

# 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 ± 0.02 mA
<b>RANGE mAs</b>	0.05 – 9999 mAs
<b>UNCERTAINTY mAs</b>	1% or ± 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

<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)

### DOSE (R/F LOW)

<b>RANGE</b>	10 nGy – 9999 Gy (1 µR – 9999 R)
<b>TRIG LEVEL</b>	100 nGy/s (0.7 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)

### DOSE (R/F HIGH)

<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)

### DOSE RATE (R/F LOW)

<b>RANGE</b>	10 nGy/s – 1 mGy/s (70 µR/min – 7 R/min)
<b>MIN. PEAK TRIG LEVEL</b>	100 nGy/s (0.7 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)

### DOSE RATE (R/F HIGH)

<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)

### EXPOSURE TIME

<b>RANGE</b>	1 ms – 999 s
<b>UNCERTAINTY</b>	0.5 % or 0.2 ms

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

<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)

### PULSE

<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

## RAYSAFE SOLO RAD

<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)

### DOSE

<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)

### DOSE RATE

<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)

### kV/kVp

<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</b>	0.8 mA, 70 kV, 50 cm (19.7 in), no added filtration

### EXPOSURE TIME

<b>RANGE</b>	1 ms – 999 s
<b>UNCERTAINTY</b>	0.5 % or 0.2 ms

### PULSE

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

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

<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)

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

<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 dose and RaySafe Solo RAD.

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

## RAYSAFE SOLO DENT

<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)

### DOSE (DENT LOW)

<b>RANGE</b>	10 nGy – 9999 Gy (1 µR – 9999 R)
<b>TRIG LEVEL</b>	1 µGy/s (7 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)

### DOSE (DENT HIGH)

<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)

### DOSE RATE (DENT LOW)

<b>RANGE</b>	10 nGy/s – 1 mGy/s (70 µR/min – 7 R/min)
<b>MIN. PEAK TRIG LEVEL</b>	1 µGy/s (7 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)

### DOSE RATE (DENT HIGH)

<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)

### kV/kVp

<b>RANGE</b>	45 – 150 kV/kVp
<b>UNCERTAINTY</b>	2 % (for total filtrations from 2.5 mm Al up to 1 mm Cu or equivalent, Active Compensation)
<b>SENSITIVITY (DENT LOW)</b>	0.4 mA, 40 kV, 40 cm (15.7 in), no added filtration
<b>SENSITIVITY (DENT HIGH)</b>	0.8 mA, 70 kV, 50 cm (19.7 in), no added filtration

### EXPOSURE TIME

<b>RANGE</b>	1 ms – 999 s
<b>UNCERTAINTY</b>	0.5 % or 0.2 ms

### PULSE

<b>RANGE</b>	1 – 9999 pulses
<b>PEAK TRIG LEVEL (DENT LOW)</b>	> 3 µGy/s
<b>PEAK TRIG LEVEL (DENT HIGH)</b>	> 1 mGy/s

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

<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)

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

<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 DENT.

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

## RAYSAFE SOLO MAM

<b>SIZE DETECTOR</b>	117 x 22 x 12 mm
<b>WEIGHT</b>	50 g (2 oz)
<b>DOSE</b>	
<b>BEAM QUALITIES</b>	Mo/Mo, Mo/Al, Mo/Rh, Rh/Rh, Rh/Al, W/Rh, W/Ag
<b>RANGE</b>	5 µGy – 9999 Gy (0.5 mR – 9999R)
<b>TRIG LEVEL</b>	10 µGy/s (70 mR/min)
<b>UNCERTAINTY</b>	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)
<b>DOSE RATE</b>	
<b>RANGE</b>	10 µGy/s – 100 mGy/s (70 mR/min – 700R/min)
<b>MIN. PEAK TRIG LEVEL</b>	10 µGy/s (70 mR/min)
<b>UNCERTAINTY</b>	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)
<b>kV</b> (only RaySafe Solo MAM, not RaySafe Solo MAM Dose)	
<b>BEAM QUALITIES</b>	Mo/Mo, W/Rh
<b>RANGE</b>	20 – 40 kV
<b>UNCERTAINTY</b>	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 55 – 60 µm. User selectable paddle compansation.) <sup>(1)</sup>
<b>SENSITIVITY</b>	10 mA, 28 kV, 65 cm (25.6 in), no added filtration
<b>HVL</b> <sup>(2)</sup>	
<b>BEAM QUALITIES</b>	Mo/Mo, Mo/Al, Mo/Rh, Rh/Rh, Rh/Al, W/Rh, W/Ag
<b>RANGE</b>	0.2 – 1.2 mm Al, depending on beam quality
<b>UNCERTAINTY</b>	5 % (for up to 2.5 mm Al added filtration to each beam quality)

### EXPOSURE TIME

<b>RANGE</b>	1 ms – 999 s
<b>UNCERTAINTY</b>	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.

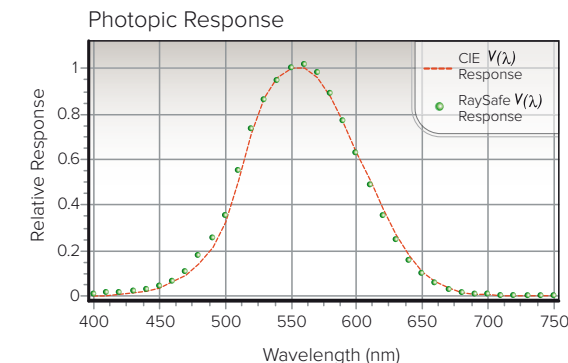
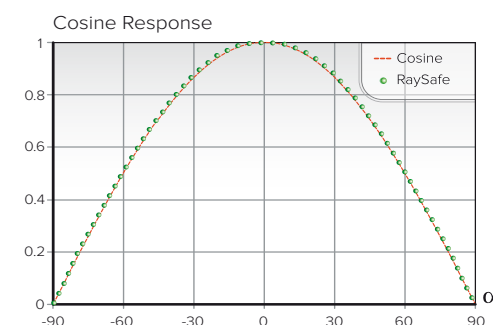
## RAYSAFE SOLO CT

<b>SIZE DETECTOR</b>	200 x 20 x 12 mm (7.9 x 0.8 x 0.5 in)
<b>SIZE Ø DETECTOR</b>	7.5 mm (0.30 in)
<b>SIZE Ø PHANTOM ADAPTER</b>	12.5 mm (0.49 in)
<b>EFFECTIVE LENGTH</b>	100 mm (3.94 in)
<b>WEIGHT</b>	50 g (1.75 oz)
<b>RANGE</b>	10 µGy – 9999 Gy (1 mR – 9999 R) 20 µGy/s – 100 mGy/s (140 mR/min – 680 R/min)
<b>UNCERTAINTY</b>	5 % (at reference point RQA9; 120 kV, 42.5 mm Al)
<b>ENERGY DEPENDENCE</b>	< 5 % (at 80 kV to 150 kV; RQR and RQA qualities)
<b>RADIAL UNIFORMITY</b>	± 2 %
<b>AXIAL UNIFORMITY</b>	± 3 %, within rated length
<b>INFLUENCE OF RELATIVE HUMIDITY</b>	< 0.3 % (for RH < 80 %)
<b>UNCERTAINTY IN TEMP. AND PRESSURE CORRECTION</b>	2 %
<b>PRESSURE RANGE</b>	80.0 – 106.0 kPa
<b>INTERNATIONAL STANDARD</b>	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</b>	3 %
<b>ILLUMINANT A</b>	
<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(λ))</b>	4 % (see figure Photopic Response)
<b>SIZE</b>	
<b>LIGHT DETECTOR</b>	30 x 104 x 21 mm (1.2 x 4.1 x 0.83 in)
<b>LUMINANCE TUBE</b>	Ø = 29 mm (1.1 in) L = 84 mm (3.3 in)
<b>SHADOW RING</b>	Ø = 50 mm (2 in)
<b>LUMINANCE</b>	
<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>	Ø 10 mm (0.4 in) measuring field. Contact measurement focusing lens 1:1
<b>ILLUMINANCE</b>	
<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)



## RAYSAFE SOLO PC KIT

<b>COMPATIBLE WITH</b>	Windows 7, Windows Vista, Windows 98 (Second Edition, OSR2), Windows XP, Windows 2000
<b>FILE FORMAT</b>	XML
<b>COMMUNICATION</b>	RS-232 /USB or Bluetooth
<b>BLUETOOTH OPTION</b>	
<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)
<b>WAVEFORM</b>	
<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.

