RaySafe Pro-Slit Camera

ABOUT THE PRO-SLIT CAMERA

The RaySafe Pro-Slit device is a so called slit camera for accurate measurement of the focal spot size according to IEC 60336.

Its smart design enables repeatability and accuracy and the possibility to measure the size of any focal spot with one tool.

This test tool can be used with the Pro-Stand (not included) in order to enable an easy and repeatable measurement setup.

SPECIFICATIONS (CAN BE MODIFIED TO CUSTOMER REQUIREMENTS)

Dimensions	40 x 40 x 10 mm (1.57x1.57x0.39 in.)
Slit Size	0.01 mm ($3.9 \cdot 10^{-4}$ in.) wide and 10 mm (0.39 in.) long slit with 8° spread
Nominal Focal Spot Range	Supports the range described in IEC 60336:2020 for the slit evaluation method: 0.1 mm ($3.9 \cdot 10^{-3}$ in.) to 3.0 mm (0.12 in.)
Material	Tungsten embedded in PMMA and brass
Standards	Complies with the following standards: • IEC 60336:2020 • IEC 61223-3-1, 2, 4:1999

TEST PROCEDURE AND EVALUATION

Note! Make sure to comply with local regulations! For complete guidance on positioning the RaySafe Pro-Stand, see its manual.

1. Remove objects between the focal spot and the table, e.g. compression device, diaphragms, cones, etc.

2. Make sure the X-ray machine film or digital detector is in place.

3. Place the stand on the X-ray machine imaging table or other surface enabling it to be positioned perpendicular to the beam axis (maximum angle 1° according to EN 60336).

4. Adjust the stand height (y) so the minimum enlargement in the table below is achieved (use Equation 1):
   From geometry rules we get $(x+y)/x = L_2/L_1$, which means $1+y/x = (L_2/L_1)$ $y/x = L_2/L_1-1$. This is the same as the enlargement factor E which consequently can be calculated in two ways:
   Equation 1: $E = y/x$, and
   Equation 2: $E = (L_2/L_1)-1 = (L_2/10)-1$
   y=Slit to detector distance, x=Slit to focal spot distance $\geq$ 100 mm (according to EN 60336).
   L1=Slit length=10 mm, L2=Measured slit length in image.

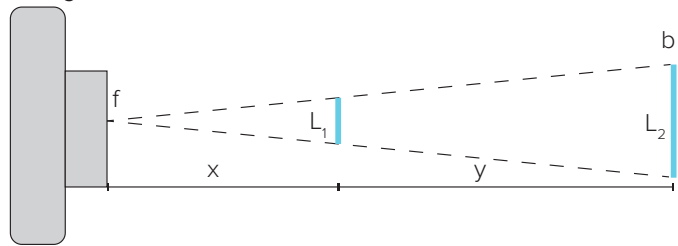| Minimum Enlargement	
Nominal Focal Spot Size (F, mm)	Enlargement
F<0.4	>3
0.4<F<2.5	>2
F>2.5	>1

Table 1.   Enlargement requirements depending on the X-ray machine and its nominal focal spot size which ultimately determines slit camera positioning.

5. Place the Pro-Slit on the stand's table so the slit is aligned with the anode-cathode axis. This corresponds to the focal spot width in the anode-cathode axis.

6. Make an exposure choosing the appropriate X-ray machine parameters to achieve the best contrast.

7. Rotate the Pro-Slit 90° so the slit is perpendicular to the anode-cathode axis, and make another separate exposure (avoid double exposure of the previously acquired image). This corresponds to the spread of the focal spot perpendicular to the anode-cathode axis (focal spot length).

8. Develop the film/save images on a computer.

9. Measure the lengths of the acquired slit images and calculate the enlargement:
   Example: If L=32 mm (1st exposure), E=(32/10)-1=2.2.

10. Measure the slit thickness for the two images using software or a magnifying glass.

11. To calculate focal spot dimensions, divide the measured width values by the calculated enlargement factor.
    If the measured width b_w=2.9 mm (1st exposure), the focal spot width f_w=2.9/2.2=1.32 mm
    If the measured width b_l=4.1 mm (2nd exposure), the focal spot length f_l=4.1/2.2=1.86 mm

12. Find the nominal focal spot value for your X-ray tube and compare your measured result with the corresponding limiting values given in Table 2 (EN 60336) on the next page.
    If the nominal value is 1.0, the calculated focal spot width 1.32 ≤ 1.40, and the calculated focal spot length 1.86 ≤ 2.00. This means performance is confirmed to be ok.

*Note! For some applications, the nominal focal spot value declaration consists of a pair of numbers,
e.g. 1.0 x 1.6. Then use the smaller nominal spot value, the width, when checking against Table 2.*

Nominal Focal Spot	Maximum Focal Spot Dimensions in mm	
F	Width	Length[2]
0.1	0.15	0.15
0.15	0.23	0.23
0.2	0.30	0.30
0.25	0.38	0.38
0.3	0.45	0.65
0.4	0.60	0.85
0.5	0.75	1.10
0.6	0.90	1.30
0.7	1.10	1.50
0.8	1.20	1.60
0.9	1.30	1.80
1.0	1.40	2.00
1.1	1.50	2.20
1.2	1.70	2.40
1.3	1.80	2.60
1.4	1.90	2.80
1.5	2.00	3.00
1.6	2.10	3.10
1.7	2.20	3.20
1.8	2.30	3.30
1.9	2.40	3.50
2.0	2.60	3.70
2.2	2.90	4.00
2.4	3.10	4.40
2.6	3.40	4.80
2.8	3.60	5.20
3.0	3.90	5.60
For nominal focus spot values between 0.3 and 3.0, the maximun focal spot length values have been adjusted by the correction factor 0.7.		

Table 2.   Maximum permissible values for focal spot dimensions based on the nominal focal spot value.

WARRANTY

Unfors RaySafe warrants to the original product purchaser that each product it manufactures will be free from defects in material and workmanship under normal use and service. The warranty period is 12 months and begins on the date of delivery.