RaySafe 452 Survey Meter

- Get reliable measurements across the energy and dose spectrum with wide and flat energy response characteristics

- Measure accurately on a broad range of radiation sources due to high sensitivity

- Be ready to detect radiation right after power-on thanks to the quick response time and no special settings needed

- Benefit from a compact, ergonomic and easily navigated design

RaySafe™

CONTENT

RaySafe 452 Multi-purpose Survey Meter

The RaySafe 452 Survey Meter is used for radiation measurements, is compliant with IEC 60846-1, and has high sensitivity combined with a wide and flat energy response making it suitable for a broad range of medical and industrial radiation applications. It measures ambient dose equivalent, air kerma and counts, all in one device. One device for every situation means less to carry, learn and handle. That equals less expense, more efficiency and time savings.

The instrument has two interchangeable lids (depending on model) to switch between air kerma, ambient dose equivalent and counts.

The ability to measure alpha, beta, gamma, and X-ray radiation, combined with excellent performance over a wide energy range, makes RaySafe 452 suitable for applications such as:

- X-ray tube leakage
- Scattered and environmental radiation detection
- Non-destructive testing

RaySafe 452 does not require any corrections or manual settings. Just turn on the instrument and within a few seconds, you are ready to measure.

The proven technology, utilizing silicon diodes combined with an energy compensated Geiger-Müller tube, provides high sensitivity and stability over a very wide energy and dose rate range.

The dose sensitive thin-walled Geiger-Müller tube enables a fast response time even at very low dose rates while the silicon diodes provide accuracy and speed at higher dose rates. The dose rate value is automatically saved every second providing comfort not to lose data.

Featuring a durable design, a wide temperature range, and IP64 classification (dust-proof and water resistant), makes indoor and outdoor measurements possible without worrying about the instrument. RaySafe 452 can also without any problems be wiped with a wet cloth or washed under rinsing water.

RaySafe View, the included PC software, provides easy data transfer for further analysis and reporting. This software also supports settings of alarm threshold values.

The intuitive interface shows all parameters in one view. The integrated handle and display are positioned so you are able to see readings at all times. Navigation buttons are within easy reach of your thumb when holding the device.

Ordering Information

Part No / Model	RaySafe 452 Survey Meter and Accessories	
5082301	**RaySafe 452 Kit**	
	The most versatile version that ca be used for air kerma and ambient dose equivalent measurements as well as a contamination monitor. Measures in Sv, rem, R, Gy, rad, cps, and cpm.	
5082288	**RaySafe 452 Ambient Kit**	
	Used for ambient dose equivalent measurements H*(10). Measures in Sv, and rem.	
5082295	**RaySafe 452 Air Kerma Kit**	
	Used for air kerma/roentgen measurements. Measures in R, Gy, and rad.	
5082312	**RaySafe 452 Heavy Duty Case**	
	Heavy duty case with fitted foam.	
5103180	**RaySafe 452 Wrist Strap**	

Specification

Model Option	R / Gy / rad	Sv / rem	cps / cpm
RaySafe 452	•	•	•
RaySafe 452 Air Kerma	•		
RaySafe 452 Ambient		•	

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
Energy range	16 keV – 7 MeV
Energy response[1] (see below for a typical performance plot)	> 20 µSv/h (2 mrem/h), and T < 30 °C (86 °F): • ±15 %, for 20 keV – 5 MeV • ±25 %, for < 20 keV or > 5 MeV Otherwise: • ±20 %, for 20 keV – 1 MeV • −25 % – +150 %, for < 20 keV or > 1 MeV
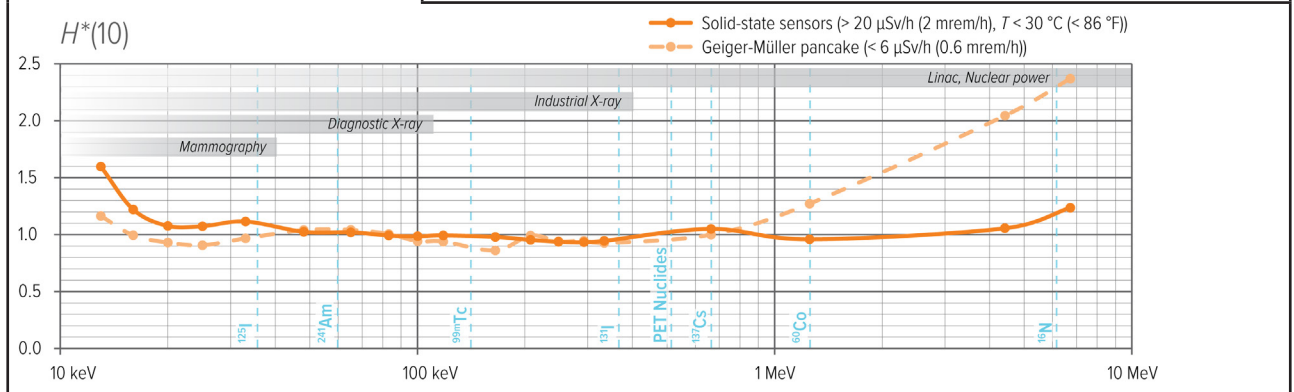
Minimum X-ray pulse length[2]	5 ms at T < 30 °C (86 °F)
Minimum linac frequency[2][3]	100 Hz at T < 30 °C (86 °F)
Rate response time	Approximately 2 s to detect a step from 0.2 to 2 µSv/h (20 to 200 µrem/h)
IEC 60846-1 energy range[4]	20 keV – 2 MeV, angle of incidence ±45°
IEC 60846-1 dose rate range[4]	1 µSv/h – 1 Sv/h (100 µrem/h – 100 rem/h), non linearity < ±10 %
IEC 60846-1 dose range[4]	1 µSv – 24 Sv (100 µrem – 2.4 krem), coefficient of variation < 3 %
Units	Sv, and rem (1 rem = 1/100 Sv)
Find footnotes, and Air Kerma and other specifications on the following pages	

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
Energy range	30 keV – 7 MeV
Energy response[1] (see below for a typical performance plot)	> 20 µGy/h (2.3 mR/h) and T < 30 °C (86 °F): • ±15 %, for 30 keV – 5 MeV • ±25 %, for 5 MeV – 7 MeV
	Otherwise: • ±30 %, for 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	Approximately 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), and 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 high rates. The rate where the solid-state sensors are fully engaged gradually increases 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.

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[5]	20 µSv/h (2 mrem/h) or 20 µGy/h (2.3 mR/h), at T < 30 °C (86 °F)

5. Above 30 °C (86 °F) the minimum dose rate gradually increases with increasing temperature.

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		
Range	0 cps – 20 kcps (0 cpm – 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% – +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	Approximately 2 s to detect a step from 1 to 10 cps (60 to 600 cpm)		
Units	cps, and cpm (1 cpm = 1/60 cps)		
2π emission sensitivity[6]	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 %

6. Measured at 3 mm distance between instrument housing (without lid) and wide area class 2 sources according to ISO 8769:2010.

General	
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 IEC 61326-1:2012, and except alarm sound level
Dimensions	250 x 127 x 83 mm (9.8 x 5.0 x 3.3 inches)
Weight	0.8 kg (1.7 pounds)
Display	240 x 400 pixel backlit color LCD, sunlight readable
Rate alarm	65 dB(A) at 30 cm (12 inches)
Operating temperature	-20 – 50 °C (-4 – 122 °F)
Storage temperature	-30 – 0 °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	IP64 (dust proof and water resistant) according to IEC 60529:1989-2013, with lid mounted, seals intact and nothing connected to the USB connector
Humidity, without lid	< 90 % relative humidity, non-condensing
Battery	Built-in rechargeable lithium-ion, 2550 mAh
Battery life	Up to 100 h
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)

Width: 127 mm (5.0 inches)

Depth: 83 mm (3.3 inches)

Length: 250 mm (9.8 inches)

Declarations

Declaration of Conformity

The Declaration of Conformity is issued under the sole responsibility of the manufacturer which declares RaySafe 452 conforms to the following EU Directives and UK Regulations:

- Directive 2015/863/EU, UK Regulation 2016: RoHS

- Directive 2014/30/EU, UK Regulation: Electromagnetic Compatibility (EMC)

- Directive 2014/35/EU, UK Regulation 2016: Low Voltage (LVD)

Standards used:

- EN/BS 63000:2016 Assessment of electrical and electronic products for restriction of hazardous substances

- EN/BS 61326-1:2013 Electrical equipment for measurement, control and laboratory-EMC; General

- EN/BS 61010-1:2010 Safety requirements for measurement, control and laboratory equipment; General

- EN/BS 60529: 1991 +A2:2013 Degrees of protection provided by enclosures