RaySafe X2

Specifications

RaySafe™

X2 GENERAL

EMC	According to IEC 61326-1
SAFETY	According to IEC 61010-1
X-RAY METERS STANDARD	Complies with IEC 61674
EXPOSURES NEEDED	One
USB CABLES	2 m (6.6 ft), 5 m (16.4 ft) and 5 m active extender
SIZE BASE UNIT	34 x 85 x 154 mm (1.3 x 3.3 x 6.1 in)
WEIGHT BASE UNIT	521 g (18.4 oz)
OPERATING TEMPERATURE	15 – 35 °C (59 – 95 °F)
STORAGE TEMPERATURE	-25 – 70 °C (-13 – 158 °F)
POWER SOURCE	Rechargeable Li ion battery
BATTERY TIME	~ 10 hours intensive usage
BATTERY TESTED	According to UN 38.3
DISPLAY	4.3" LCD with capacitive touch
MEMORY	~ 10000 latest exposures
SOFTWARE	X2 View for data handling and analysis. Also exports data to Microsoft Excel.
PTB CERTIFICATE	DE-17-M-PTB-0053

X2 mAs

mAs	
RANGE	0.001 – 9999 mAs
RESOLUTION	0.001 mAs
UNCERTAINTY	1 %
mA	
RANGE (PEAK)	0.1 – 1500 mA
RESOLUTION	0.01 mA
UNCERTAINTY	1 %
TIME	
RANGE	1 ms – 999 s
RESOLUTION	0.1 ms
BANDWIDTH	1 kHz
UNCERTAINTY	0.5 %
PULSES	
RANGE	1 – 9999 pulses
RESOLUTION	1 pulse
PULSE RATE	
RANGE	0.1 – 200 pulses/s
RESOLUTION	0.1 pulse/s
mAs/PULSE	
RANGE	0.001 – 9999 mAs
RESOLUTION	0.001 mAs
UNCERTAINTY	1 %
WAVEFORM	
RESOLUTION	125 µs*
BANDWIDTH	1 kHz

* automatically reduced for exposures longer than 3 s

UNFORS 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.

X2 R/F SENSOR

WEIGHT	42 g (1.5 oz)
SIZE	14 x 22 x 79 mm (0.5 x 0.9 x 3.1 in)

ACTIVE COMPENSATION

Beam quality independent for the following ranges:

DOSE/DOSE RATE	40 – 150 kVp, 1 – 14 mm Al HVL
kVp	40 – 150 kVp, up to 1 mm Cu
TF	60 – 120 kVp, up to 1 mm Cu

DOSE

RANGE	1 nGy – 9999 Gy (0.1 µR – 9999 R)
UNCERTAINTY	5 % or 5 nGy (0.5 µR)

DOSE RATE

RANGE	1 nGy/s – 500 mGy/s (5 µR/min – 3400 R/min)
RESOLUTION	1 nGy/s (5 µR/min)
TRIG LEVEL	50 nGy/s (340 µR/min)
UNCERTAINTY	5 % or 10 nGy/s (70 µR/min) x duty cycle

kVp

RANGE	40 – 150 kVp
MINIMUM DOSE	50 µGy (6 mR)
MINIMUM DOSE RATE (PEAK)	10 µGy/s (70 mR/min)
UNCERTAINTY	2 %

HVL

RANGE	1 – 14 mm Al
MINIMUM DOSE	1 µGy (120 µR)
MINIMUM DOSE RATE (PEAK)	0.5 µGy/s (3.5 mR/min) at > 70 kV 2.5 µGy/s (17 mR/min) at 50 kV
UNCERTAINTY	10 %

TOTAL FILTRATION

RANGE	1.5 – 35 mm Al
MINIMUM DOSE	50 µGy (6 mR)
MINIMUM DOSE RATE (PEAK)	10 µGy/s (70 mR/min)
UNCERTAINTY	10 % or 0.3 mm Al

TIME

RANGE	1 ms – 999 s
RESOLUTION	0.1 ms
BANDWIDTH	4 Hz – 4 kHz*
UNCERTAINTY	0.5 %

* automatically adjusted depending on signal level

PULSES

RANGE	1 – 9999 pulses
MINIMUM DOSE RATE (PEAK)	0.5 µGy/s (3.5 mR/min)

PULSE RATE

RANGE	0.1 – 200 pulses/s
MINIMUM DOSE RATE (PEAK)	0.5 µGy/s (3.5 mR/min)

DOSE/PULSE

RANGE	1 nGy/pulse – 999 Gy/pulse (0.1 µR/pulse – 999 R/pulse)
MINIMUM DOSE RATE (PEAK)	0.5 µGy/s (3.5 mR/min)

WAVEFORMS

RESOLUTION	62.5 µs*
BANDWIDTH kV	0.1 – 0.4 kHz**
BANDWIDTH DOSE RATE	4 Hz – 4 kHz**

* automatically reduced for exposures longer than 1.5 s
** automatically adjusted depending on signal level

X2 MAM SENSOR

WEIGHT	42 g (1.5 oz)
SIZE	14 x 22 x 79 mm (0.5 x 0.9 x 3.1 in)

ACTIVE COMPENSATION

Beam quality independent for the following ranges:

DOSE/DOSE RATE & HVL
No selections needed.
With or without paddle, with or without phantom.

Mo/Mo, Mo/Rh	20 – 40 kVp
Rh/Ag	27 – 40 kVp
Mo/Al, W/Rh, W/Ag, W/Al, Rh/Rh, Rh/Al	20 – 50 kVp
Mo/Cu, Rh/Cu, W/Cu, W/Ti	40 – 50 kVp

kVp
User selectable beam qualities.
Paddle compensation available when relevant.

W/Ag	20 – 40 kVp
W/Al	20 – 50 kVp Measuring above 40 kVp requires an X2 R/F Sensor + 2 mm Al (incl.)
W/Rh	20 – 40 kVp
Mo/Mo	20 – 40 kVp
Mo/Rh	32 – 40 kVp using + 2 mm Al (incl)
Rh/Ag	27 – 40 kVp
Mo/Cu, W/Cu, W/Ti	40 – 50 kVp, using the X2 R/F Sensor

DOSE

RANGE	1 µGy – 9999 Gy (0.1 mR – 9999 R)
UNCERTAINTY	5 %

DOSE RATE

RANGE	10 µGy/s – 300 mGy/s (70 mR/min – 2000 R/min)
UNCERTAINTY	5 %

kVp

RANGE	20 – 50 kVp* Measuring above 40 kVp requires an X2 R/F Sensor and on W/Al +2 mm Al (incl.)
MINIMUM DOSE	50 µGy (6 mR)
MINIMUM DOSE RATE (PEAK)	10 µGy/s (70 mR/min)
UNCERTAINTY	2 % or 0.5 kV (without paddle) 2 % or 0.7 kV (with paddle)

* depending on beam quality, see active compensation

HVL

RANGE	0.2 – 3.6 mm Al
MINIMUM DOSE	1 µGy (0.1 mR)
UNCERTAINTY	5 % above 25 kV 10% below 25 kV

TIME

RANGE	1 ms – 999 s
RESOLUTION	0.1 ms
BANDWIDTH	400 Hz
UNCERTAINTY	0.5 %

PULSES

RANGE	1 – 9999 pulses

PULSE RATE

RANGE	0.1 – 200 pulses/s

DOSE/PULSE

RANGE	1 µGy/pulse – 999 Gy/pulse (0.1 mR/pulse – 999 R/pulse)

WAVEFORMS

RESOLUTION	62.5 µs**
BANDWIDTH	400 Hz

** automatically reduced for exposures longer than 1.5 s

X2 LIGHT SENSOR

WEIGHT	136 g (4.8 oz)
SIZE	48 x 60 x 68 mm (1.9 x 2.4 x 2.7 in)
CLASSIFICATION	DIN 5032 part 7 class B
STANDARDS	Complies with relevant parts of AAPM TG18, IEC 62563-1 and IEC 61223-2-5.

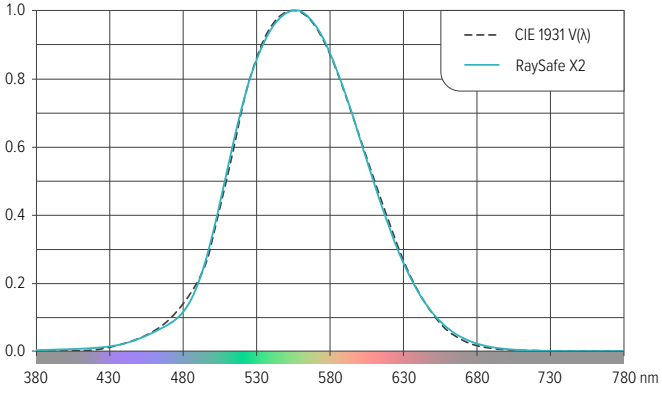
LUMINANCE

RANGE	0.01 – 10 000 cd/m^2 (0.03 – 34 000 fL)
RESOLUTION	0.001 cd/m^2 (0.001 fL)
APERTURE ANGLE	5°
MEASUREMENT AREA	ø 10 mm (0.4 in)
UNCERTAINTY ILLUMINANT A	3%
DEVIATION FROM HUMAN EYE V(λ) (f_1')	< 3 % (see figure Photopic Response)

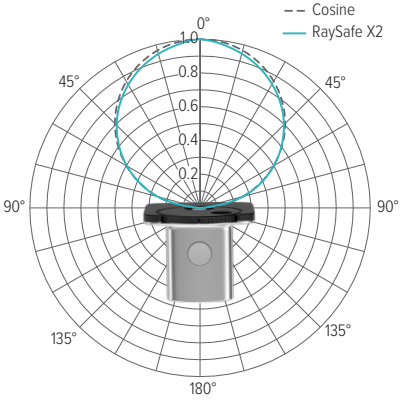
ILLUMINANCE

RANGE	0.1 – 100 000 lux (0.01 – 9000 fc)
RESOLUTION	0.01 lux (0.001 fc)
UNCERTAINTY ILLUMINANT A	3%
DEVIATION FROM HUMAN EYE V(λ) (f_1')	< 3 % (see figure Photopic Response)
COSINE DEVIATION (f_2)	< 3 % (see figure Cosine Response)

Photopic Response



Cosine Response



X2 SURVEY SENSOR

DIMENSIONS	14 x 66 x 192 mm (0.5 x 2.6 x 7.6 in)
WEIGHT	140 g (4.9 oz)
ACTIVE COMPENSATION	H*(10) – when selecting Sv Air kerma – when selecting Gy or R

TRIG MODES

MANUAL	Manual start and stop of measurement
AUTO	Trig level (N80): 10 µGy/h (1.2 mR/h) or 20 µSv/h

H*(10)

RANGE	0 nSv – 9999 Sv
RESOLUTION	1 nSv
UNCERTAINTY	10 %, N-series 20 – 150 kV

H*(10) RATE

RANGE	0 µSv/h – 150 mSv/h
UNCERTAINTY	10 % or 0.3 µSv/h, N-series 20 – 150 kV

AIR KERMA

RANGE	0 nGy – 9999 Gy (0 µR – 9999 R)
RESOLUTION	1 nGy (0.1 µR)
UNCERTAINTY	5 %, RQA 50 – 150 kV 10 %, N-series 40 – 150 kV

AIR KERMA RATE

RANGE	0 µGy/h – 100 mGy/h (0 mR/h – 10 R/h)
UNCERTAINTY	5 % or 0.3 µGy/h (0.03 mR/h), RQA 50 – 150 kV 10% or 0.3 µGy/h (0.03 mR/h), N-series 40 – 150 kV

MEAN ENERGY

RANGE	30 – 120 keV
UNCERTAINTY	10 %
MINIMUM DOSE RATE	10 µSv/h or 10 µGy/h (1 mR/h)
DEFINING STANDARD:	ISO 4037-1

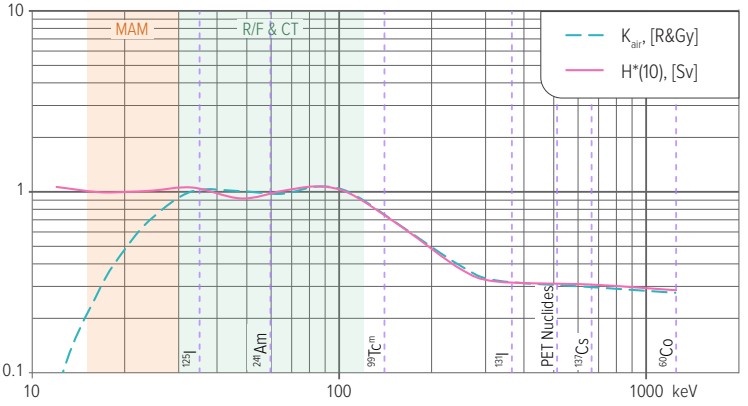
TIME

RANGE	0.1 – 9999 s
RESOLUTION	0.01 s
BANDWIDTH	1 Hz

WAVEFORM

RESOLUTION	10 ms
BANDWIDTH	1 Hz
MINIMUM DOSE RATE	1 µSv/h or 1 µGy/h (0.1 mR/h)

Typical response



X2 CT SENSOR

WEIGHT	86 g (3.0 oz)
SIZE	14 x 22 x 219 mm (0.5 x 0.9 x 8.6 in)
SIZE Ø	12.0 mm (0.47 in)
STANDARD	For measurements in accordance with IEC 60601-2-44
ACTIVE LENGTH	100 mm (3.94 in)
ENERGY DEPENDENCE	< 5 % for 70 – 150 kV (RQR, RQA and RQT beam qualities)
AUTOMATIC ENVIRONMENTAL COMPENSATION	55 – 110 kPa, 15 – 35 °C (59 – 95 °F)

DOSE

RANGE	10 µGy – 999 Gy (1 mR – 999 R)
UNCERTAINTY	5 %

DOSE LENGTH PRODUCT

RANGE	100 µGycm – 9999 Gycm (10 mRcm – 9999 Rcm)
UNCERTAINTY	5 %

DOSE RATE

RANGE	10 µGy/s – 250 mGy/s (70 mR/min – 1700 R/min)
UNCERTAINTY	5 %

TIME

RANGE	10 ms – 999 s
RESOLUTION	1 ms
BANDWIDTH	10 Hz
UNCERTAINTY	0.5 %

WAVEFORMS

RESOLUTION	1 ms
BANDWIDTH	10 Hz

Unfors RaySafe offers comprehensive solutions for the X-ray room to measure the performance of X-ray equipment and to monitor medical staff dose in real-time.

RaySafe helps you avoid unnecessary radiation.

www.raysafe.com

RaySafe™