

# RaySafe Solo

## Specifications



## RAYSAFE SOLO GENERAL

<b>EMC TESTED</b>	According to EN 61000-6-1:2007 and EN 61000-6-3:2007
<b>EXPOSURE NEEDED</b>	One
<b>RESET</b>	Automatic
<b>TEMP. RANGE</b>	15 – 35 °C (59 – 95 °F)
<b>DETECTOR CABLE LENGTH</b>	2 and 10 m (6.5 and 33 ft)
<b>PATENT</b>	Germany DE69430268.6-08 UK 0758522 Japan 3449721 Sweden 9302909-8 France 075822 USA 5761270
<b>SIZE BASE UNIT</b>	28 x 74 x 142 mm (1.1 x 2.9 x 5.6 in)
<b>WEIGHT</b>	250 g (9 oz)
<b>POWER OFF</b>	Never, or after 5, 20 or 60 min of inactivity
<b>POWER SOURCE</b>	Rechargeable 7.4 V Li-on battery
<b>BATTERY TIME</b>	20 – 40 hours (depending on detector and if Bluetooth is used)
<b>READ OUT</b>	Three row alphanumeric backlit display with four digits numerical resolution

## RAYSAFE SOLO mAs

<b>RANGE mA</b>	0.2 – 2000 mA
<b>UNCERTAINTY mA</b>	1% or $\pm 0.02$ mA
<b>RANGE mAs</b>	0.05 – 9999 mAs
<b>UNCERTAINTY mAs</b>	1% or $\pm 0.02$ mAs
<b>MAX LOAD</b>	< 200 mA continuously, 500 mA < 1 s, 1000 mA < 0.5 s
<b>REPRODUCIBILITY</b>	< 0.5 %
<b>OVER VOLTAGE PROTECTION</b>	70 V
<b>EXPOSURE TIME</b>	
<b>RANGE</b>	1 ms – 999 s
<b>UNCERTAINTY</b>	0.5 % or 0.2 ms
<b>PULSE</b>	
<b>RANGE</b>	1 – 9999 pulses
<b>PEAK TRIG LEVEL</b>	> 8 mA
<b>PULSE RATE</b>	
<b>RANGE</b>	1/6 – 120 pulses/s
<b>mAs PER PULSE</b>	
<b>RANGE</b>	0.001 – 2000 mAs/pulse

# RAYSAFE SOLO R/F

<b>SIZE DETECTOR</b>	12 x 22 x 117 mm (0.5 x 0.9 x 4.6 in)
<b>WEIGHT</b>	50 g (2 oz)
<b>DOSE (R/F LOW)</b>	
<b>RANGE</b>	10 nGy – 9999 Gy (1 µR – 9999 R)
<b>TRIG LEVEL</b>	200 nGy/s (1.4 mR/min)
<b>UNCERTAINTY</b>	5 % or ± 10 nGy (1 µR) (40 – 150 kVp, HVL: 1.5 – 14 mm Al <sup>(1)</sup> , Active Compensation)
<b>DOSE (R/F HIGH)</b>	
<b>RANGE</b>	10 µGy – 9999 Gy (1 mR – 9999 R)
<b>TRIG LEVEL</b>	100 µGy/s (0.7 R/min)
<b>UNCERTAINTY</b>	5 % or ± 10 µGy (1 mR) (40 – 150 kVp, HVL: 1.5 – 14 mm Al <sup>(1)</sup> , Active Compensation)
<b>DOSE RATE (R/F LOW)</b>	
<b>RANGE</b>	20 nGy/s – 1 mGy/s (140 µR/min – 7 R/min)
<b>MIN. PEAK TRIG LEVEL</b>	200 nGy/s (1.4 mR/min)
<b>UNCERTAINTY</b>	5 % or ± 10 nGy/s (70 µR/min) (40 – 150 kVp, HVL: 1.5 – 14 mm Al <sup>(1)</sup> , Active Compensation)
<b>DOSE RATE (R/F HIGH)</b>	
<b>RANGE</b>	20 µGy/s – 1000 mGy/s <sup>(2)</sup> (140 mR/min – 7000 R/min)
<b>MIN. PEAK TRIG LEVEL</b>	100 µGy/s (0.7 R/min)
<b>UNCERTAINTY</b>	5 % or ± 10 µGy/s (70 mR/min) (40 – 150 kVp, HVL: 1.5 – 14 mm Al <sup>(1)</sup> , Active Compensation)

<b>kV/kVp</b>	
<b>RANGE</b>	45 – 150 kV/kVp
<b>UNCERTAINTY</b>	2 % (for total filtrations from 2.5 mm Al up to 15 mm Al or equivalent, Active Compensation)
<b>SENSITIVITY (R/F LOW)</b>	0.4 mA, 40 kV, 40 cm (15.7 in), no added filtration
<b>SENSITIVITY (R/F HIGH)</b>	0.8 mA, 70 kV, 50 cm (19.7 in), no added filtration
<b>EXPOSURE TIME</b>	
<b>RANGE</b>	1 ms – 999 s
<b>UNCERTAINTY</b>	0.5 % or 0.2 ms
<b>PULSE</b>	
<b>RANGE</b>	1 – 9999 pulses
<b>PEAK TRIG LEVEL (R/F LOW)</b>	> 3 µGy/s
<b>PEAK TRIG LEVEL (R/F HIGH)</b>	> 1 mGy/s
<b>HVL<sup>(3)</sup></b>	
<b>RANGE</b>	1.0 – 14.0 mm Al
<b>UNCERTAINTY</b>	10 % or ± 0.2 mm Al (at signal levels above 1/1000 of max dose rate for selected sensor)
<b>TOTAL FILTRATION<sup>(4)</sup></b>	
<b>RANGE</b>	1.5 – 35 mm Al (60 – 120 kV)
<b>UNCERTAINTY</b>	10% or ± 0.3 mm Al (at signal levels above 1/1000 of max dose rate for selected sensor)

<sup>(1)</sup> 45 mm Al added filtration at 145 kVp gives a HVL of ~13 mm Al.

<sup>(2)</sup> 1000 mGy/s up to 70 kVp, 400 mGy/s at 100 kVp, 250 mGy/s at 140 kVp.

<sup>(3)</sup> HVL is an option to RaySafe Solo R/F.

<sup>(4)</sup> Total filtration is included in the HVL option.

## RAYSAFE SOLO DOSE

**SIZE DETECTOR** 12 x 22 x 117 mm (0.5 x 0.9 x 4.6 in)  
**WEIGHT** 50 g (2 oz)

### DOSE (R/F LOW)

**RANGE** 10 nGy – 9999 Gy (1  $\mu$ R – 9999 R)  
**TRIG LEVEL** 200 nGy/s (1.4 mR/min)  
**UNCERTAINTY** 5 % or  $\pm$  10 nGy (1  $\mu$ R)  
(40 – 150 kVp, HVL: 1.5 – 14 mm Al<sup>(1)</sup>,  
Active Compensation)

### DOSE (R/F HIGH)

**RANGE** 10  $\mu$ Gy – 9999 Gy (1 mR – 9999 R)  
**TRIG LEVEL** 100  $\mu$ Gy/s (0.7 R/min)  
**UNCERTAINTY** 5 % or  $\pm$  10  $\mu$ Gy (1 mR)  
(40 – 150 kVp, HVL: 1.5 – 14 mm Al<sup>(1)</sup>,  
Active Compensation)

### DOSE RATE (R/F LOW)

**RANGE** 10 nGy/s – 1 mGy/s (70  $\mu$ R/min – 7 R/min)  
**MIN. PEAK TRIG LEVEL** 200 nGy/s (1.4 mR/min)  
**UNCERTAINTY** 5 % or  $\pm$  10 nGy/s (70  $\mu$ R/min)  
(40 – 150 kVp, HVL: 1.5 – 14 mm Al<sup>(1)</sup>,  
Active Compensation)

### DOSE RATE (R/F HIGH)

**RANGE** 20  $\mu$ Gy/s – 1000 mGy/s<sup>(2)</sup>  
(140 mR/min – 7000 R/min)  
**MIN. PEAK TRIG LEVEL** 100  $\mu$ Gy/s (0.7 R/min)  
**UNCERTAINTY** 5 % or  $\pm$  10  $\mu$ Gy/s (70 mR/min)  
(40 – 150 kVp, HVL: 1.5 – 14 mm Al<sup>(1)</sup>,  
Active Compensation)

### EXPOSURE TIME

**RANGE** 1 ms – 999 s  
**UNCERTAINTY** 0.5 % or 0.2 ms

### HVL<sup>(3)</sup>

**RANGE** 1.0 – 14.0 mm Al  
**UNCERTAINTY** 10 % or  $\pm$  0.2 mm Al (at signal levels above  
1/1000 of max dose rate for selected sensor)

### PULSE

**RANGE** 1 – 9999 pulses  
**PEAK TRIG LEVEL  
(R/F LOW)** > 3  $\mu$ Gy/s  
**PEAK TRIG LEVEL  
(R/F HIGH)** > 1 mGy/s

## RAYSAFE SOLO RAD

**SIZE DETECTOR** 12 x 22 x 117 mm (0.5 x 0.9 x 4.6 in)  
**WEIGHT** 50 g (2 oz)

### DOSE

**RANGE** 10  $\mu$ Gy – 9999 Gy  
(1 mR – 9999 R)  
**TRIG LEVEL** 100  $\mu$ Gy/s (0.7 R/min)  
**UNCERTAINTY** 5 % or  $\pm$  10  $\mu$ Gy (1 mR)  
(40 – 150 kVp, HVL: 1.5 – 14 mm Al<sup>(1)</sup>,  
Active Compensation)

### DOSE RATE

**RANGE** 20  $\mu$ Gy/s – 1000 mGy/s<sup>(2)</sup>  
(140 mR/min – 7000 R/min)  
**MIN. PEAK TRIG LEVEL** 100  $\mu$ Gy/s (0.7 R/min)  
**UNCERTAINTY** 5 % or  $\pm$  10  $\mu$ Gy/s (70 mR/min)  
(40 – 150 kVp, HVL: 1.5 – 14 mm Al<sup>(1)</sup>,  
Active Compensation)

### kV/kVp

**RANGE** 45 – 150 kV/kVp  
**UNCERTAINTY** 2 % (for total filtrations from 2.5 mm Al up to  
15 mm Al or equivalent, Active Compensation)  
**SENSITIVITY** 0.8 mA, 70 kV, 50 cm (19.7 in),  
no added filtration

### EXPOSURE TIME

**RANGE** 1 ms – 999 s  
**UNCERTAINTY** 0.5 % or 0.2 ms

### PULSE

**RANGE** 1 – 9999 pulses  
**PEAK TRIG LEVEL** > 1 mGy/s

### HVL<sup>(3)</sup>

**RANGE** 1.0 – 14.0 mm Al  
**UNCERTAINTY** 10 % or  $\pm$  0.2 mm Al (at signal levels above  
1/1000 of max dose rate for selected sensor)

### TOTAL FILTRATION<sup>(4)</sup>

**RANGE** 1.5 – 35 mm Al (60 – 120 kV)  
**UNCERTAINTY** 10% or  $\pm$  0.3 mm Al (at signal levels above  
1/1000 of max dose rate for selected sensor)

<sup>(1)</sup> 45 mm Al added filtration at 145 kVp gives a HVL of ~13 mm Al.

<sup>(2)</sup> 1000 mGy/s up to 70 kVp, 400 mGy/s at 100 kVp, 250 mGy/s at 140 kVp.

<sup>(3)</sup> HVL is an option to RaySafe Solo dose and RaySafe Solo RAD.

<sup>(4)</sup> Total filtration is included in the HVL option for RaySafe Solo RAD.

# RAYSAFE SOLO DENT

**SIZE DETECTOR** 12 x 22 x 117 mm (0.5 x 0.9 x 4.6 in)

**WEIGHT** 50 g (2 oz)

## DOSE (DENT LOW)

**RANGE** 10 nGy – 9999 Gy (1  $\mu$ R – 9999 R)

**TRIG LEVEL** 1  $\mu$ Gy/s (7 mR/min)

**UNCERTAINTY** 5 % or  $\pm$  10 nGy (1  $\mu$ R)  
(40 – 150 kVp, HVL: 1.5 – 14 mm Al<sup>(1)</sup>,  
Active Compensation)

## DOSE (DENT HIGH)

**RANGE** 10  $\mu$ Gy – 9999 Gy (1 mR – 9999 R)

**TRIG LEVEL** 100  $\mu$ Gy/s (0.7 R/min)

**UNCERTAINTY** 5 % or  $\pm$  10  $\mu$ Gy (1 mR)  
(40 – 150 kVp, HVL: 1.5 – 14 mm Al<sup>(1)</sup>,  
Active Compensation)

## DOSE RATE (DENT LOW)

**RANGE** 10 nGy/s – 1 mGy/s  
(70  $\mu$ R/min – 7 R/min)

**MIN. PEAK TRIG LEVEL** 1  $\mu$ Gy/s (7 mR/min)

**UNCERTAINTY** 5 % or  $\pm$  10 nGy/s (70  $\mu$ R/min)  
(40 – 150 kVp, HVL: 1.5 – 14 mm Al<sup>(1)</sup>, Active  
Compensation)

## DOSE RATE (DENT HIGH)

**RANGE** 20  $\mu$ Gy/s – 1000 mGy/s<sup>(2)</sup>  
(140 mR/min – 7000 R/min)

**MIN. PEAK TRIG LEVEL** 100  $\mu$ Gy/s (0.7 R/min)

**UNCERTAINTY** 5 % or  $\pm$  10  $\mu$ Gy/s (70 mR/min)  
(40 – 150 kVp, HVL: 1.5 – 14 mm Al<sup>(1)</sup>,  
Active Compensation)

## kV/kVp

**RANGE** 45 – 150 kV/kVp

**UNCERTAINTY** 2 % (for total filtrations from 2.5 mm Al  
up to 1 mm Cu or equivalent,  
Active Compensation)

**SENSITIVITY (DENT LOW)** 0.4 mA, 40 kV, 40 cm (15.7 in),  
no added filtration

**SENSITIVITY (DENT HIGH)** 0.8 mA, 70 kV, 50 cm (19.7 in),  
no added filtration

## EXPOSURE TIME

**RANGE** 1 ms – 999 s

**UNCERTAINTY** 0.5 % or 0.2 ms

## PULSE

**RANGE** 1 – 9999 pulses

**PEAK TRIG LEVEL  
(DENT LOW)** > 3  $\mu$ Gy/s

**PEAK TRIG LEVEL  
(DENT HIGH)** > 1 mGy/s

## HVL<sup>(3)</sup>

**RANGE** 1.0 – 14.0 mm Al

**UNCERTAINTY** 10 % or  $\pm$  0.2 mm Al (at signal levels above  
1/1000 of max dose rate for selected sensor)

## TOTAL FILTRATION<sup>(4)</sup>

**RANGE** 1.5 – 35 mm Al (60 – 120 kV)

**UNCERTAINTY** 10% or  $\pm$  0.3 mm Al (at signal levels above  
1/1000 of max dose rate for selected sensor)

<sup>(1)</sup> 45 mm Al added filtration at 145 kVp gives a HVL of ~13 mm Al.

<sup>(2)</sup> 1000 mGy/s up to 70 kVp, 400 mGy/s at 100 kVp, 250 mGy/s at 140 kVp.

<sup>(3)</sup> HVL is an option to RaySafe Solo DENT.

<sup>(4)</sup> Total filtration is included in the HVL option.

# RAYSAFE SOLO MAM

**SIZE DETECTOR** 117 x 22 x 12 mm

**WEIGHT** 50 g (2 oz)

## DOSE

**BEAM QUALITIES** Mo/Mo, Mo/Al, Mo/Rh, Rh/Rh, Rh/Al, W/Rh, W/Ag

**RANGE** 5 µGy – 9999 Gy (0.5 mR – 9999R)

**TRIG LEVEL** 10 µGy/s (70 mR/min)

**UNCERTAINTY** 5 % or ± 5 µGy (0.5 mR)  
(20 – 40 kV: Mo/Mo  
22 – 49 kV: Mo/Al, Rh/Rh, Rh/Al  
22 – 40 kV: Mo/Rh, W/Rh, W/Ag,  
0 – 2.5 mm Al added filtration, Active  
Compensation)

## DOSE RATE

**RANGE** 10 µGy/s – 100 mGy/s (70 mR/min – 700R/min)

**MIN. PEAK TRIG LEVEL** 10 µGy/s (70 mR/min)

**UNCERTAINTY** 5 % or ± 5 µGy/s (35 mR/min)  
(20 – 40 kV: Mo/Mo  
22 – 49 kV: Mo/Al, Rh/Rh, Rh/Al  
22 – 40 kV: Mo/Rh, W/Rh, W/Ag,  
0 – 2.5 mm Al added filtration, Active  
Compensation)

kV (only RaySafe Solo MAM, not RaySafe Solo MAM Dose)

**BEAM QUALITIES** Mo/Mo, W/Rh

**RANGE** 20 – 40 kV

**UNCERTAINTY** 2 % or ± 0.5 kV (no paddle)  
2 % or ± 0.7 kV (paddle)  
(Active Compensation for inherent Mo  
filtration of 25 – 35 µm and for inherent Rh  
filtration of 50 – 60 µm. User selectable  
paddle compensation.)<sup>(1)</sup>

**SENSITIVITY** 10 mA, 28 kV, 65 cm (25.6 in), no added  
filtration

## HVL <sup>(2)</sup>

**BEAM QUALITIES** Mo/Mo, Mo/Al, Mo/Rh, Rh/Rh, Rh/Al, W/Rh,  
W/Ag

**RANGE** 0.2 – 1.2 mm Al, depending on beam quality

**UNCERTAINTY** 5 % (for up to 2.5 mm Al added filtration to  
each beam quality)

## EXPOSURE TIME

**RANGE** 1 ms – 999 s

**UNCERTAINTY** 0.5 % or 0.2 ms

<sup>(1)</sup> Definition: Paddle = 0.1 mm Al

Note! Variation in paddle thickness and homogeneity may affect kV results. To achieve the most accurate result, kV measurements without paddle is recommended.

<sup>(2)</sup> HVL is an option to RaySafe Solo MAM.

# RAYSAFE SOLO CT

**SIZE DETECTOR** 200 x 20 x 12 mm  
(7.9 x 0.8 x 0.5 in)

**SIZE Ø DETECTOR** 7.5 mm (0.30 in)

**SIZE Ø PHANTOM  
ADAPTER** 12.5 mm (0.49 in)

**EFFECTIVE LENGTH** 100 mm (3.94 in)

**WEIGHT** 50 g (1.75 oz)

**RANGE** 10 µGy – 9999 Gy  
(1 mR – 9999 R)  
20 µGy/s – 100 mGy/s  
(140 mR/min – 680 R/min)

**UNCERTAINTY** 5 %  
(at reference point RQA9; 120 kV, 42.5 mm Al)

**ENERGY DEPENDENCE** < 5 % (at 80 kV to 150 kV; RQR and RQA  
qualities)

**RADIAL UNIFORMITY** ± 2 %

**AXIAL UNIFORMITY** ± 3 %, within rated length

**INFLUENCE OF RELATIVE  
HUMIDITY** < 0.3 % (for RH < 80 %)

**UNCERTAINTY IN  
TEMP. AND PRESSURE  
CORRECTION** 2 %

**PRESSURE RANGE** 80.0 – 106.0 kPa

**INTERNATIONAL  
STANDARD** Fulfills requirements in IEC 61674

RaySafe Solo CT detector comes with a phantom adapter to fit a standard head and/or body phantom.

# RAYSAFE SOLO LIGHT

<b>WEIGHT</b>	170 g (6 oz)
<b>RELATIVE AIR HUMIDITY RANGE</b>	< 80 %
<b>UNCERTAINTY ILLUMINANT A</b>	3 %
<b>DETECTOR MEMORY</b>	30 measurements per sensor
<b>CLASSIFICATION</b>	Class B (according to DIN 5032, part 7)
<b>MAX. DEVIATION FROM THE CIE CURVE FOR THE HUMAN EYE (V(<math>\lambda</math>))</b>	4 % (see figure Photopic Response)

## SIZE

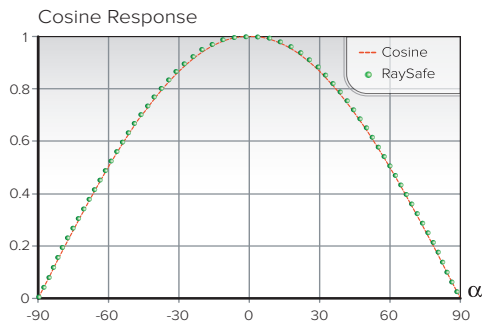
<b>LIGHT DETECTOR</b>	30 x 104 x 21 mm (1.2 x 4.1 x 0.83 in)
<b>LUMINANCE TUBE</b>	$\varnothing = 29$ mm (1.1 in) L = 84 mm (3.3 in)
<b>SHADOW RING</b>	$\varnothing = 50$ mm (2 in)

## LUMINANCE

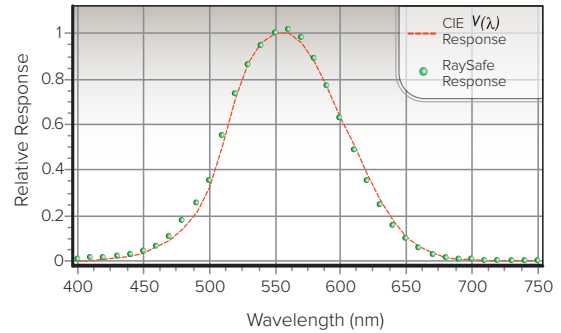
<b>RANGE (AUTO)</b>	0.05 – 50 000 cd/m <sup>2</sup>
<b>RESOLUTION</b>	0.01 cd/m <sup>2</sup>
<b>LUMINANCE DETECTOR OPTICS</b>	$\varnothing 10$ mm (0.4 in) measuring field. Contact measurement focusing lens 1:1

## ILLUMINANCE

<b>RANGE (AUTO)</b>	0.05 – 50 000 lux
<b>RESOLUTION</b>	0.01 lux
<b>MAX. DEVIATION FROM COSINE ANGULAR RESPONSE</b>	1.7 % (see figure Cosine Response)



Photopic Response



# RAYSAFE SOLO PC KIT

<b>COMPATIBLE WITH</b>	Windows 10, Windows 8, Windows 8.1, Windows 7, Windows Vista, Windows XP, Windows 2000
<b>FILE FORMAT</b>	XML
<b>COMMUNICATION</b>	RS-232 /USB or Bluetooth

## BLUETOOTH OPTION

<b>CONNECTOR</b>	9-pin D-SUB, pre-configured for communication with Xi View
<b>OPERATING DISTANCE</b>	100 m nominal (actual performance depends on environment and receiving Bluetooth module)

## WAVEFORM

<b>BANDWIDTH (R/F LOW, DENT LOW)</b>	0.1 kHz
<b>BANDWIDTH (R/F HIGH, DENT HIGH &amp; RAD)</b>	2.5 kHz
<b>BANDWIDTH (MAM)</b>	2.4 kHz
<b>BANDWIDTH (mAs)</b>	1 kHz
<b>MEMORY DEPTH</b>	1200 ms

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#### RAYSAFE UNCERTAINTY DEFINITION

The expanded uncertainty is stated as the combined uncertainty of measurement multiplied by the coverage factor  $k=2$ , which assuming a normal distribution has a coverage probability of 95 % (complies with GUM by ISO (1995, ISBN 92-67-10188-9)).

Instrument specifications are subject to purchased configuration.  
All specifications may change without notice.