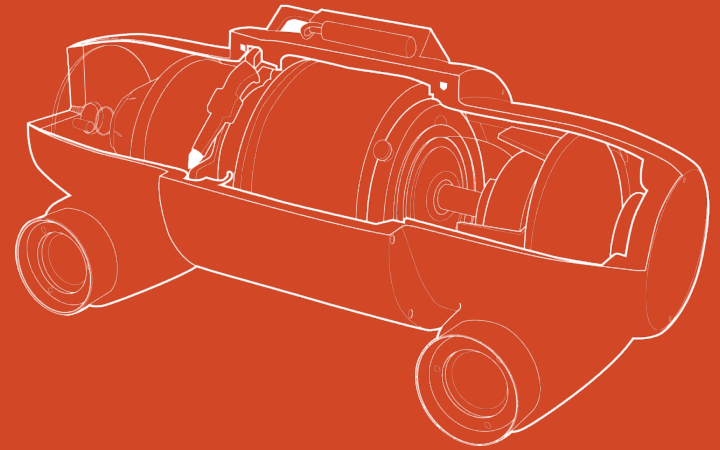
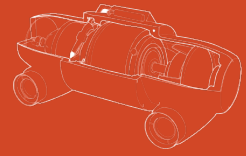


XRAY TUBE

X-ray Tube



TO FSJ (gen)



TO FSJ (gen):

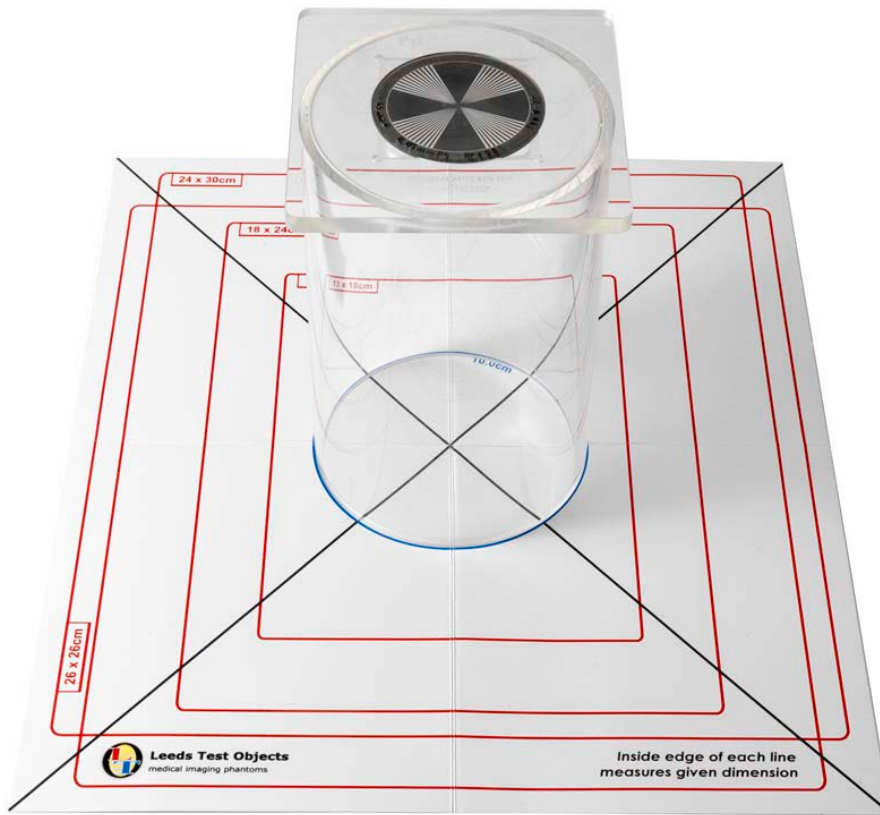
Measures focal spot size

TO FSJ (gen) includes:

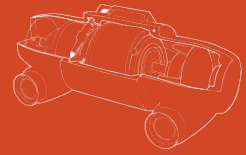
- Cylinder with bonded lid
- Alignment tube
- Card alignment sheet
- Hard carry case

Test patterns available separately, to suit customer:

- Slit Camera
- Type 41-010 – LP/mm
- Type 9/20-005 - Star



TO FSJ (gen)

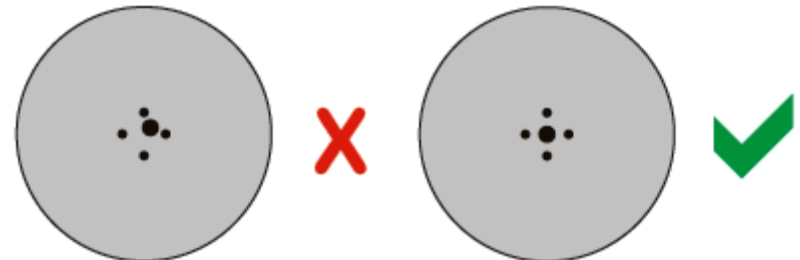
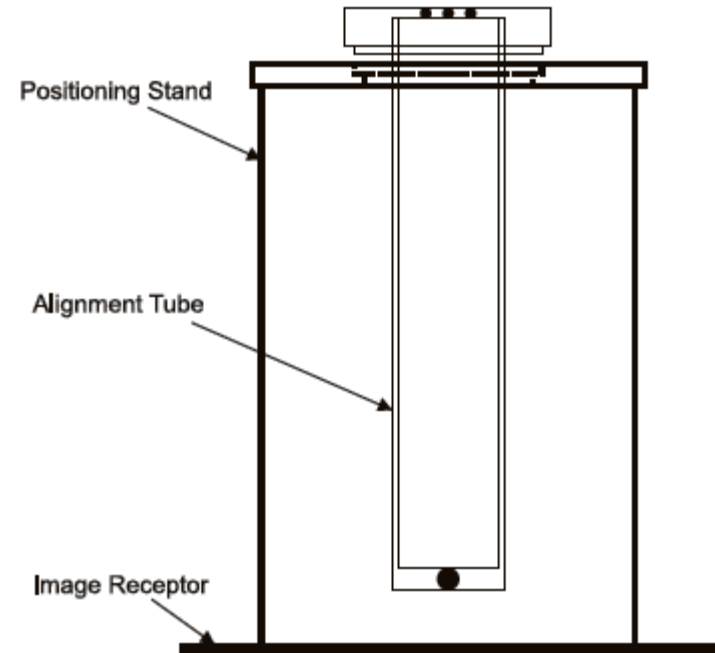


Phantom Positioning:

- Lay cardboard on image receptor
- Align to light field (if applicable & calibrated)
- Place cylinder onto card

or

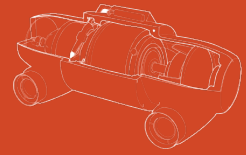
- Place cylinder onto image receptor
- Slide alignment tube into cylinder
- Check central alignment under X-ray



Exposure Conditions:

Refer to User Manual for details

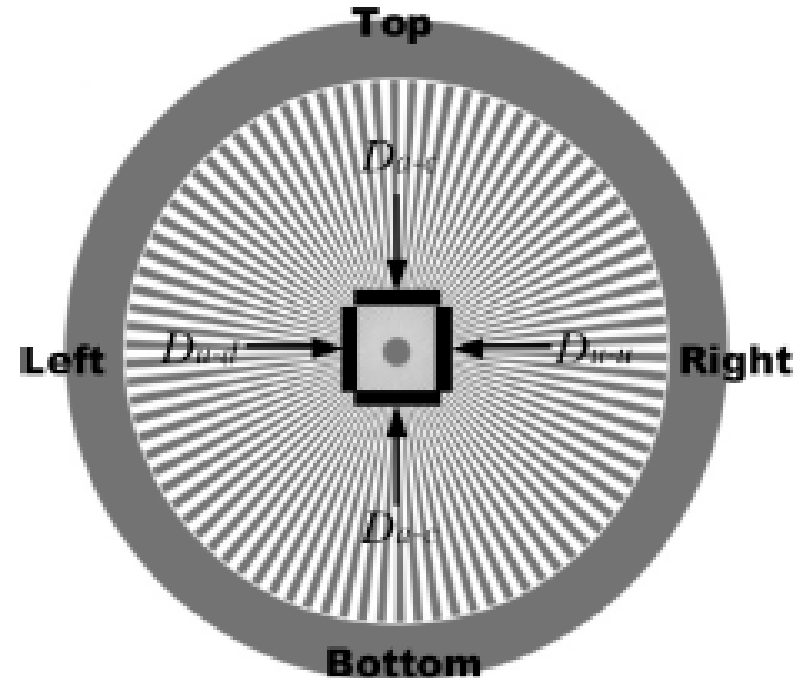
TO FSJ (gen)



Star test patterns:

Measure the width and length of the blurred region (“zero contrast region”)

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



Where:

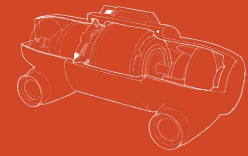
F is the focal spot size in mm

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

TO FSJ (gen)

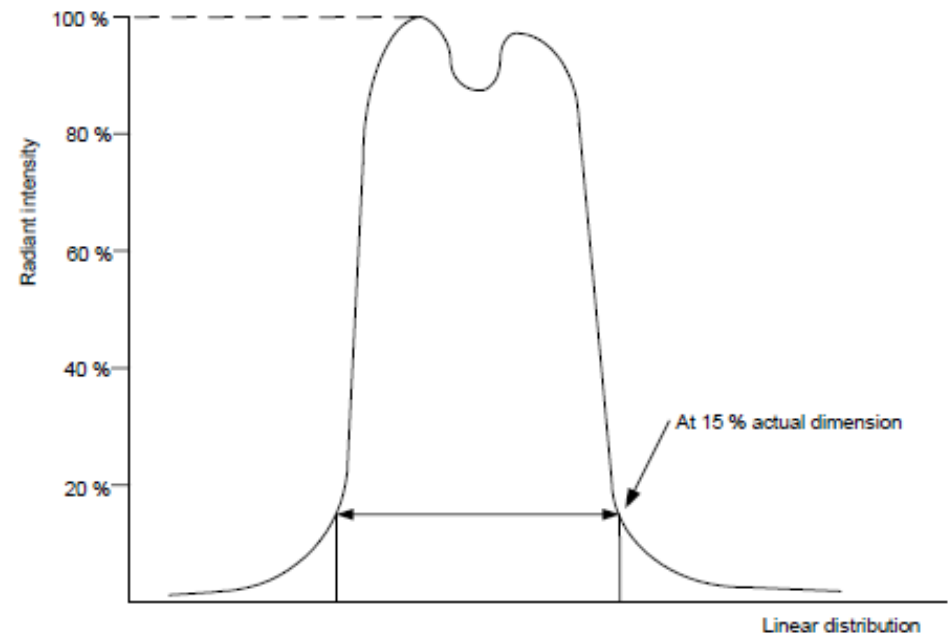


LP/mm test patterns:

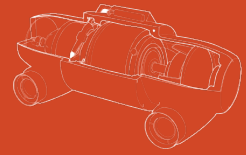
- Measure the limiting spatial resolution
- Use the conversion tables in the user manual (evidence-based)

Slit camera:

- Take 2 images, at 90°
- Measure the width at 15% of peak signal (image)



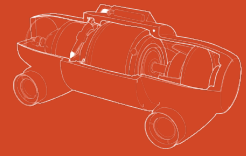
TO FSJ (gen)



Actions:

- Repeat any test(s) that fail to verify the result
- Refer to common protocol
- e.g. IEC 60336:2005 Medical electrical equipment
X-ray tube assemblies for medical diagnosis - Characteristics of focal spots

TOR ABC



TOR ABC includes:

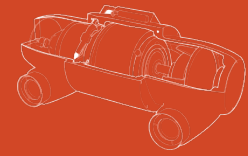
- high contrast grid (x-ray and light field coincidence and radiation field size)
- central high contrast circular detail and centring tower (beam angle deviation)

Options available:

Vertical bucky jig (hanger)

Vertical bucky jig (suction)

TOR ABC



Phantom Positioning:

- centrally to the light field
- directly on top of the loaded test cassette
- As close as possible to the image receptor for optimum beam geometry

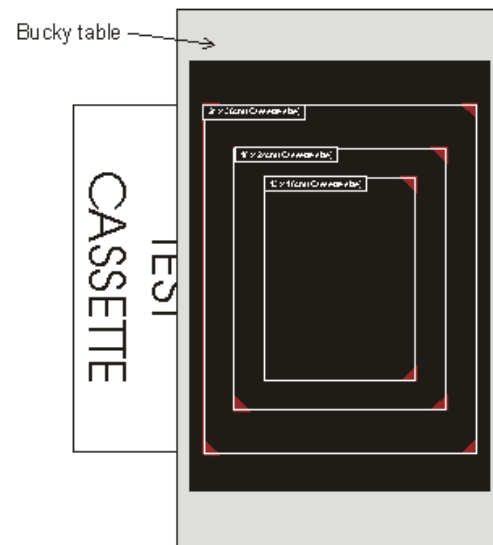


Figure 7a Setup on a Bucky table.

Exposure conditions:

- refer to the TOR ABC user manual

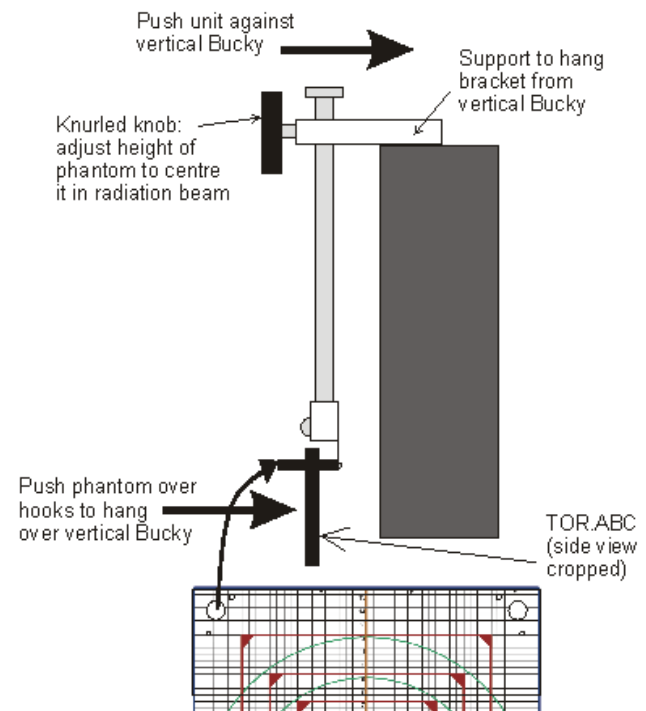
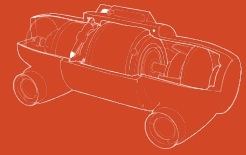
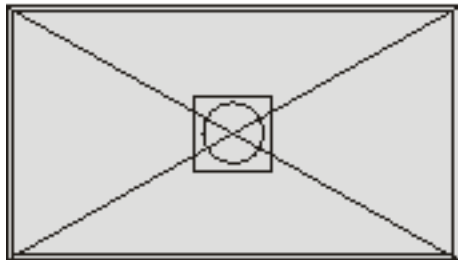


Figure 7b Setup on vertical Bucky attachment.

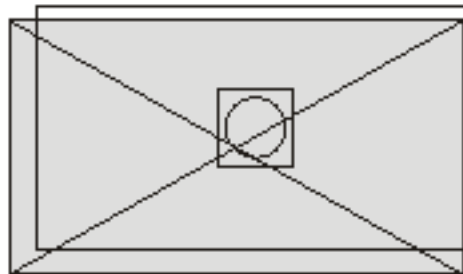
TOR ABC



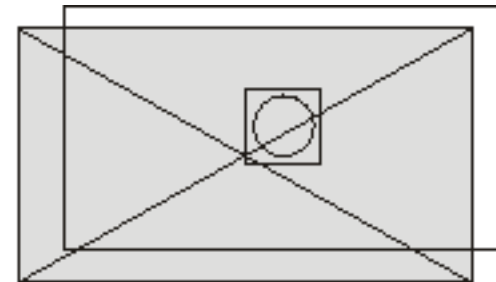
X-ray and light field coincidence:



the phantom is
imaged centrally so
alignment is perfect
PASS

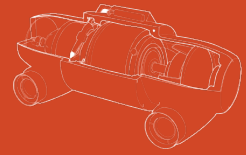


the central cross is
just touching the
edge of the circle, so
misalignment within
tolerance **PASS**



the cross is outside
the circle, so
misalignment is
outside tolerance
FAIL

TOR ABC

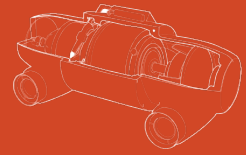


Effective radiation field size:

- measure the effective radiation field size using the high contrast grid
- the size should correspond with that displayed on the machine settings, to within the tolerance given in IEC 61223-2-11



TO ABC



Beam angle deviation:



central detail imaged in centre of annulus **PASS**

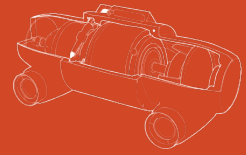


central detail imaged with horizontal displacement from centre of annulus (~1mm). The detail just touches the annulus **PASS**



central detail imaged with displacement in both x and y directions (~2mm). The detail overlaps the annulus **FAIL**

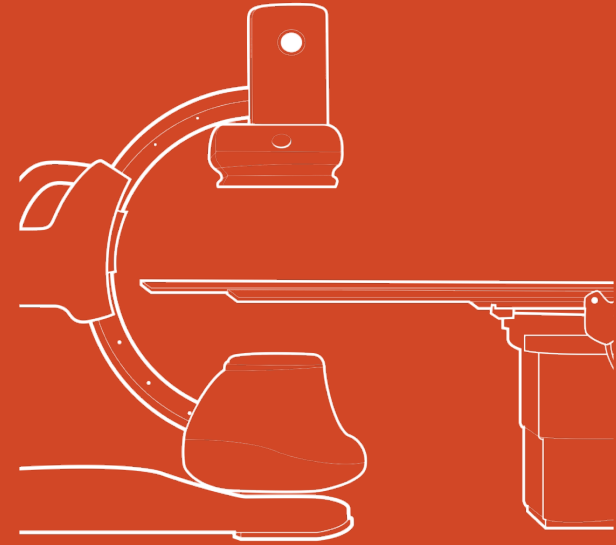
TOR ABC

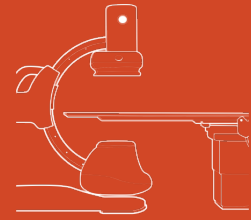


Actions:

- repeat any test(s) that fail to verify the result
- refer to common protocol for acceptance
e.g. IEC 61223-2-11: Constancy tests – Equipment for general direct radiography

Fluoroscopy





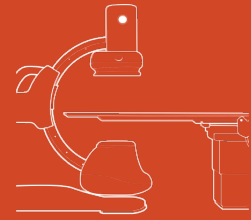
TOR 18FG



Includes:

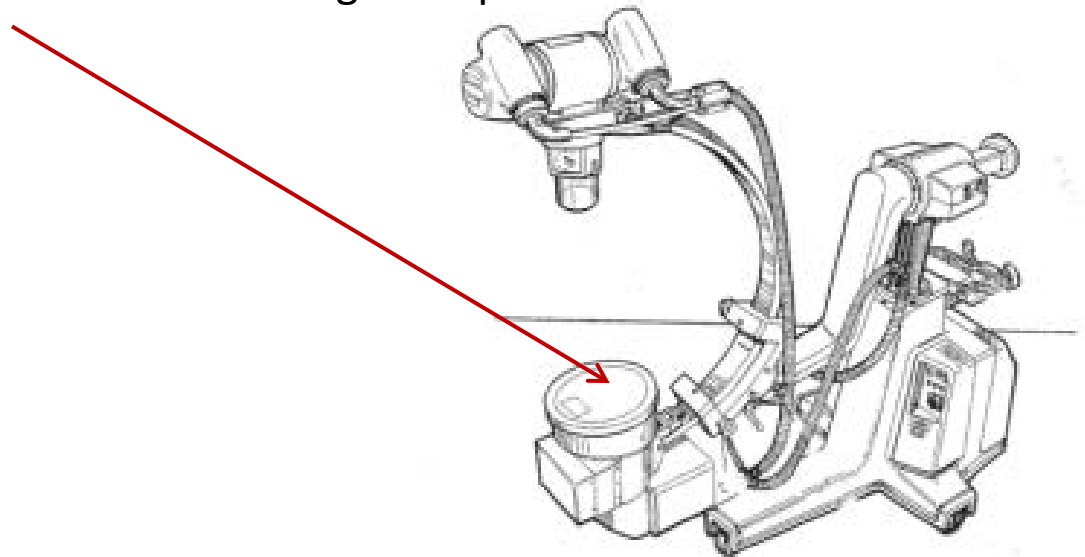
- Phantom
- 1mm Cu filter
- Protective case

TOR 18FG



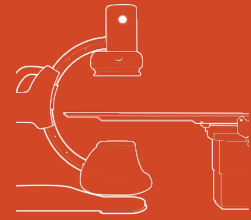
Phantom Positioning:

Position central to the field of view on the image receptor



Exposure Conditions:

Refer to User Manual. The exposure conditions should be recorded; they must be the same every time, otherwise the test results can not be compared.

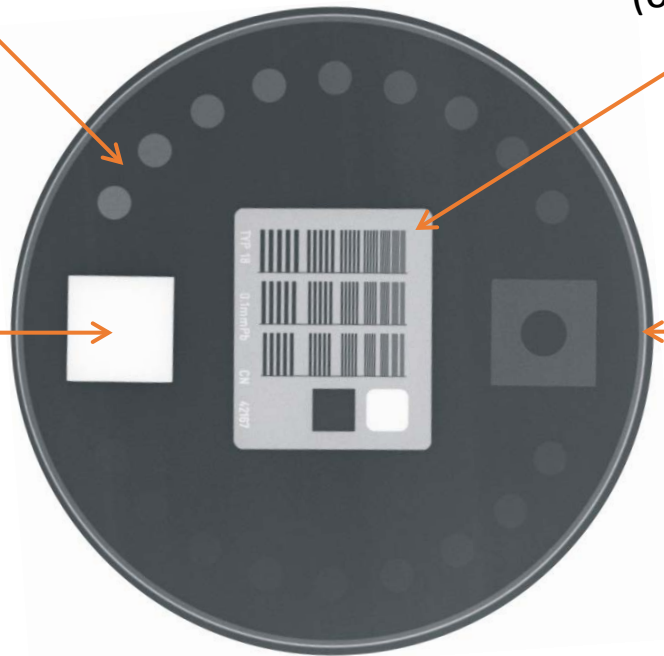


TOR 18FG

18 contrast resolution discs
(9 upper, 9 lower)

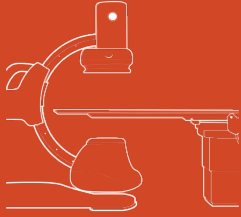
Spatial resolution test pattern
(0.5 – 5.0 LP/mm)

Monitor greyscale display
Observe the light and dark squares, and set the brightness and contrast controls so that both circles are clearly visible within the squares.



Geometric
distortion ring

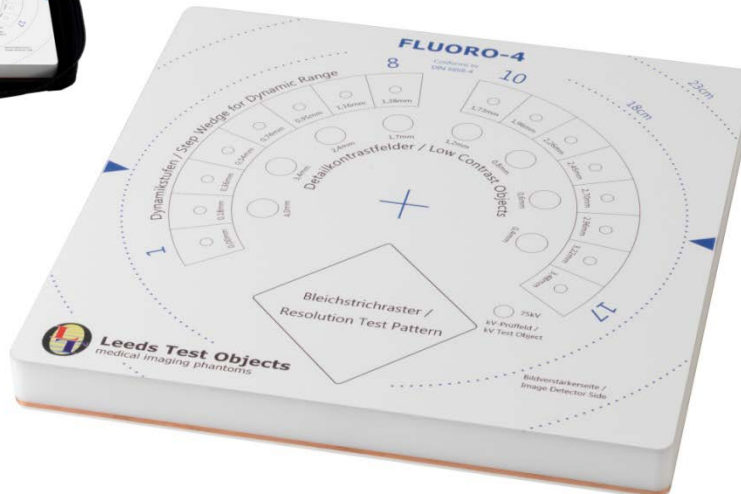
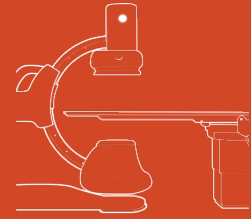
TOR 18FG



Actions:

- Set baseline at acceptance
- Conduct routine testing thereafter
- Repeat any test(s) that failed to verify the result
- Refer to regional protocol for acceptance (e.g. IPEM91)

Fluoro4

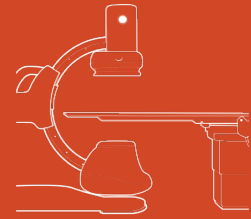


Includes:

- Phantom
- Protective Case

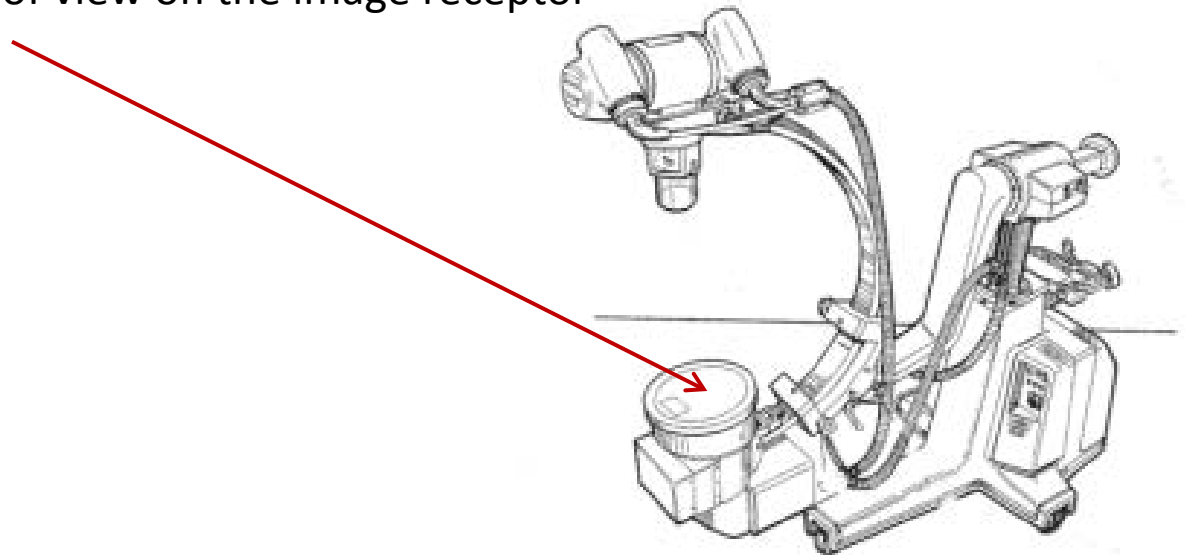
Designed to meet DIN 6868-4 standard

Fluoro4



Phantom Positioning:

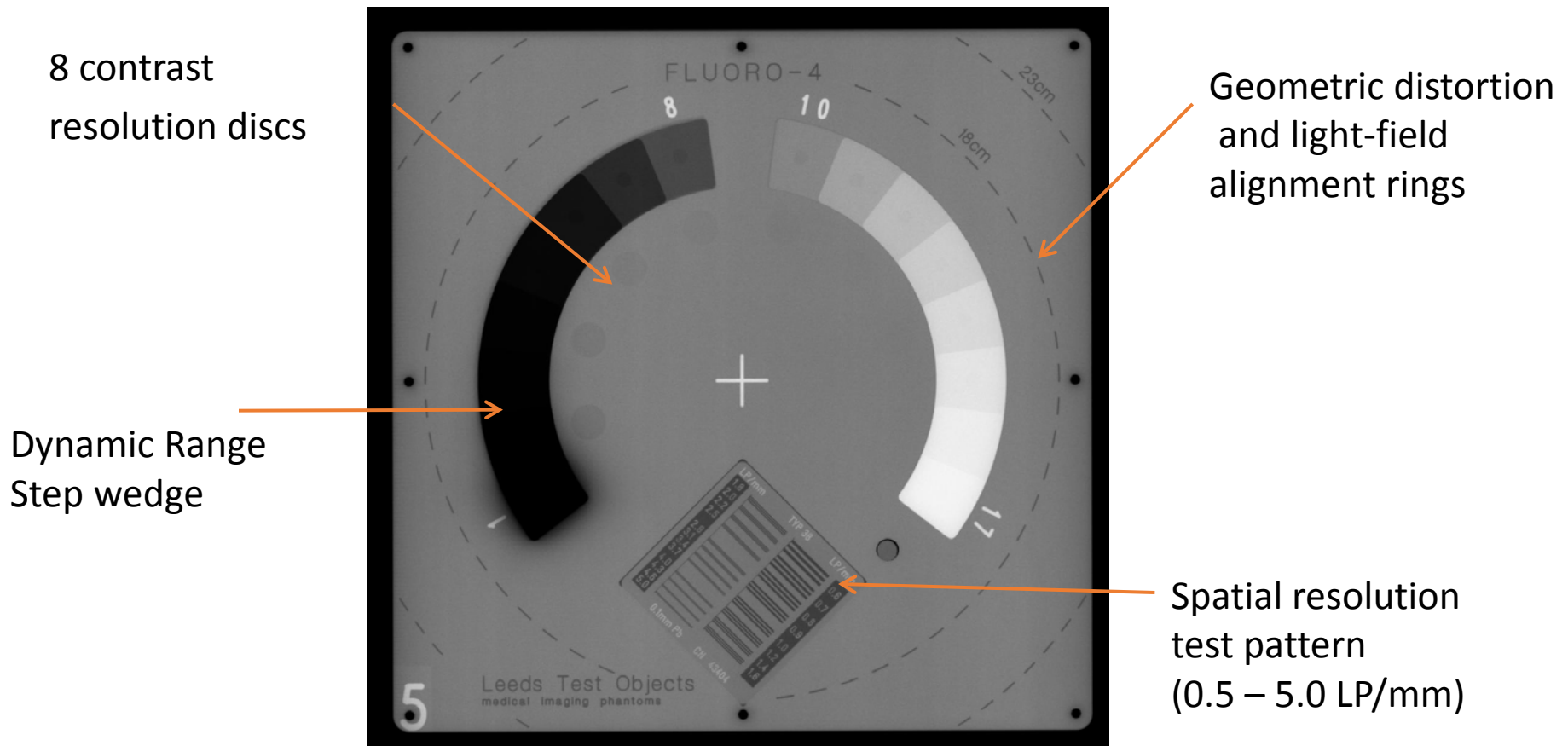
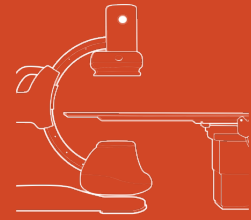
Position central to the field of view on the image receptor



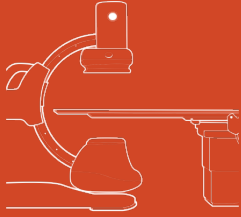
Exposure Conditions:

Refer to User Manual. The exposure conditions should be recorded; they must be the same every time, otherwise the test results can not be compared.

Fluoro4



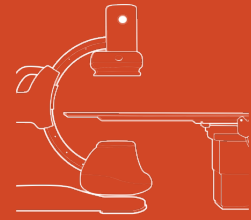
Fluoro4



Actions:

- Set baseline at acceptance
- Conduct routine testing thereafter
- Repeat any test(s) that failed to verify the result
- Refer to regional protocol for acceptance (e.g. DIN6868-4)

SFS



Includes:

TO.M1

TO.E1

TO.MS1, 3 and 4

TO.GS2

TO.N3

TO.10

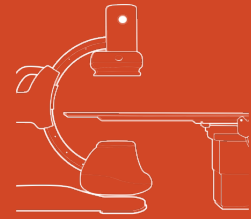
Test Pattern

1.0 mm Copper filter x 1

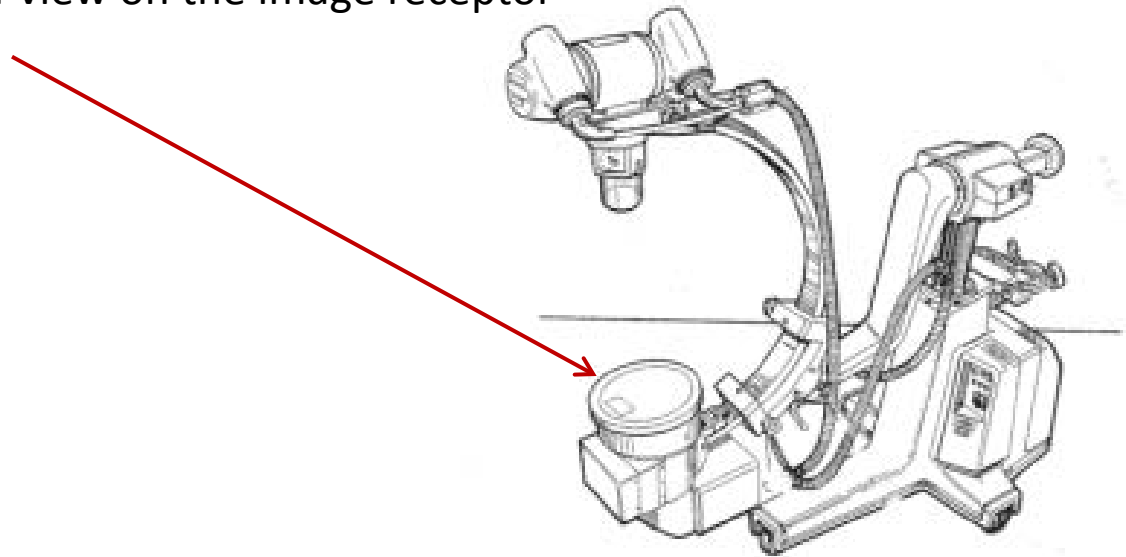
0.5 mm Copper filter x 2

Video cable and adaptors

Protective Case

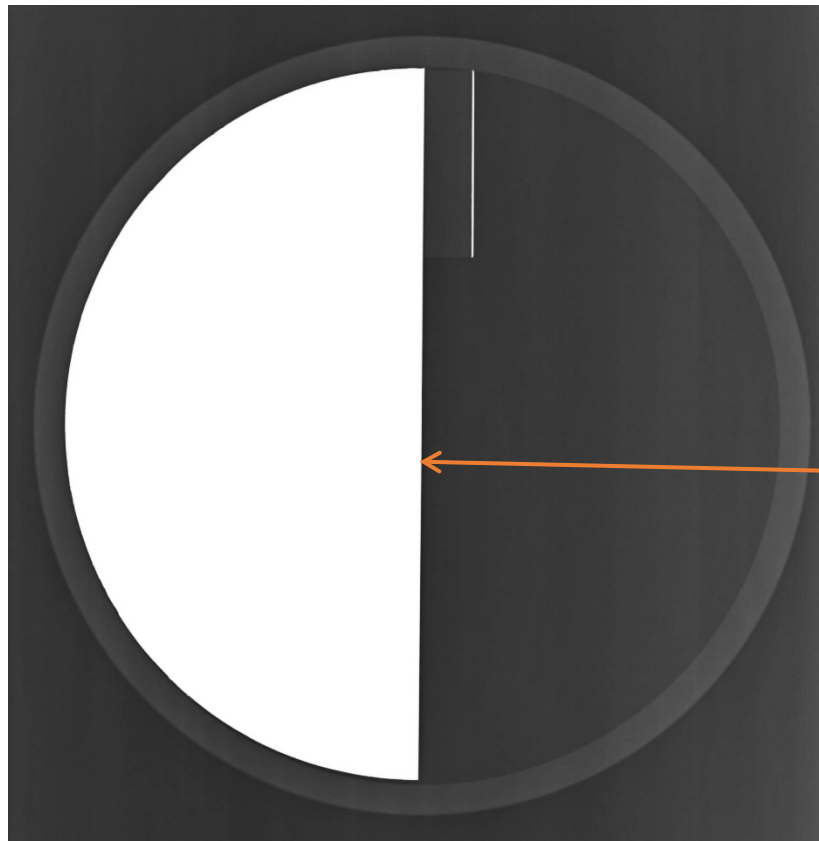
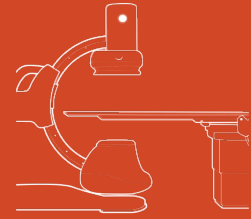
**Phantom Positioning:**

Position central to the field of view on the image receptor

**Exposure Conditions:**

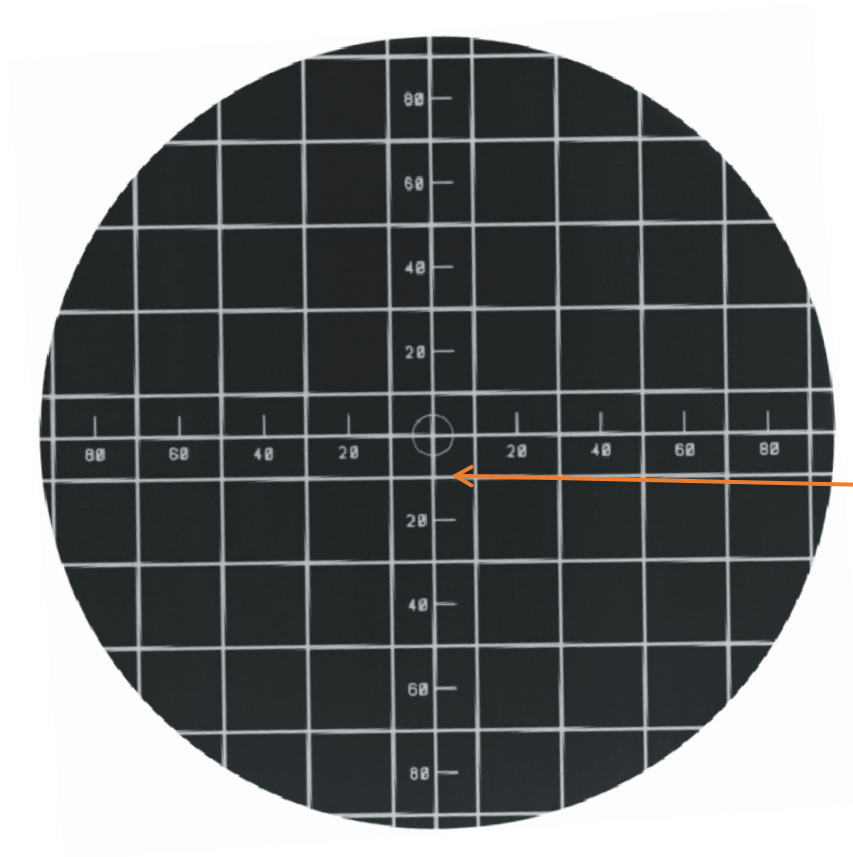
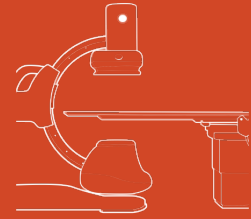
Refer to User Manual. The exposure conditions should be recorded; they must be the same every time, otherwise the test results can not be compared.

TO.E1

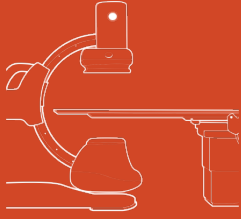


ESF edge block for
measurement of MTF

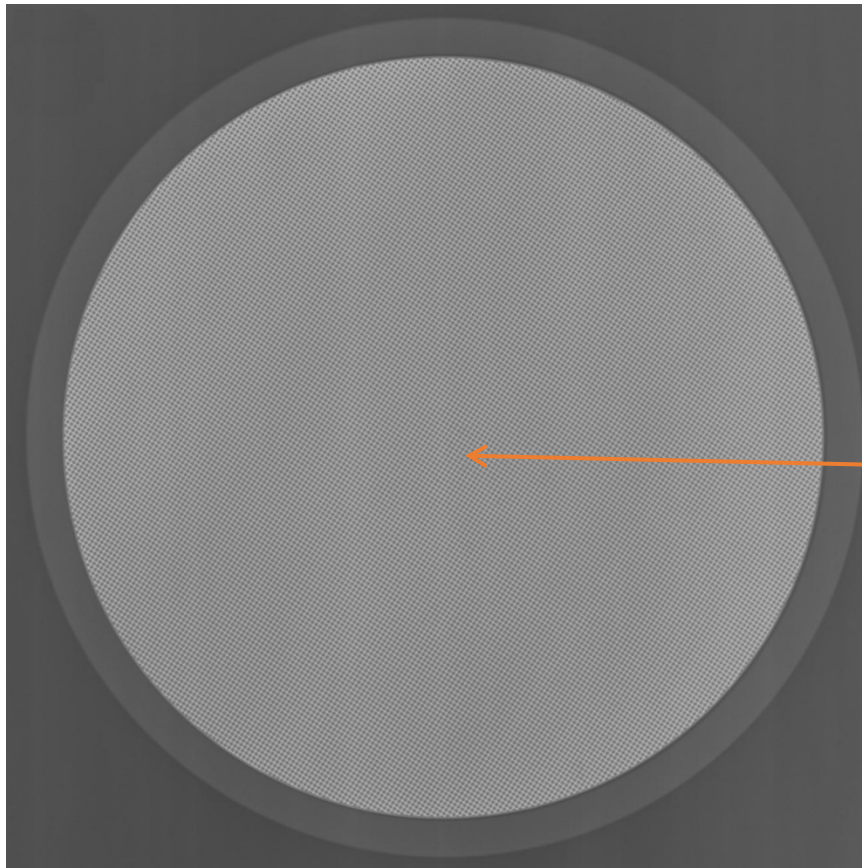
TO.M1



Radiopaque grid and rulers
used for measurement of
geometric distortion

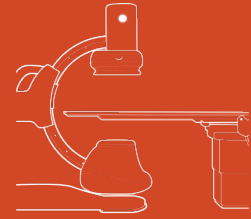


TO.MS1, 3, 4



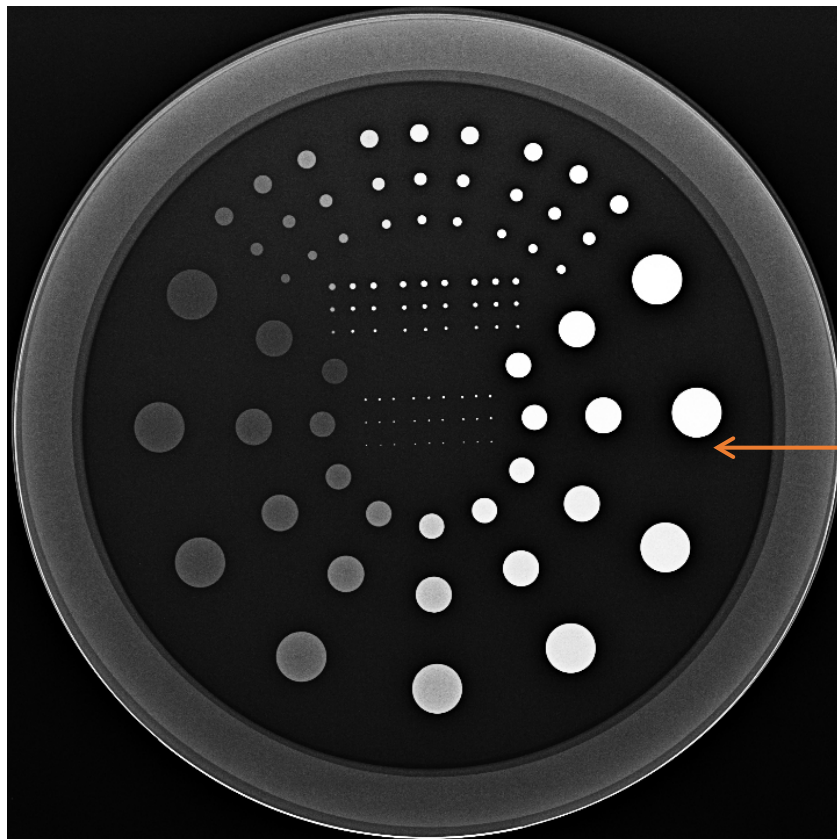
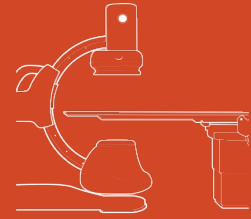
Radiopaque mesh
used for measurement of
homogeneity of the detector

TO.N3



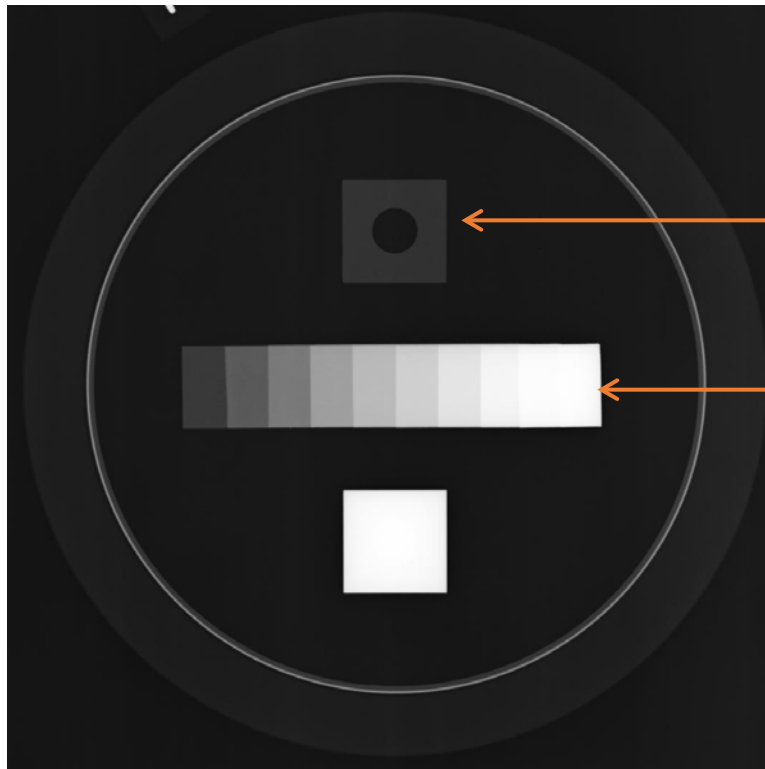
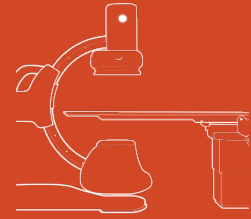
Low contrast resolution
Details x 19

TO.10



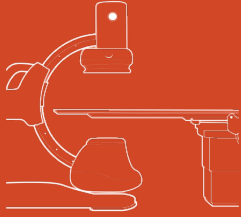
← Threshold contrast
detail detectability
108 details
(12 sizes x 9 contrasts)

TO.GS2



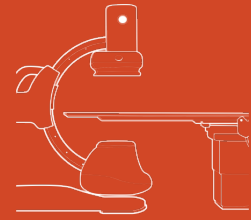
Same features for setting
dynamic range as for TOR18FG

Monitor dynamic range setting
Greyscale stepwedge

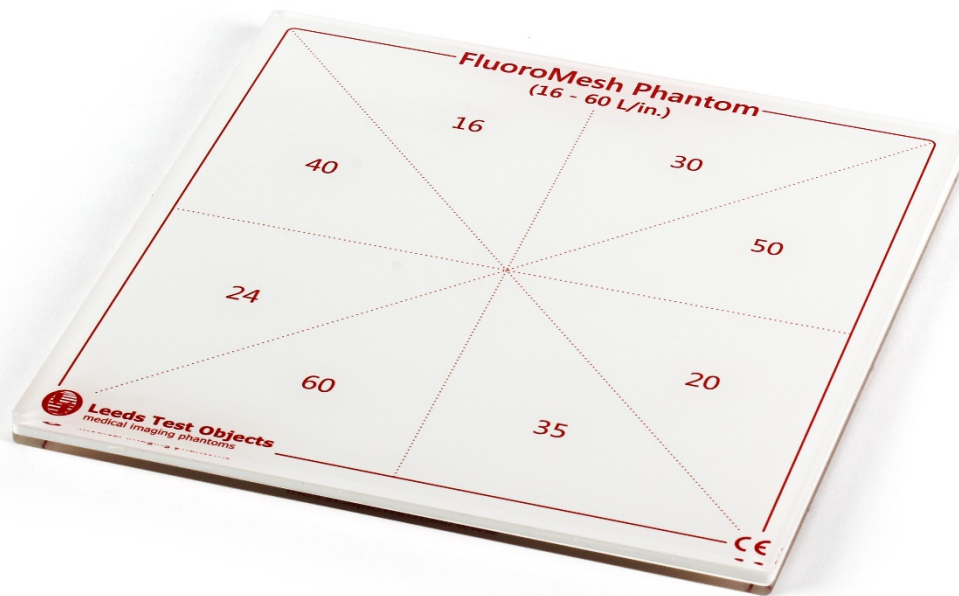


Actions

- Set baseline at acceptance
- Conduct routine testing thereafter
- Repeat any test(s) that failed to verify the result
- Refer to regional protocol for acceptance (e.g. IPEM91)



FLUOROMESH



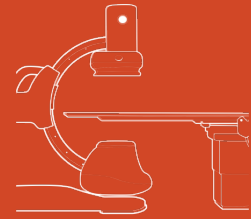
Includes:
Phantom
Protective soft bag

Available in three resolution ranges:

FLUOROMESH 16-60 contains 8 x mesh wedges with a range of 16 to 60 lines/inch

FLUOROMESH 30-100 contains 8 x mesh wedges with a range of 30 to 100 lines/inch

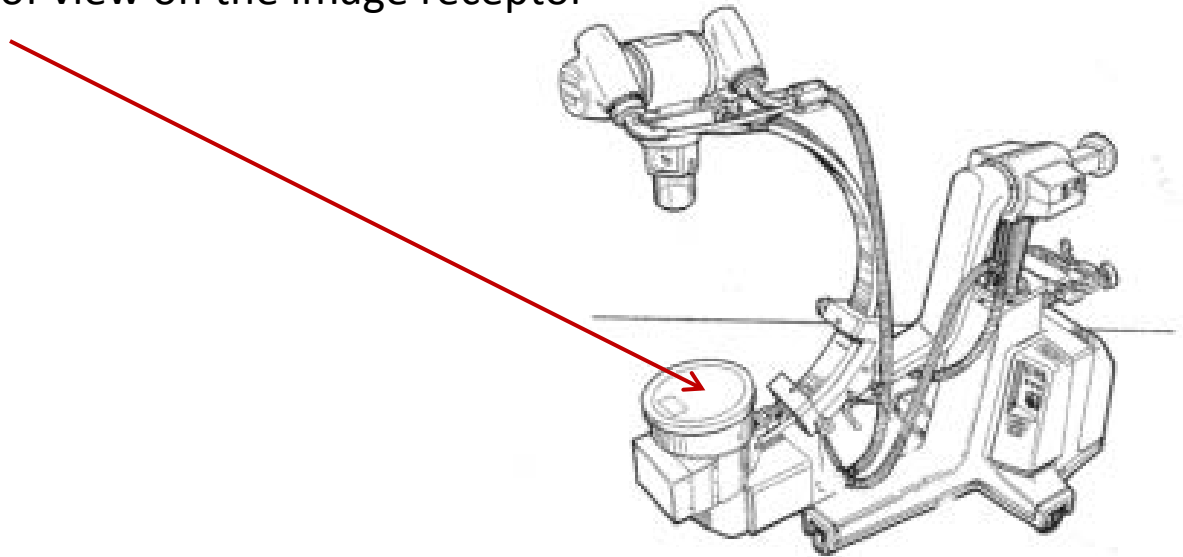
FLUOROMESH 60-150 contains 8 x mesh wedges with a range of 60 to 150 lines/inch



FLUOROMESH

Phantom Positioning:

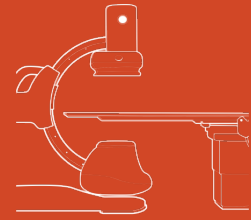
Position central to the field of view on the image receptor



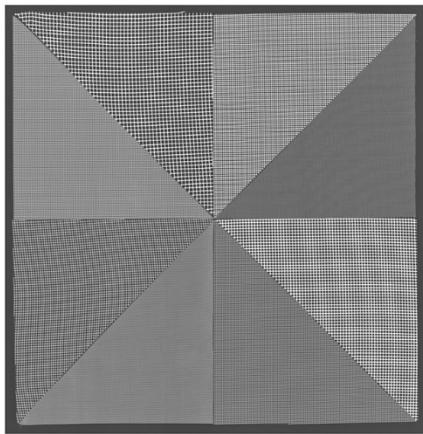
Exposure Conditions:

It is recommended to use the lowest possible kVp and mA settings (typically 50kVp, 1mA)

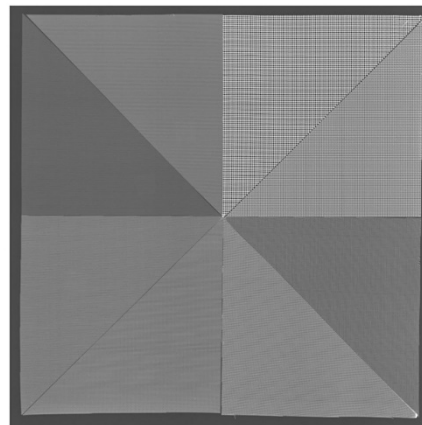
The exposure conditions should be recorded; they must be the same every time, otherwise the test results can not be compared



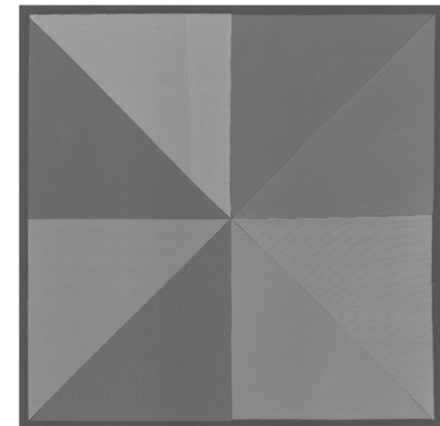
FLUOROMESH



16-60



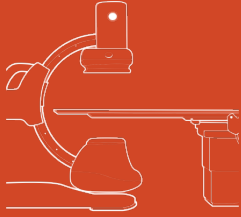
30-100



60-150

Radiopaque mesh used for quality control testing of the spatial resolution of fluoroscopy imaging systems

Simply count the number of mesh patterns resolved in the image

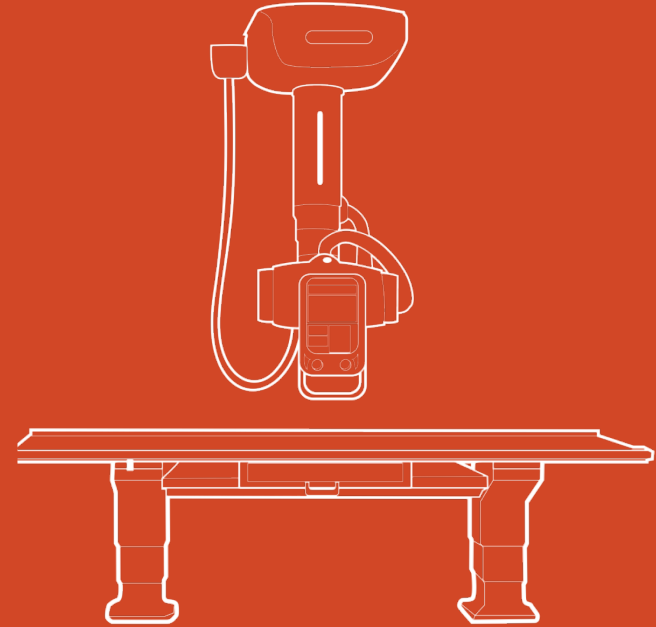


FLUOROMESH

Actions:

- Set baseline at acceptance
- Conduct routine testing thereafter
- Repeat any test(s) that failed to verify the result
- Refer to regional protocol for acceptance

Radiography





TOR CDR



Includes:

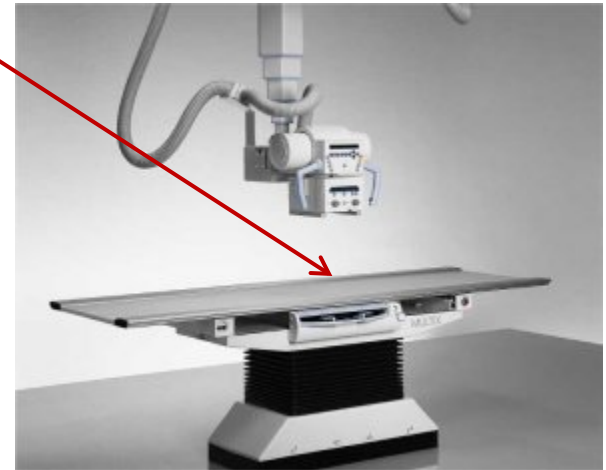
- Phantom
- 1mm Cu filter
- Protective case

TOR CDR



Phantom Positioning:

Position central to the field of view of the detector



Exposure Conditions:

Refer to User Manual. The exposure conditions should be recorded; they must be the same every time, otherwise the test results can not be compared.

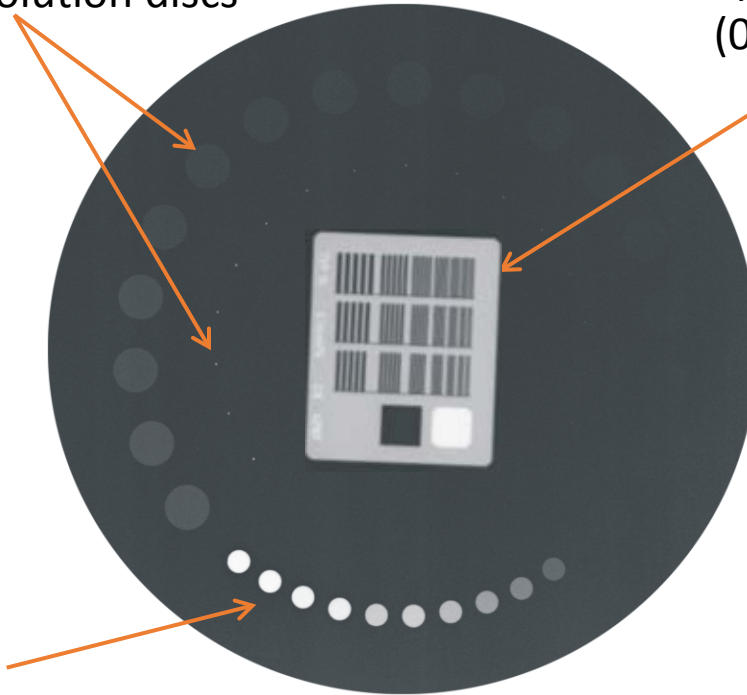


TOR CDR

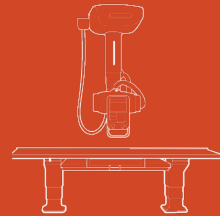
17 low contrast resolution discs

17 high contrast resolution discs

Spatial resolution test pattern
(0.5 – 14.3 LP/mm)



10 point greyscale stepwedge



TOR CDR

Actions:

- Set baseline at acceptance
- Conduct routine testing thereafter
- Repeat any test(s) that failed to verify the result
- Refer to regional protocol for acceptance (e.g. IPEM91)



PIX13

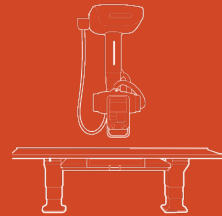


Includes:

- Phantom
- Protective case

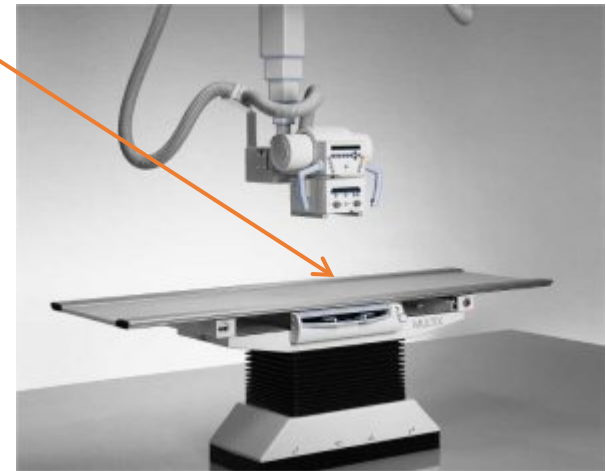
Designed to meet DIN 6868-13 standard

PIX13



Phantom Positioning:

Position central to the field of view of the detector



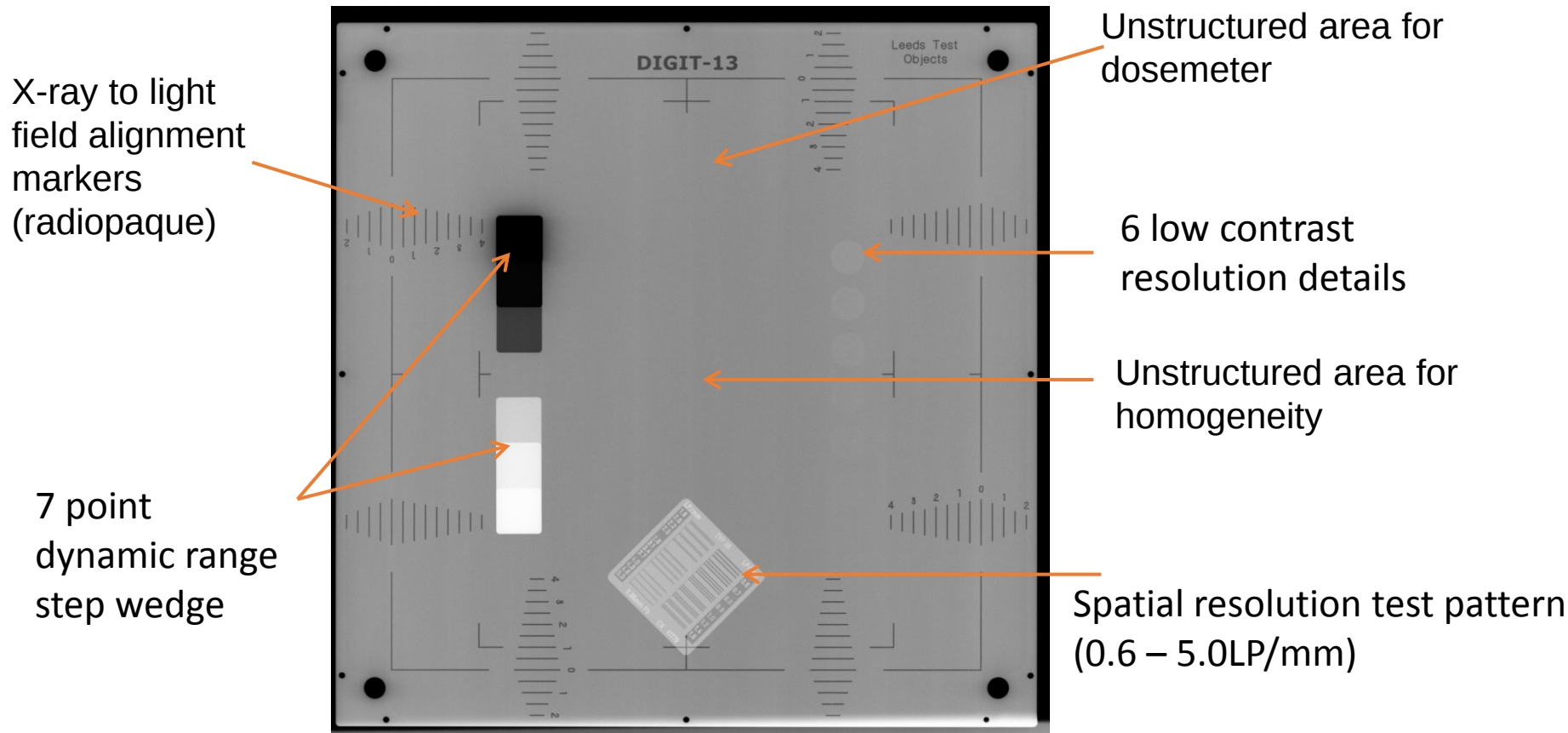
Exposure Conditions:

Refer to User Manual

The exposure conditions should be recorded; they must be the same every time, otherwise the test results can not be compared



PIX13





PIX13

Actions:

- Set baseline at acceptance
- Conduct routine testing thereafter
- Repeat any test(s) that failed to verify the result
- Refer to regional protocol for acceptance (e.g. DIN6464-13)



CR/DDR



CR/DDR set includes:

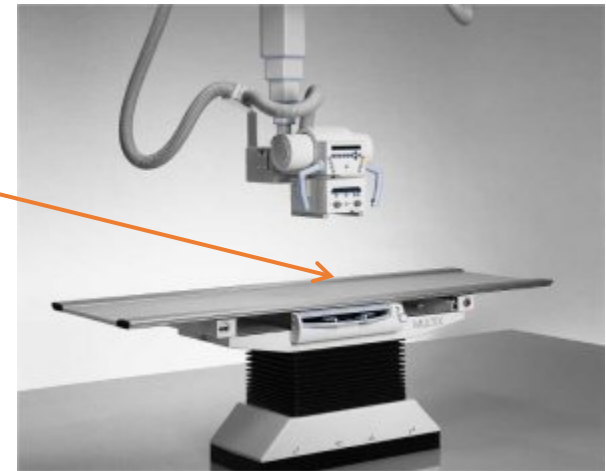
- TO 20
- TO M1 (matrix)
- TO MS4 (mesh)
- Type 43-005
- 1.5mm copper filter
- lead block
- steel rule
- tape measure

CR/DDR



Positioning of phantom:

- place the test objects directly on the detector or directly on the CR cassette
- place the resolution test pattern on the detector at 45°



Exposure conditions:

- the user manual includes all relevant exposure details for each test

CR/DDR



TO 20

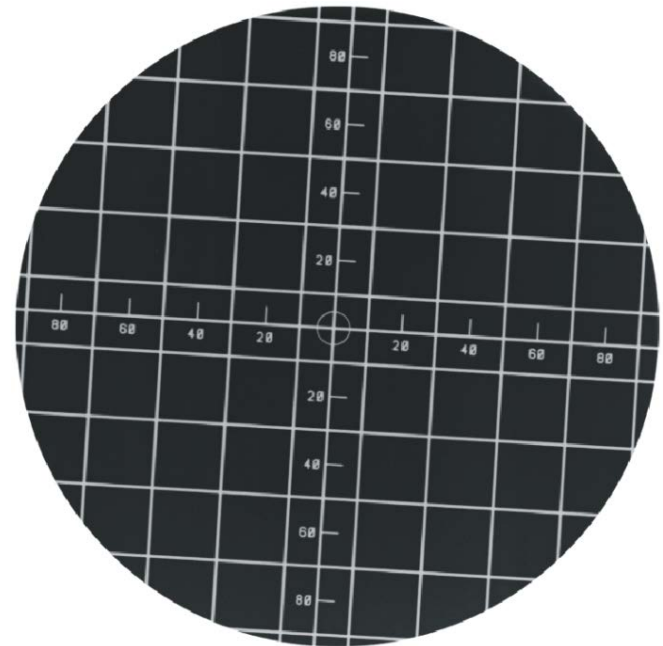
threshold contrast detail detectability



144 circular details arranged in rows of 12 contrasts

TO M1

geometric distortion



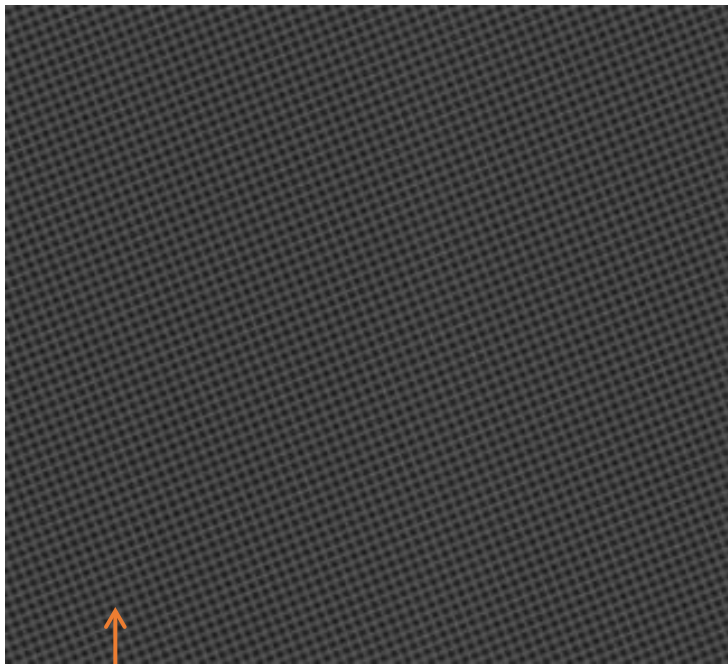
20mm square spacing with 10 mm diametrical interpolations

CR/DDR



TO MS4

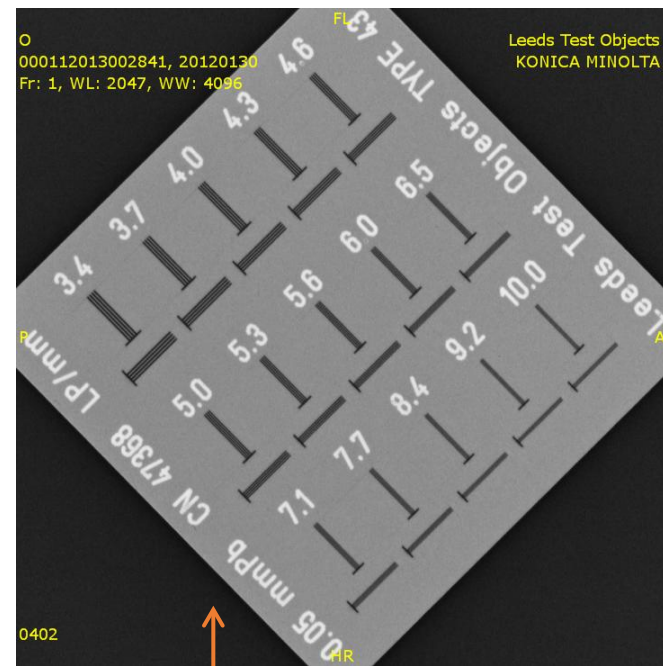
uniformity, blurring, stitching artefacts



precision test mesh

Type 43-005

limiting spatial resolution



15 groups ranging from 3.4-10 LP/mm



CR/DDR

Actions:

- repeat any test(s) that failed to verify the result
- refer to common protocol
- in the UK - KCare protocols for CR and DDR QA testing
- copies of the protocols are included in this set (for future revisions see <http://www.kcare.co.uk/Education/protocols.htm>)



TO AEC



Includes:

- PMMA plates
 - 8 pieces – 25x250x250mm
 - 4 pieces – 10x250x250mm
 - 2 pieces – 5x250x250mm
- Protective Case

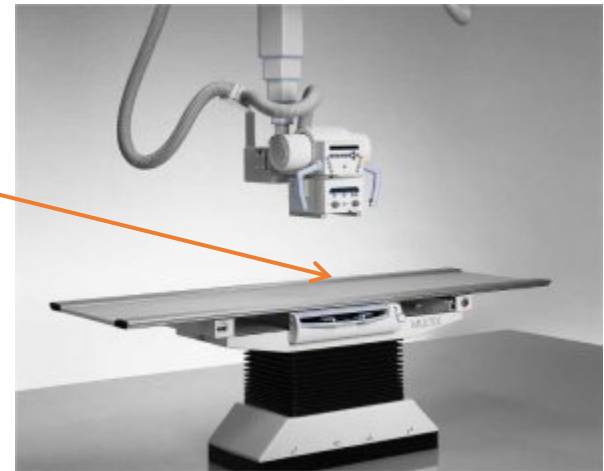
Designed to meet IPEM91 standard

TO AEC



Positioning of phantom:

- place the test object directly on the detector or directly on the CR cassette



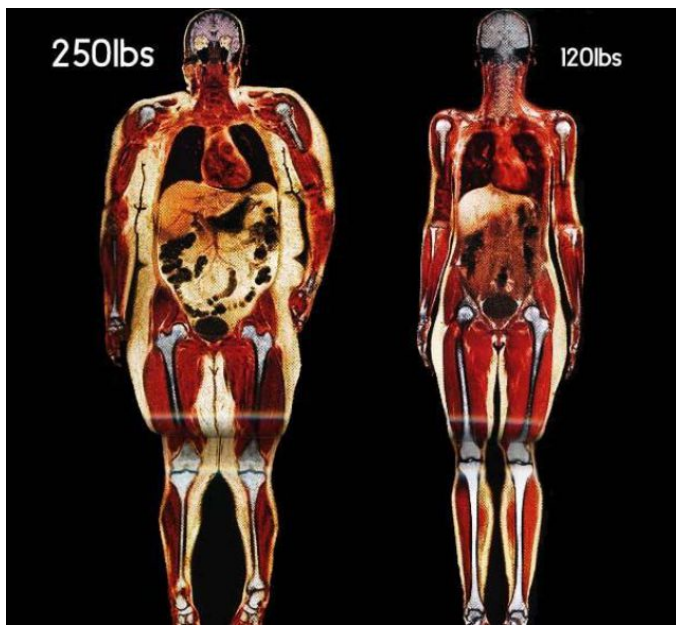
Exposure conditions:

- the user manual includes all relevant exposure details

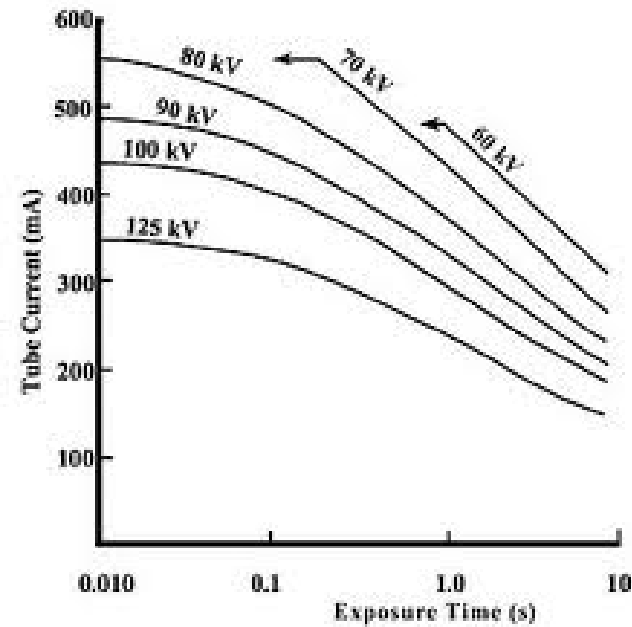


TO AEC

The purpose of TO AEC is to assess the function and calibration of the AEC device over the range of conditions likely to be employed clinically



Variation in Patient Size



Variation in kV



TO AEC

Consistency Between Chambers:

Consistency should be checked for each chamber and for various combinations of chambers on a single AEC system

Position 150mm of PMMA plates and collimate the x-ray beam to within the footprint of the rearmost PMMA plate. Ensure that all of the chambers to be tested are covered

Select chamber/combination to be tested, set 70kV and 300mA current, and expose. Record the mAs and DDI

Repeat 4 or 5 times at the same setting to check consistency



TO AEC

Repeatability:

Repeatability should be checked for each chamber on a single AEC system

Position 150mm of PMMA plates and collimate the x-ray beam to within the footprint of the rearmost PMMA plate. Ensure that all of the chambers to be tested are covered

Select chamber to be tested, set 70kV and 300mA current, and expose. Record the mAs

Repeat 4 or 5 times at the same setting to check repeatability



TO AEC

Reproducibility:

Reproducibility should be checked for each chamber on a single AEC system

The response of the AEC system to changes in kV is checked by positioning 150mm of PMMA plates and collimating the x-ray beam to within the footprint of the rearmost PMMA plate. Ensure that the chamber to be tested is covered. Select chamber to be tested, set 70kV and expose. Record the mAs. Repeat with 60, 50, 40, 30 kV, each time measuring the mAs to check reproducibility

The response of the AEC system to changes in patient size is checked by positioning 50mm of PMMA plates and collimating the x-ray beam to within the footprint of the rearmost PMMA plate. Ensure that the chamber to be tested is covered. Select chamber to be tested, set 70kV and 300mA and expose. Record the mAs. Repeat with 100, 150, 200, 250 mm PMMA, each time measuring the mAs to check reproducibility



TO MTF



Includes:

- PMMA positioning wheel 80x80mm
- 1mm thick precision tungsten edge
 - High purity
 - Highly polished
- Protective case

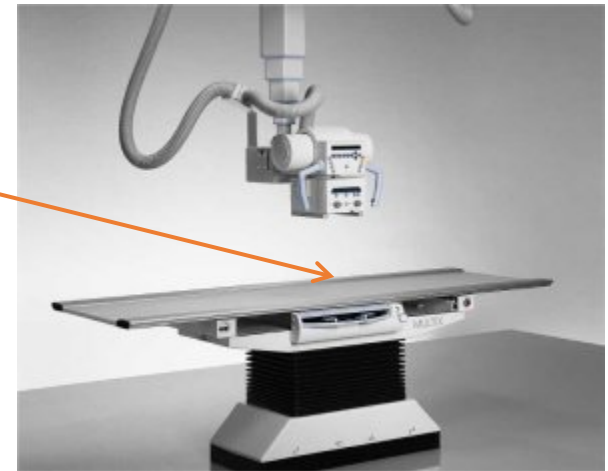
Designed to meet IEC 62220-1

TO MTF



Positioning of phantom:

- Place the test device directly on the detector or directly on the CR cassette
- Centre edge to FOV
- FFD = 1.5m >
- Rotate edge to between 1.5 and 3.0°



Exposure conditions:

- Typical exposure conditions
- Two exposures; one horizontal and one vertical



TO MTF

Measure the blur (spread) of an ideal edge at FWHM to get the ESF

Take the transfer function of the ESF to get the MTF

