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Biomedical

Technical Data

452R
Radiation Survey Meter

Built to Withstand and Designed to Perform

The Fluke Biomedical 452R combines the trusted precision of the original 452 with a rugged new design that's built to meet the toughest industrial demands. The 1 meter drop-tested 452R, with its enhanced durability and upgraded IP65 rating, is ready to tackle a broad range of applications, from non-destructive testing and contamination measurements to x-ray scanning and process control. Whether you're helping to ensure workplace safety, conducting critical inspections, or monitoring radiation, the Fluke Biomedical 452R delivers reliable, fast, and accurate results—no matter where the job takes you.

One device for every situation. Endless possibilities.

Technology

The measurement technology of the Fluke Biomedical 452R is based on a combination of a silicon sensor cluster and a Geiger-Müller pancake. The instrument has two interchangeable lids (depending on model) to switch between air kerma, ambient dose equivalent and counts. This design makes it a versatile instrument with a wide and flat energy response along with high sensitivity and quick response time.

Models

The 452R comes in three different models.

	R / Gy / rad	Sv / rem	cps / cpm
452R	✓	✓	✓
452R Air Kerma	✓		
452R Ambient		✓	

Typical applications

- X-ray tube leakage
- X-ray wall leakage
- Contamination measurements
- Environmental radiation
- Non-destructive testing
- Scattered room radiation

Key features

- Broad application range
- Compliant with IEC 60846-1
- IP65 (dust tight and watertight against low pressure water spray)
- Shock resistance: Designed to typically withstand a 1-meter drop onto concrete, as per the IEC 60068-2-31:2008 standard, with the lid mounted
- Automatic data storage
- PC software connectivity
- USB charging
- Measures alpha, beta, gamma, X-ray radiation types
- Alarm threshold setting
- Built for indoor and outdoor applications

General Specifications

Safety standard	Complies with IEC 61010-1:2010, pollution degree 2
Radiation meter standard	Complies with IEC 60846-1:2009, except EMC which complies with EN 61326:2013, and except alarm sound level
Dimensions	254 x 130 x 90 mm (10.0 x 5.1 x 3.5 inches)
Weight	0.9 kg (2.1 pounds)
Display	240 x 400 pixel color LCD, sunlight readable, backlit
Rate alarm	65 dB(A) at 30 cm (12 inches)
Operating temperature	-20 – +50 °C (-4 – +122 °F)
Storage temperature	-30 – +70 °C (-22 – +158 °F)
Battery charging temperature	+10 – +40 °C (+50 – +104 °F)
Atmospheric pressure	70 – 107 kPa, altitude up to 3000 m (10,000 ft)
IP code	IP65 (dust proof and water resistant) according to IEC 60529:1989-2013, with lid mounted, seals intact and USB cap closed
Shock	Typically survives a fall from 1 meter onto concrete, according to IEC 60068-2-31:2008, with lid mounted
Humidity, lid open	< 90 % relative humidity, non-condensing
Battery life	Up to 100 h
Battery	Built-in rechargeable lithium-ion, 2550 mAh
Connector	USB micro (5 V DC, 1.3 A), for communication and charging
Mounting	Standard 1/4″ tripod thread on handle
Data storage	4000 stored measurements and 10 days of dose rate log with 1 s resolution
Software	RaySafe View (for remote control, analysis and data export)

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Radiology Specifications

Ambient dose equivalent, $H^*(10)$		
Range	0 µSv/h – 1 Sv/h (0 µrem/h – 100 rem/h)	
Rate resolution	0.01 µSv/h (1 µrem/h) or 3 digits	
Dose resolution	0.1 nSv (0.01 µrem) or 3 digits	
Radiation detected	γ and X-rays > 10 keV	
Linearity, ^{137}Cs	±10 %, after subtraction of background	
Energy range	16 keV – 7 MeV	
Energy response[1]	> 20 µSv/h (2 mrem/h) and T < 30 °C (86 °F)	±25 %, 16 – 20 keV ±15 %, 20 keV – 5 MeV ±25 %, 5 – 7 MeV
	otherwise	±25 %, 16 – 20 keV ±20 %, 20 keV – 1 MeV –25 % – + 150 %, 1 – 7 MeV
Minimum X-ray pulse length[2]	5 ms at T < 30 °C (86 °F)	
Minimum linac frequency[2,3]	100 Hz at T < 30 °C (86 °F)	
Rate response time	~2 s to detect a step from 0.2 to 2 µSv/h (20 to 200 µrem/h)	
IEC 60846-1 energy range[4]	20 keV – 2 MeV, angle of incidence ±45°	
IEC 60846-1 dose rate range[4]	1 µSv/h – 1 Sv/h (100 µrem/h – 100 rem/h)	
IEC 60846-1 dose range[4]	1 µSv – 24 Sv (100 µrem – 2.4 krem), coefficient of variation < 3 %	
Units	Sv rem (1 rem = 1/100 Sv)	

Air kerma, K_{air}		
Range	0 µGy/h – 1 Gy/h (0 µR/h – 114 R/h)	
Rate resolution	0.01 µGy/h (1 µR/h) or 3 digits	
Dose resolution	0.1 nGy (0.01 µR) or 3 digits	
Radiation detected	γ and X-rays > 10 k	
Linearity, ^{137}Cs	±10 %, after subtraction of background	
Energy range	30 keV – 7 MeV	
Energy response[1]	> 20 µSv/h (2.3 mR/h) and T < 30 °C (86 °F)	±15 %, 30 keV – 5 MeV ±25 %, 5 MeV – 7 MeV
	otherwise	±30 %, 30 keV – 1 MeV –25 % – +120 %, 1 MeV – 7 MeV
Minimum X-ray pulse length[2]	5 ms at T < 30 °C (86 °F)	
Minimum linac frequency[2,3]	100 Hz at T < 30 °C (86 °F)	
Rate response time	~2 s to detect a step from 0.2 to 2 µGh/h (23 to 230 µR/h)	
Units	Gy rad (1 rad = 1/100 Gy) R (1 R = 1/114.1 Gy)	

1. The instrument uses a Geiger-Müller pancake at low rates and a cluster of solid-state sensors at higher rates. The rate where the solid-state sensors engage gradually increase with temperature, for temperatures above 30 °C (86 °F).
2. Limit where the response is within ±20 % of the response at continuous radiation. Above 30 °C (86 °F) the instrument's ability to handle low linac pulse rates and short X-ray pulses gradually declines with increasing temperature.
3. Refers to the microwave pulse repetition frequency of typical medical linear accelerators. Each pulse has a typical duration of a few µs.
4. Ranges where the instrument fulfills IEC 60846-1:2009.

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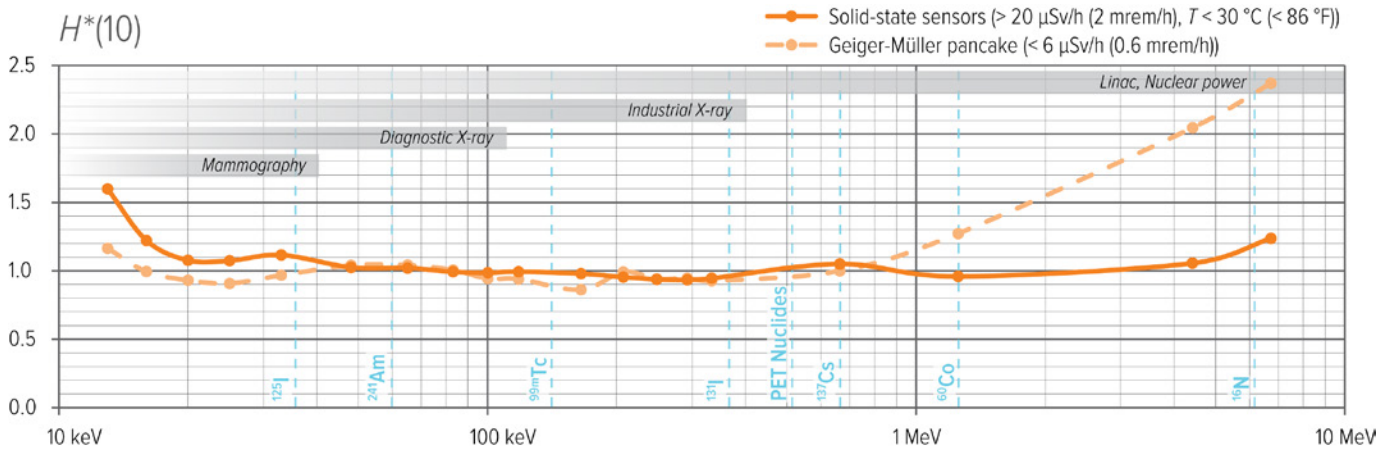
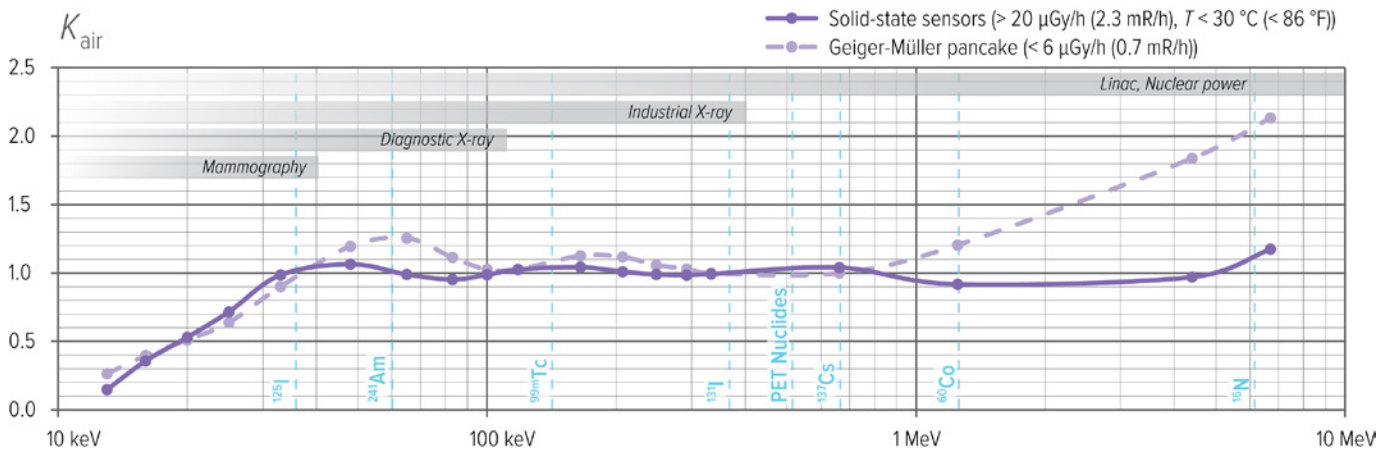
Radiology Specifications (continued)

Mean photon energy, $\bar{E}$			
Range	20 keV – 600 keV		
Uncertainty	10 % at < 100 keV, 20 % otherwise		
Defining standard	ISO 4037-1:2019		
Minimum dose rate[1]	20 µSv/h (2 mrem/h) or 20 µGy/h (2.3 mR/h), at T < 30 °C (86 °F)		
Counter (α, β, γ)			
Detector type	Geiger-Müller pancake		
Window	Mica, 1.5 – 2 mg/cm^2		
Sensitive area	15.55 cm^2, behind 79 % open steel grid		
Radiation detected	α > 3.5 MeV β > 40 keV γ and X-rays > 5 keV		
Range	0 cps – 20 kcps (0 cpm to 1.2 Mcpm)		
Rate resolution	0.1 cps (1 cpm) or 3 digits		
Counter resolution	1 count or 3 digits		
Dead time correction	Automatic, linearity within -10 % to +30 %		
Typical background at 0.1 µSv/h	0.5 cps (30 cpm)		
Typical gamma sensitivity, ^{137}Cs	6 cps / µGy/h (3000 cpm / mR/h)		
Rate response time	~2 s to detect a step from 1 to 10 cps (60 cpm to 600 cpm)		
Units	cps cpm (1 cpm = 1/60 cps)		
2π emission sensitivity[2]	Radionuclide	Decay (E_{max})	Typical efficiency
	^{14}C	β^- (0.16 MeV)	15 %
	^{60}Co	β^- (0.32 MeV)	31 %
	^{36}Cl	β^- (0.71 MeV)	43 %
	^{90}Sr / ^{90}Y	β^- (0.55 / 2.28 MeV)	49 %
	^{239}Pu	α (5.16 MeV)	26 %
	^{241}Am	α (5.49 MeV)	26 %

1. Above 30 °C (86 °F) the minimum dose rate gradually increases with increasing temperature.
2. Measured at 3 mm distance between instrument housing (without lid) and wide area class 2 sources according to ISO 8769:2010.

Typical Energy Response





Ordering Information

The system includes

Instrument with mounted lids (depending on model). Power supply + plugs, 5 m USB cable, Printed user manual and quick guide, calibration certificate, cardboard box with fitted foam.

Optional accessories

Heavy duty case with fitted foam

Protect+ Service Program

The Protect+ Service Program helps ensure a predictable, annual expense to keep your instrument performing and looking new. This optional service program will keep your Fluke Biomedical 452R Survey Meter working accurately and efficiently through annual checks and calibrations and extends the instrument hardware warranty.

Fluke Biomedical regulatory commitment

As a test device manufacturer and distributor, we recognize and follow certain quality standards and certifications when developing our products. We are ISO 9001 and ISO 13485 certified.

Visit flukebiomedical.com for more information.

Fluke Biomedical

We empower our everyday heroes to focus only on protecting lives.

Fluke Biomedical
6920 Seaway Boulevard
Everett, WA 98203

For more information, contact us at:

(800) 850-4608 or Fax (440) 349-2307
sales@flukebiomedical.com
flukebiomedical.com

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