190-100BGS is specifically designed for use with the Model 190 Survey and Count Rate Meter or the Model 190F Frisker Area Monitor/Frisker Count Rate Meter.

Features

- Compatible with Model 190 and 190F instruments for both general surveys and frisker applications
- Open area of 100 cm² meets international requirements
- Ergonomic handle design reduces fatigue during surveys

Specifications

Detector Plastic scintillator

Active area Approximately 126 cm²

Open area Approximately 100 cm² (approximately 80% open)

Window 1.2 mg/cm² mylar, metalized

Calibration The probe is calibrated to ¹³⁷Cs gamma radiation. Other radionuclide calibrations available upon request

Efficiency gamma

Minimum gamma sensitivity and efficiency

Nuclide	Energy (max Mev)	Sensitivity cpm/μCi	Efficiency %*
¹²⁹ I	0.039	44,400	2.0
²⁴¹ Am	0.060	133,200	6.0
¹³³ Ba	0.356	44,400	2.0
¹³⁷ Cs	0.662	44,400	2.0
⁶⁰ Co	1.200	66,600	3.0

* Efficiency = cpm/dpm minimum

Cable (Model 50-183) Shielded, approximately 4.5 ft (1.3 m) long with MHV connector

Adapter module (Model 190060) Required to interface to the Model 190 or Model 190F

Operating voltage 1300 V (nominal)

Operating temperature - 4° to 122°F (- 20° to 50°C)

Weight Approximately 1.1 lb (0.5 kg)

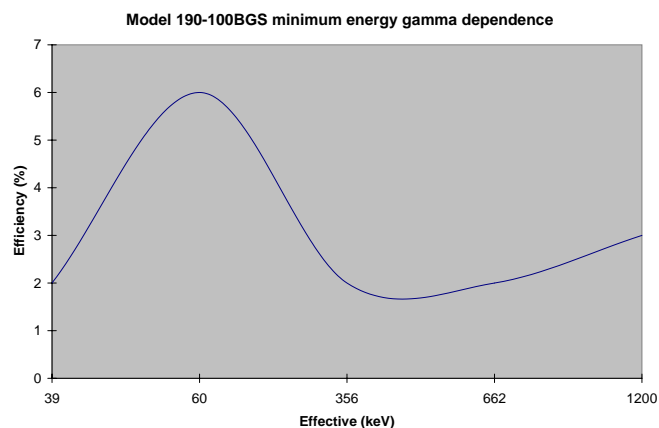
Efficiency beta

Minimum beta sensitivity and efficiency

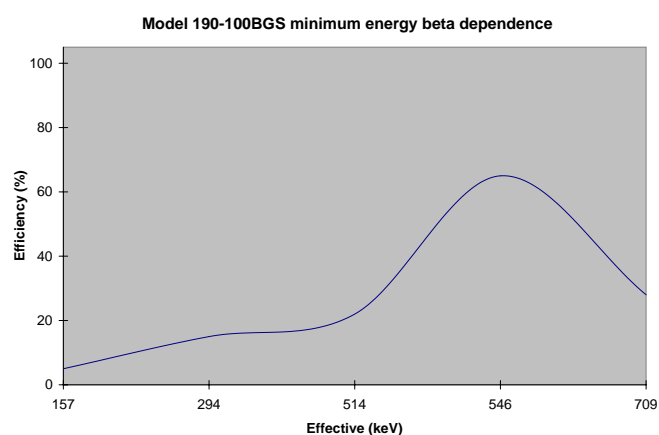
Nuclide	Energy (max Mev)	Sensitivity cpm/μCi	Efficiency %*
¹⁴ C	0.157	111,000	5.0
⁹⁹ Tc	0.294	333,000	15.0
¹³⁷ Cs	0.514/1.17	488,400	22.0
⁹⁰ Sr	0.546	1,443,000	65.0
³⁶ Cl	0.709	621,600	28.0

* Efficiency = cpm/dpm minimum

Typical energy dependence gamma



Typical energy dependence beta



Available model(s)

190-100BGS cm² Beta/Gamma Scintillation Probe

For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA. Specifications are subject to change without notice.

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Victoreen® Geiger-Mueller and Scintillation Probe Selection Guide

RS

Radiation Safety



- GM probes for qualitative radiation detection
- Scintillation probes for quantitative radiation assessment
- All probes are direct read when married with Models 190 and 290 meters
- Rugged and reliable designs
- Scintillators are test selected and optically coupled to PMT
- GM probes are available in pancake style, energy compensated and with beta discrimination

Introduction

The Geiger-Mueller (GM) detectors fulfill a wide variety of radiation measurement needs. Probes are available for detection of alpha, beta, and gamma radiation. Some probes are provided with a 360° shield to permit discrimination between penetrating and non-penetrating radiation.

Reliability and ruggedness are built into the GM detectors, with uniformity of construction and field-proven design to assure dependable performance with all the GM survey instruments. Standard MHV type connectors readily allow interchange of all detector probes. The GM counters are fastened to the Model 190 Count Rate and Survey Meter by a Velcro® strap. 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 Model 498-110D Pancake GM Probe.

The scintillation detectors are carefully selected and optically coupled to photomultiplier tubes. The photomultipliers are 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

The GM probes provide a qualitative assessment for radiation detection. 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.

The scintillation detectors provide a quantitative assessment for radiation detection in counts/minutes. Applications outlined in this guide include nuclear medicine labs, HAZMAT spills, radiation safety office surveys, industrial hygiene, industrial x-ray manufacturing, and geological surveys.

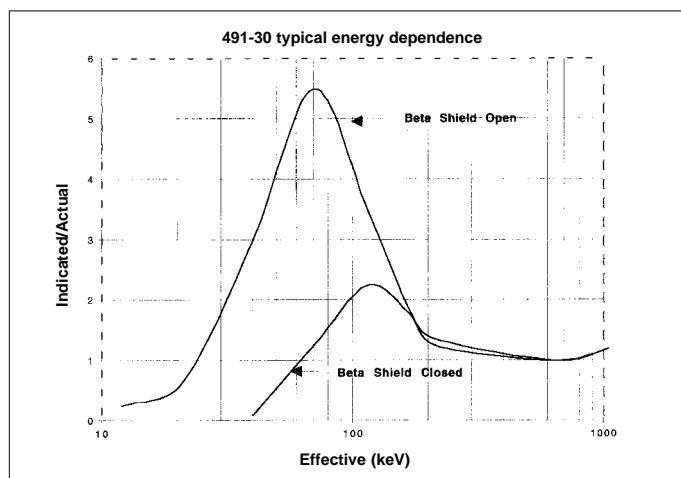
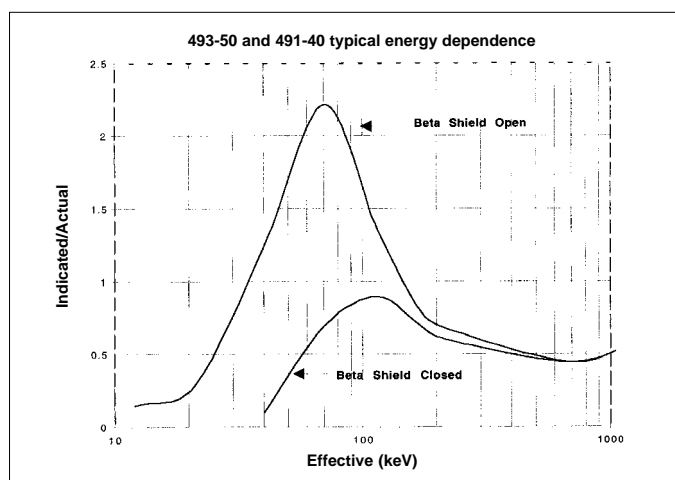
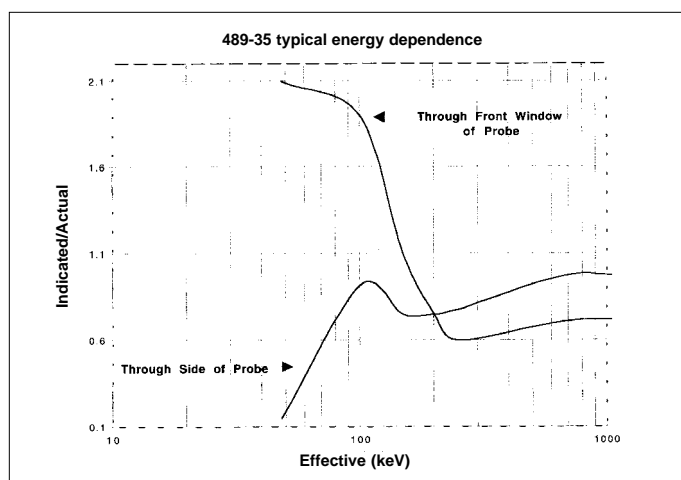
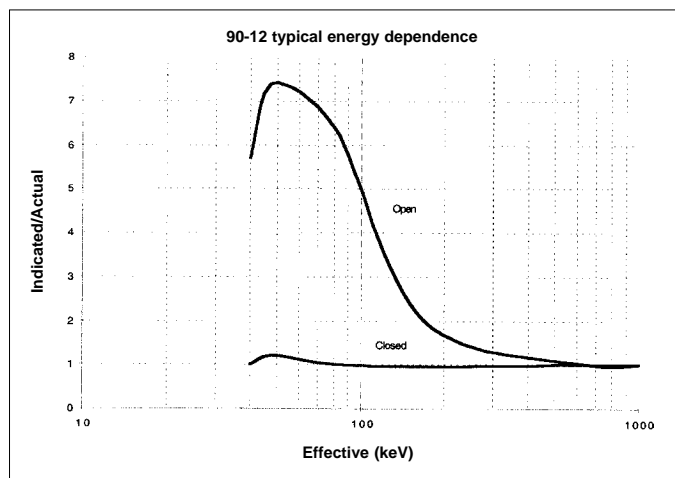
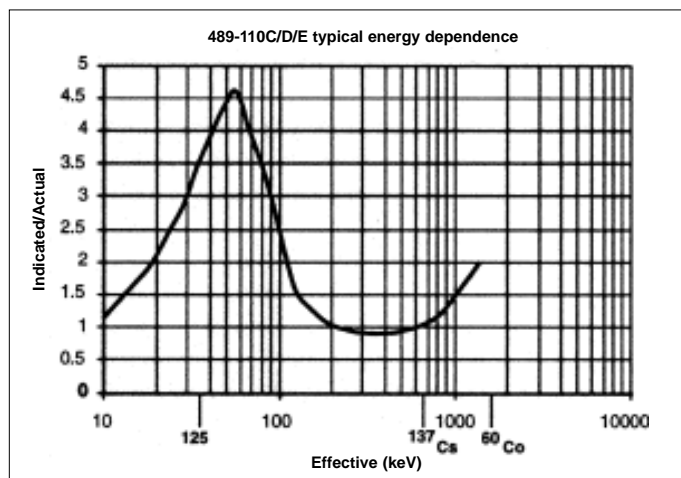
Scintillation probes specifications

Model	489-50	489-55	489-120	489-60	425-110	425-200	489-200
Type	NaI (TI) Sodium Iodide 1 x 1, scintillator optically coupled to PMT	NaI (TI) Sodium Iodide 1.25 x 1.50, scintillator optically coupled to PMT	NaI (TI) Sodium Iodide 2 x 2, scintillator optically coupled to PMT	ZnS (Ag) Alpha, scintillator optically coupled to PMT	NaI (TI) Thin Scintillator for Low Energy Gamma, scintillator optically coupled to PMT	NE 102A Plastic Scintillator Flashlight Probe, scintillator optically coupled to PMT	NaI (TI) 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	<ul style="list-style-type: none"> Nuclear medicine Industrial hygiene Industrial x-ray manufacturing Geological surveys Radiation safety office 		<ul style="list-style-type: none"> Nuclear medicine seed finder 	<ul style="list-style-type: none"> Alpha detection Uranium, Plutonium HAZMAT RSO 	<ul style="list-style-type: none"> Primary probe for nuclear medicine Low energy x-ray manufacturing Industrial hygiene 	<ul style="list-style-type: none"> Alpha, beta counting of filter paper HAZMAT spills Nuclear medicine missing sources 	<ul style="list-style-type: none"> 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	10 cm ²	20 cm ²	11.4 cm ²	5 cm ²	20.3 cm ²	59.2 cm ²
Crystal dim.	1 x 1 in	1.25 x 1.5 in	2 x 2 in	1.5 in Ø	1 in Ø	2 in Ø	2 x 2 x 0.5 in
Probe diameter	2 in	2 in	2.25 in	2 in	2 in	2.625 in	2.25 x 0.69 in
Probe length	8.75 in	9.125 in	9.625 in	7.25 in	8.125 in	8 in	11 in
Cable length	48 in	48 in	48 in	48 in	48 in	48 in	48 in
Operating voltage	900 V	900 V	900 V	900 V	900 V	900 V	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	¹³⁷ Cs 2 pts/scale to 10 mR/hr
Cal. tolerance	± 10%	± 10%	± 10%	± 10%	± 10%	± 10%	± 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%	0 to 95%	0 to 95%	0 to 95%	0 to 95%	0 to 95%	0 to 95%
Operating temp	- 40° to + 120° F - 40° to + 50° C Max. temp increase of 20° F/hr	- 40° to + 120° F - 40° to + 50° C Max. temp increase of 20° F/hr	- 40° to + 120° F - 40° to + 50° C Max. temp increase of 20° F/hr	- 40° to + 120° F - 40° to + 50° C Max. temp increase of 20° F/hr	- 40° to + 120° F - 40° to + 50° C Max. temp increase of 20° F/hr	- 40° to + 120° F - 40° to + 50° C Max. temp increase of 20° F/hr	- 40° to + 120° F - 40° to + 50° C Max. temp increase of 20° F/hr
Weight (approx.)	1.5 lb (0.68 kg)	1.5 lb (0.68 kg)	2.0 lb (0.91 kg)	1.5 lb (0.68 kg)	1.5 lb (0.68 kg)	0.78 lb (0.35 kg)	0.78 lb (0.35 kg)

Geiger-mueller probes specifications

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	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Energy compensated to eliminate low energy over response • Convenient size to fit in small spaces around linear accelerators • X-ray tube manufacturers 	<ul style="list-style-type: none"> • Ultra sensitive alpha, beta, gamma probe with directional focus • Nuclear medicine • Emergency response 	<ul style="list-style-type: none"> • Rugged probe with beta discrimination • Scrap metal yards • Rugged to drop down wells • Nuclear medicine 	<ul style="list-style-type: none"> • 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 with Model 190	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	1.5 in Ø (38mm)	0.75 in (19.1 mm)	4 in (102 mm)	0.75 in (19.1 mm)	0.75 in (19.1 mm)	2.25 in (57.2 mm)
Quenching gas	Neon & halogen	Neon & halogen	Neon & halogen	Neon & halogen	Neon & halogen	Neon & halogen
Diameter of probe	2.6875 in (68 mm)	1.375 in (35 mm)	1.3125 in (33.4 mm)	1.25 in (32 mm)	1.1875 in (30 mm)	1.1875 in (30 mm)
Length of probe	9.75 in (248 mm)	6.7 in (170 mm)	7.5 in (191 mm)	3.3125 in (84 mm)	5.375 in (136 mm)	5.375 in (136 mm)
Cable length	48 in (122 cm)	48 in (122 cm)	48 in (122 cm)	48 in (122 cm)	48 in (122 cm)	48 in (122 cm)
Weight	Approx. 1.0 lb (0.45 kg)	Approx. 0.59 lb (0.26 kg)	Approx. 1.0 lb (0.45 kg)	Approx. 1.0 lb (0.45 kg)	Approx. 1.0 lb (0.45 kg)	Approx. 1.0 lb (0.45 kg)
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	- 65° to + 185° F (- 56° to + 85° C)	- 65° to + 185° F (- 56° to + 85° C)	- 65° to + 185° F (- 56° to + 85° C)	- 65° to + 185° F (- 56° to + 85° C)	- 65° to + 185° F (- 56° to + 85° C)	- 65° to + 185° F (- 56° to + 85° C)
Pressure range	To 5 psig	To 15 psig	To 5 psig	To 15 psig	To 15 psig	To 15 psig
Energy dependence	See graphs	See graphs	See graphs	See graphs	See graphs	See graphs
* Model 489-110C GM Pancake Probe with metal housing and MHV connector Model 489-110D GM Pancake Probe with ABS plastic housing and MHV connector Model 489-110E GM Pancake Probe with ABS plastic housing and BNC connector						

GM probes typical energy dependence



For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA. Specifications are subject to change without notice. Victoreen is a registered trademark of Cardinal Health, Inc. or one of its subsidiaries. Velcro is a registered trademark of Velcro Industries B.V. © Copyright 2003 Cardinal Health, Inc. or one of its subsidiaries. All rights reserved. psg-ds rev 3 11 mar 03