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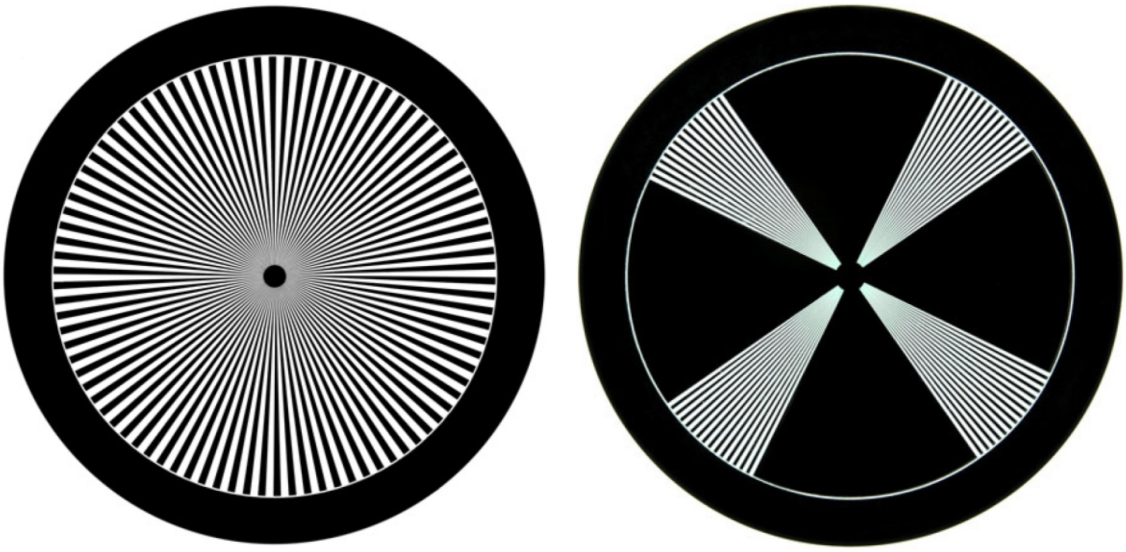
STAR TEST PATTERNS

user manual



Star X-ray Test Patterns

DESCRIPTION

The test type 9-0,5 consists of 60 spoke pairs divided into four 15° sectors. Each spoke diverges at an angle of 0,5°.

The test type 9-2,0 consists of 44 spoke pairs divided into four 45° sectors and diverging at an angle of 2° for each spoke.

The test type 9-2,0-360 is divided into 90 spoke pairs, each spoke diverges at an angle of 2°.

The test type 9-1,5 consists of 48 spoke pairs divided into four 35° sectors. Each spoke diverges at an angle of 1,5°.

INSTRUCTIONS FOR USE

Focal spot size can be determined with the 9 - 2,0°; 9 - 1,5°; 9 - 1,0°; 9 - 0,5°; 9 - 2,0° - 360; 9 - 1,5° - 360 test plates by observing the regions of blurring which occur when the star pattern is radiographed by an x-ray source of finite dimensions.

Radiation from different areas of the focal spot will cause a periodic blurring of the pattern due to penumbra effects. Knowledge of the geometric factors and the distance from the centre of the pattern to the region where blurring occurs will permit the calculation of the focal spot size with the same accuracy as measurements made with a pinhole camera.

Note:
The minimum focal spot size measurable with the 2,0° star is 0.05cm. For smaller focal spots, a 1,5°, 1,0° or a 0,5° star should be used.

1. Mount the star test plate so that the radiographic central ray is perpendicular to the star pattern and passes through the centre of the star. It is usually convenient to tape the plate directly to the face of the collimator. If an under-the-table tube is being checked, the test plate can be placed on the table and a test film taken.

2. Place a radiographic film (direct film exposure) at about the same distance from the test plate as the plate is from the focal spot, (this will give a magnification of two) and align it so that the central ray strikes the centre of the film. The film should be parallel to the test plate. If the blur pattern is too small, magnification can be increased by moving the film further from the test plate. If the blur pattern is too large, magnification can be decreased by moving the film closer to the tube. The film can be used with a screen or in a cardboard holder. The kV and mA should be comparable to that used clinically, to get the true focal size which is somewhat dependent upon the electrical factors employed. Recommended technique should be one half the maximum mA at 75 kVp. Exposure time will vary according to the film speed used. The density of the image should be about 1.5.

3. Develop the film. Standard film processing procedures should be followed.

4. Determine the magnification (M) by dividing the diameter of the radiographic image of the star pattern by the true star test pattern diameter (45 mm).

5. Scan the star pattern on the radiograph inward from the periphery to find the outermost region in which the image of the sectors disappears. This is the region of zero contrast. Measure the diameter of this region across its greatest extent and also in the perpendicular dimension. Let these diameters be called D1 and D2.

6. The focal spot size corresponding to the individual diameter dimensions can be determined by the following formula:

$$F = \frac{N}{57.3} \times \frac{D}{(M - 1)}$$

Where:

F is the focal spot size in mm
N is the angle of the star pattern line (which is marked on the test plates, 0,5°; 1,0°; 1,5° or 2,0°)
D is the diameter of the zero contrast region in mm (either D1 or D2)
M is the magnification

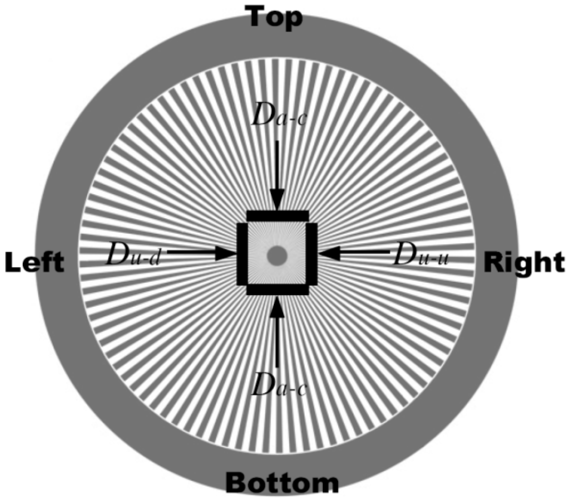
7.See Page 3 for an example calculation of focal spot size.

8.a. Several regions of zero contrast may be found on a single film. It is extremely important that the largest one be used. If there is any doubt (i.e. the focal spot calculation yields low values), then a second exposure with a longer magnification should be taken.

b. If the test plate is not properly centred, the pattern of the star will appear distorted. The pattern should be realigned and the exposure repeated.

c. Formula and data presented yields the equivalent homogenous focal spot size.

Figure 1: Typical radiograph of focal spot



Note:
Due to the resolution limitations of the printing process, the above model 9-2,0-360 picture has been retouched to enhance the focal spot image.

For the radiograph shown:

$$F = \frac{N}{57.3} \times \frac{D}{(M - 1)}$$

N = 2

Magnification (M - 1) = 0.18

$$M = \frac{53mm}{45mm} = 1.18$$

For the Anode-Cathode Diameter:

$$D_{u-d} = 28mm$$

$$F_{u-d} = \frac{2}{57.3} \times \frac{28}{0.18}$$

$$F_{u-d} = 5.4mm$$

For the Transverse Diameter:

$$D_{a-c} = 34mm$$

$$F_{a-c} = \frac{2}{57.3} \times \frac{34}{0.18}$$

$$F_{a-c} = 6.6mm$$

Therefore:

The focal spot is 5.4 mm x 6.6 mm at the kVp and mA setting used.

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