

# Calibration Certificate



2035  
ISO/IEC 17025

**Customer**

Konex Industria e Comercio  
Ltda.  
Rua Joao Mafra, 424 jd da  
Saude  
CNPJ: 48.203.210/0001-03  
04288-000 Sao Paulo, SP  
Brazil


**Laboratory**

Unfors RaySafe AB  
Uggledalsvägen 29, SE-427 40 Billdal, Sweden  
+46 31 719 97 10 (phone), +46 31 910 950 (fax)  
customerservice.se@raysafe.com

**Customer Instrument**

Product X2 R/F  
Serial Number 218936  
Manufacturer RaySafe

**Calibration Information**

As Found Not performed  
As Left 2016-08-05  
Adjustment Done Yes  
Tested by Anna Wendel  
Approved by   
Örjan Arnström  
Certificate Date 2016-08-11

This laboratory is accredited by the "Swedish Board for Accreditation and Conformity Assessment" (SWEDAC) and the results shown in this certificate have been determined within the scope of accreditation unless stated otherwise in this certificate.



# Laboratory Information

## ENVIRONMENTAL CONDITIONS

Ambient temperature: 15 – 30 °C

Relative humidity: < 80 %

## CALIBRATION METHODS

RaySafe calibration methods used are "Calibration method for Air Kerma Rate.ACCR-1112", "Calibration method for Air Kerma.ACCR-0453" and "Calibration method for Voltage.ACCR-0454".

## LABORATORY CALIBRATION

All standards are calibrated once a year. Voltage standards are traceable to SP Technical Research Institute of Sweden. All air kerma and air kerma rate standards are traceable to PTB, and NIST on available beam qualities.

# Calibration As Left

## REFERENCE EQUIPMENT

INSTRUMENT	VALID UNTIL DATE
CPI Indico 100 Serial number: AM13295D10	2017-05-18
Varian A196 Serial number: 93085-S4	
RaySafe Xi R/F Serial Number: 187339	2017-05-20
Unfors MoM 100 S/N: 180811	2017-05-20

## MEASUREMENTS

### Air Kerma

Set Voltage	Anode Target	Nominal tube filtration	Added filtration	Air Kerma Rate $\mu\text{Gy/s}$	Instrument setting	Standard $\mu\text{Gy}$	Deviation from standard	Deviation limit	Uncertainty
50 kV	W	2.5 mm Al	0 mm Al	4974	--	1583	-1.6%	3.7%	1.3%
70 kV	W	2.5 mm Al	0 mm Al	4209	--	1347	-0.3%	3.7%	1.3%
100 kV	W	2.5 mm Al	0 mm Al	1987	--	646.1	1.1%	3.8%	1.2%
150 kV	W	2.5 mm Al	0 mm Al	2845	--	944.9	0.4%	3.8%	1.2%
80 kV	W	2.5 mm Al	26 mm Al	654.6	--	211.0	-0.6%	3.7%	1.3%

### Air Kerma Rate

Set Voltage	Anode Target	Nominal tube filtration	Added filtration	Standard $\mu\text{Gy/s}$	Deviation from standard	Deviation limit	Uncertainty
80 kV	W	2.5 mm Al	26 mm Al	1.043	-1.7%	3.2%	1.8%

### HVL (Non-Accredited)

Set Voltage	Anode Target	Nominal tube filtration	Added filtration	Air Kerma Rate $\mu\text{Gy/s}$	Instrument setting	Standard mmAl	Deviation from standard	Deviation limit
70 kV	W	2.5 mm Al	0 mm Al	4209	--	2.744	2.4%	10.0%

### Voltage

Set Voltage	Anode Target	Nominal tube filtration	Added filtration	Air Kerma Rate $\mu\text{Gy/s}$	Instrument setting	Standard kV	Deviation from standard	Deviation limit	Uncertainty
50 kV	W	2.5 mm Al	0 mm Al	4974	--	49.95	0.1%	1.5%	0.5%
70 kV	W	2.5 mm Al	0 mm Al	4209	--	69.90	0.0%	1.5%	0.5%
100 kV	W	2.5 mm Al	0 mm Al	1987	--	99.76	0.4%	1.4%	0.6%
150 kV	W	2.5 mm Al	0 mm Al	2845	--	149.4	-0.1%	1.3%	0.7%
80 kV	W	2.5 mm Al	26 mm Al	654.6	--	79.86	0.1%	1.2%	0.8%



## Appendix for Accredited Measurements

### INFORMATION ON ASSESSMENT OF COMPLIANCE WITH SPECIFICATION

#### UNCERTAINTY

All measurements are associated with some level of uncertainty. According to (EA-4/02 (Expression of the Uncertainty of Measurement in Calibration) and ISO/IEC Guide 98-3:2008, Guide to the Expression of Uncertainty in Measurement (GUM)), the uncertainty is stated as the probability that the measurement result is within a certain tolerance interval.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , which for a normal distribution provides a level of confidence of approximately 95%.

#### TOLERANCE LIMIT FOR CALIBRATION AS FOUND

When an instrument arrives for service at Unfors RaySafe, a calibration is performed. The measurement results for the tested instrument are compared with a tolerance limit. Unfors RaySafe will indicate an instrument as Out of Tolerance if the measurement is outside the specification with a probability of at least 95%. The tolerance limit for calibration as found is the specification increased by the expanded uncertainty of measurement.

In the example below, only the measurement point marked with a star (\*) will be indicated as Out of Tolerance.

