

Rotating Anode X-Ray Tube
 Tubes Radiogénés à Anode Tournante
 Röntgenröhre mit rotierender Anode
 Tubos de Rayos-X con Ánodo Giratorio

Large - Black
 Grand - Noir
 Gross - Schwarz
 Largo - Negro

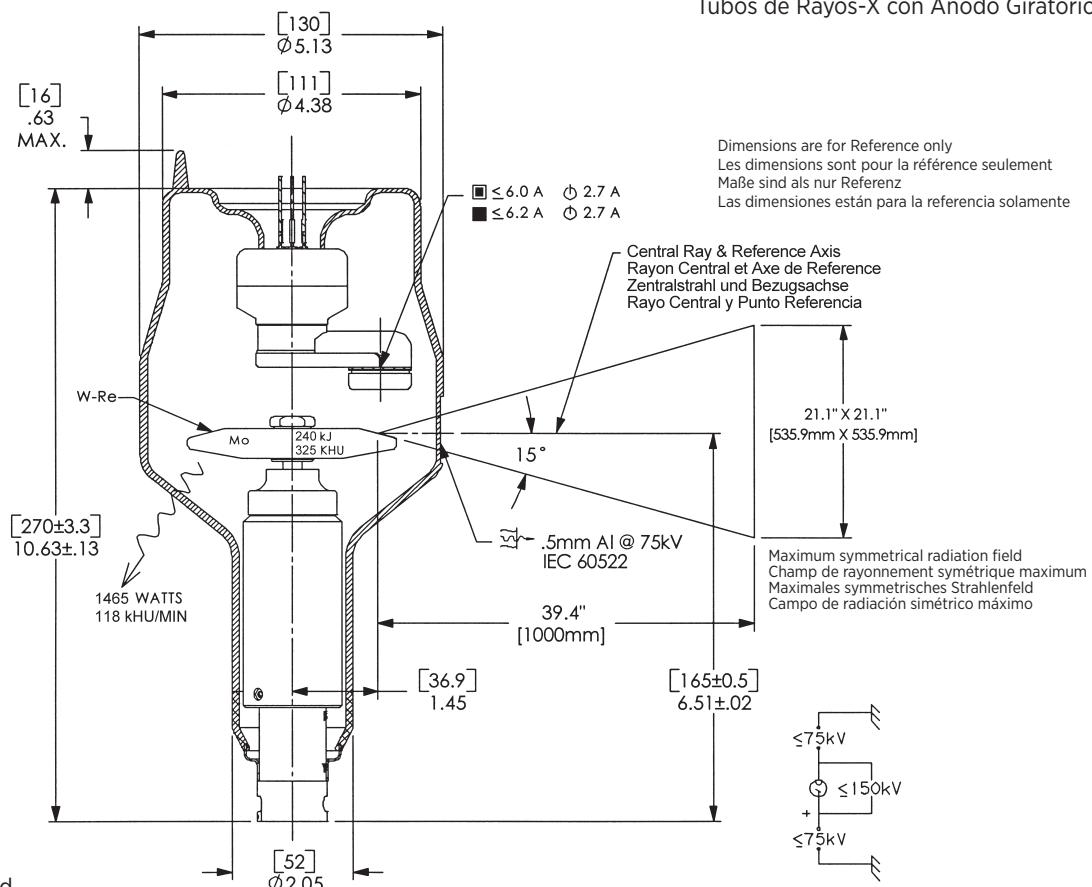
Small - White
 Petit - Blanc
 Klein - Weiss
 Pequeño - Blanco

Stand - By
 Attente
 Bereit Stehen
 En Espera

Frame or Chassis
 Masse
 Chassis
 Soporte o Chasis

X-Ray Tube
 Tube Radiogène
 Röntgenröhre
 Tubo de Rayos X

Radiation Filter or Filtration
 Filtre de rayonnement
 Filterung
 Filtración de Radiación



Note: Document originally drafted in the English language.

Product Description

The RAD-50 is a 3.5" (90mm) 150 KV, 240 kJ (325 kHU) maximum anode heat content, rotating anode insert. This insert is specifically designed for general radiographic and fluoro/spot film procedures. The insert features a 15° rhениum-tungsten molybdenum target and is available with the following nominal focal spots:

0.6 - 1.0
 IEC 60336

Nominal Anode Input Power

Small - 31.5 kW IEC 60613
 Large - 52.5 kW IEC 60613

For the equivalent anode input power of 140 Watts

Description du Produit

Le tube RAD-50, à anode tournante de 90mm (3,5 pouces), 150 KV, avec une capacité calorifique maximale de 240 kJ (325 kUC) est à usage spécifique pour la radiographie de grande puissance et pour la radio-fluorographie. L'anode composite en Rhénium - Tungstène-Molybdéne avec pente d'anode de 15° est disponible avec les combinaisons focales suivantes:

0.6 - 1.0
 CEI 60336

Puissance anodique nominale de l'anode

Petit foyer - 31.5 kW CEI 60613
 Grand foyer - 52.5 kW CEI 60613
 Pour la puissance anodique d'équilibre thermique de 140 Watts

Produktbeschreibung

Die RAD-50 ist eine 90mm (3.5zoll) Doppelfokus Drehanoden-Röntgenröhre, mit einer Wärmespeicherkapazität des Anodenstellers von 240 kJ (325 kHU) und einer max. Spannungsfestigkeit von 150 KV. Die Röhre wurde für stark frequentierte Aufnahmearbeitsplätze und für den Durchleuchtungs- und Zielgerätebetrieb (1mm FFA) ausgelegt. Der Rhénium, Wolfram, und Molybdän Anodensteller besitzt einen Winkel von 15°. Folgende Brennfleckkombinationen ist lieferbar:

0.6 - 1.0
 IEC 60336

Nominale Anodenbezugsleistung

Klein - 31.5 kW IEC 60613
 Gross - 52.5 kW IEC 60613
 Gilt bei einer Äquivalent - Anodenleistung von 140 Watt

Descripción del Producto

El RAD-50 es un tubo de ánodo giratorio de 90mm, (3.5"), 150 KV, 240 kJ (325 kUC) diseñado específicamente para procedimientos generales de alto volumen en radiografía y fluoroscopía. Consta de un objetivo de renio, tungsteno y molibdeno con pendiente de 15 grados. Disponible con las siguientes combinaciones de marcas focales:

0.6 - 1.0
 IEC 60336

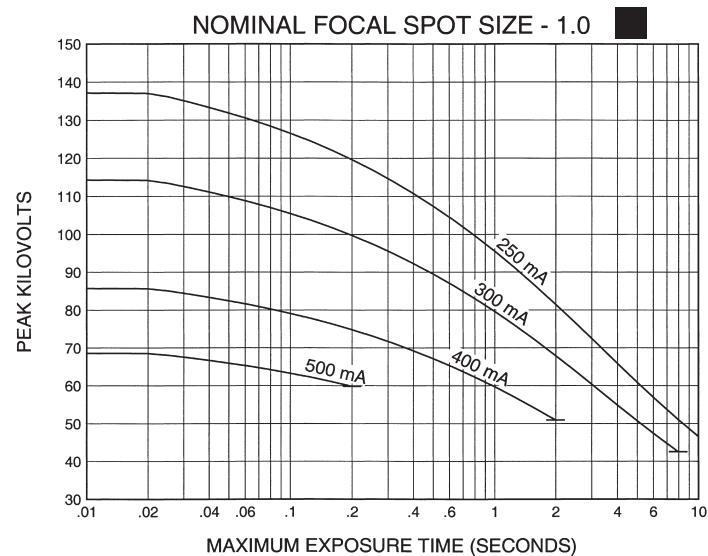
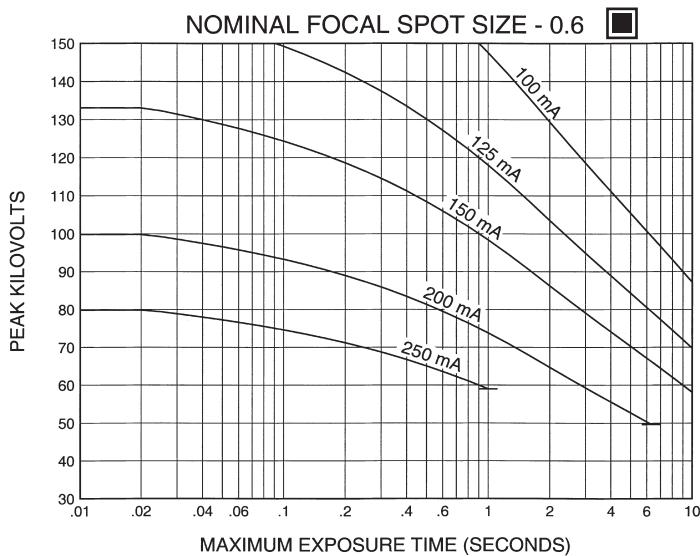
Potencia nominal de entrada del anodo

Foco fine - 31.5 kW IEC 60613
 Foco grueso - 52.5 kW IEC 60613
 Para una potencia equivalente del anodo de 140 Watts

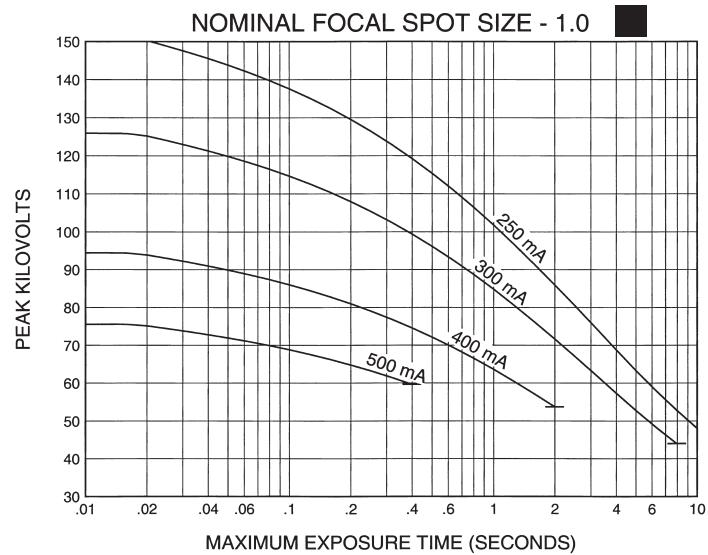
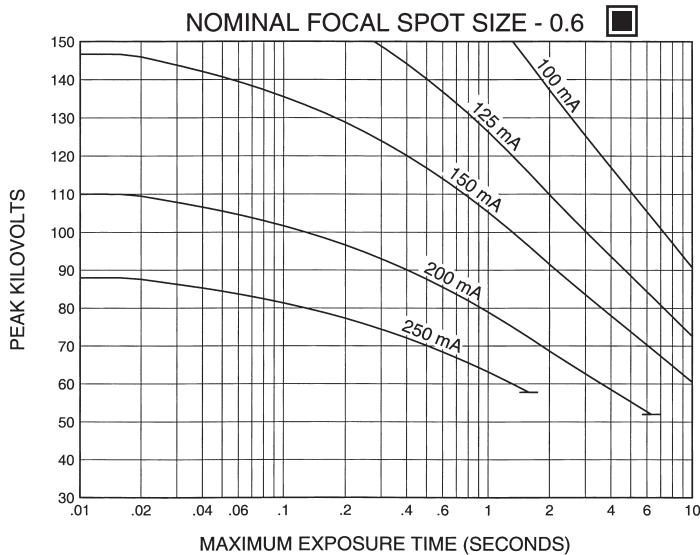
3 Ø Constant Potential ---

Single Load Ratings IEC 60613
 Abaques de Charge pour Pose Unique CEI 60613
 Brennfleck - Belastungskurven IEC 60613
 Diagramas de Exposición Radiográfica IEC 60613

50 HZ - 2,850 RPM



60 HZ - 3,450 RPM



Nominal anode input power for the anode heat content 40%. IEC 60613

Puissance calorifique nominale de l'anode: 40%, CEI 60613

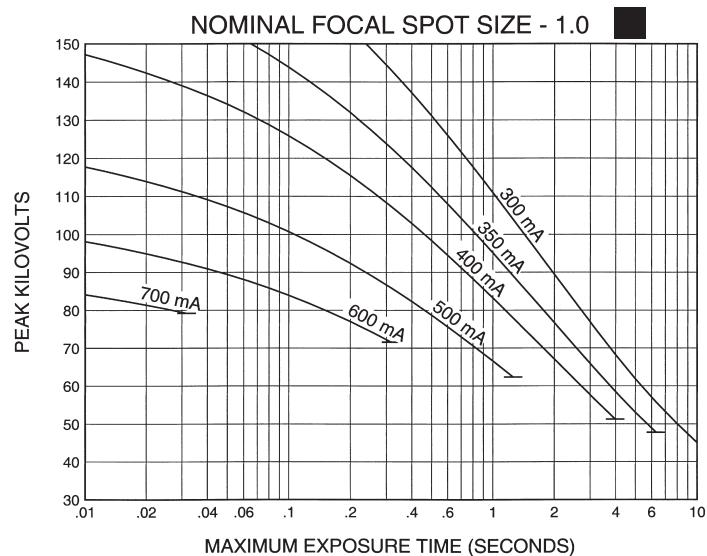
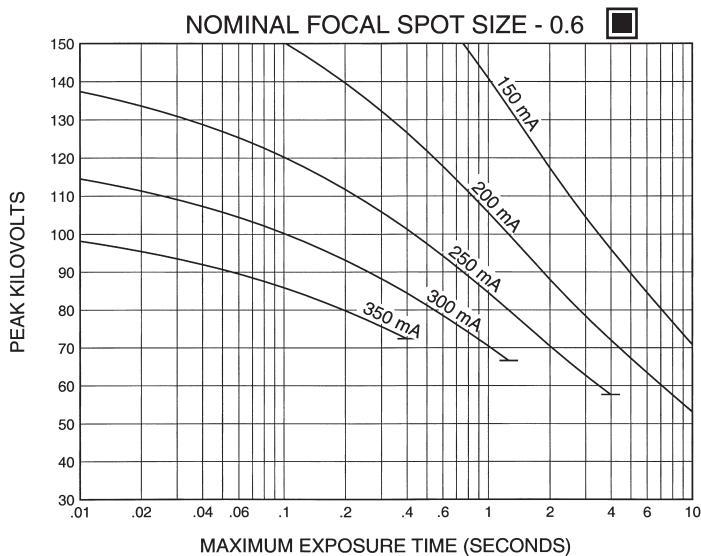
Thermische Anodenbezugsleistung bei einer Wärmespeicherung von 40%. IEC 60613

Aproximadamente el poder de penetración para obtener un almacenaje de calor del anodo de 40%. IEC 60613

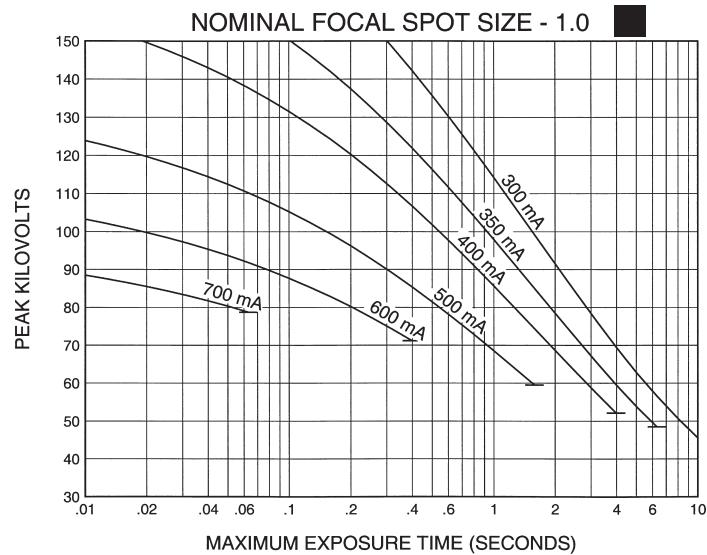
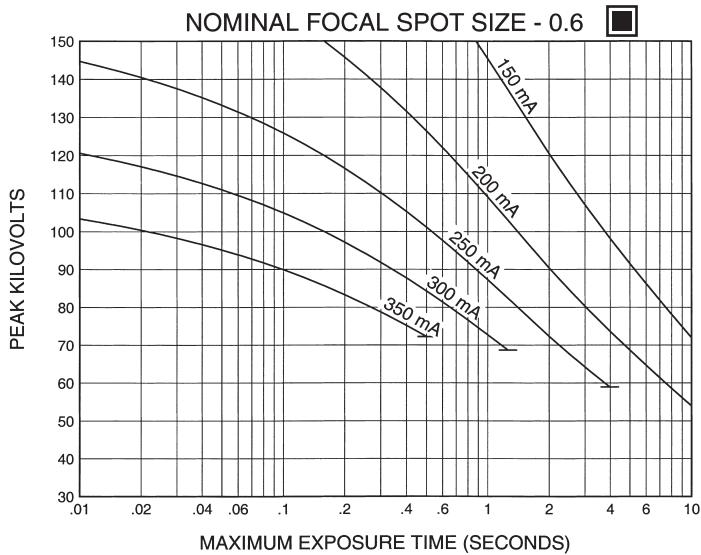
3 Ø Constant Potential ---

Single Load Ratings IEC 60613
 Abaques de Charge pour Pose Unique CEI 60613
 Brennfleck - Belastungskurven IEC 60613
 Diagramas de Exposición Radiográfica IEC 60613

150 HZ - 8,500 RPM



180 HZ - 10,000 RPM



Nominal anode input power for the anode heat content 40%. IEC 60613

Puissance calorifique nominale de l'anode: 40%, CEI 60613

Thermische Anodenbezugsleistung bei einer Wärmespeicherung von 40%. IEC 60613

Aproximadamente el poder de penetración para obtener un almacenaje de calor del anodo de 40%. IEC 60613

CINERADIOGRAPHIC RATINGS

HOW TO USE CINERADIOGRAPHIC CHARTS

General: With the Cineradiographic rating chart we can determine the maximum allowable kW of the Cine pulse, or with a given kW determine maximum time in seconds the Cine run can progress.

The Most common way of using the charts is to determine maximum time of any expected Cine run and maximum duty factor. With a known duty factor and Cine run time kW can easily be determined.

Definition of Terms

Time in seconds: Total time of one Cine run, usually 5 to 12 seconds.

Duty Factor in Percent (DF%): Actual time during one second the x-ray tube is producing x-rays. If we select a 5 msec pulse width and 50 exposures per second the x-ray tube will be producing x-rays for a total of 250 msec each second or 25% of the time. The higher the DF number, the more load placed on the x-ray tube.

Peak Pulse Power: Peak energy in watts of any one Cine Pulse. Can be any combination of kV and mA allowed by Radiographic and Filament Emission curves.

Example: 80 kV at 400 mA equals

$$80,000 \text{ V} \times 0.4 \text{ A} = 32,000 \text{ W} \text{ or } 32 \text{ kW}$$

USING THE CINE RATING CHARTS:

RAD-50 150/180 Hz 3 Phase 1.0 Focal Spot

Example: Determine maximum kW allowed with the following known factors:

Maximum Pulse Width 4 msec
 Exposures per Second 60
 Maximum Cine Run Time 4 seconds

Calculate Duty Factor: (DF%)

$$\text{DF\%} = \frac{\text{Pulse Width (mSec)} \times \text{Frames per Second}}{10}$$

$$\text{DF\%} = \frac{4 \text{ msec} \times 60 \text{ exp/sec}}{10} = \frac{240}{10} = 24\%$$

Refer to Rating Chart RAD-50 150/180 Hz 3 Phase 1.0 Focal Spot:

At bottom of chart find 4 second line. Move vertically to intersection with 24% DF curve. Make a horizontal reference to left side of rating chart and note kW rating of 35 kW.

We now know each pulse during the cine run can have a maximum rating of 35 kW under conditions given in example.

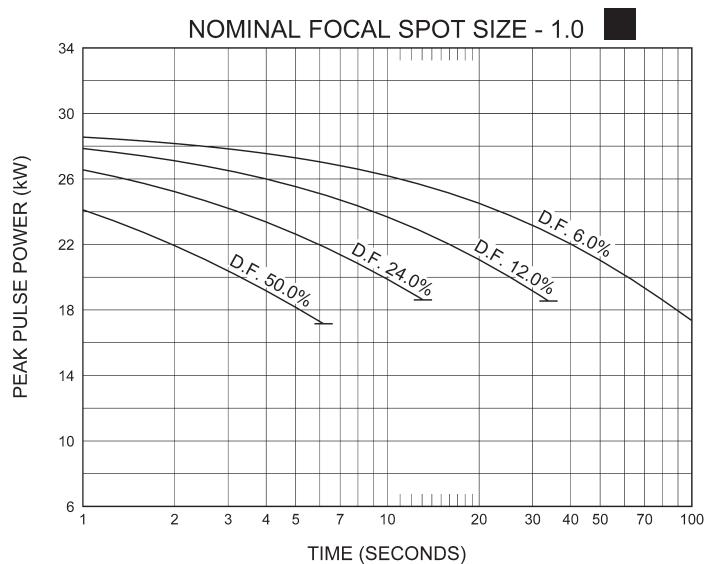
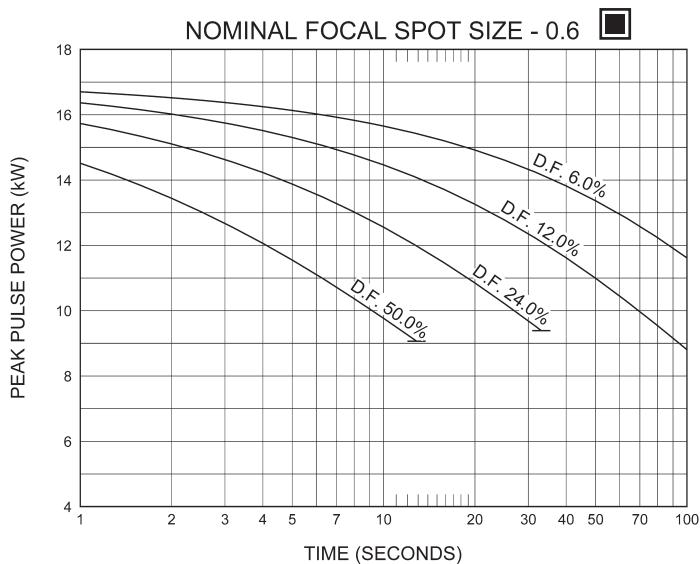
kW = kV x mA. The kW of the exposure can be any combination of mA and kV allowed by the Radiographic and Filament Emission Charts.

The Cine rating charts are usable to 100% anode heat storage. The start of Cine run should be below 70% anode heat storage. Exceeding 100% anode heat storage will cause anode track erosion with high risk of tube destruction.

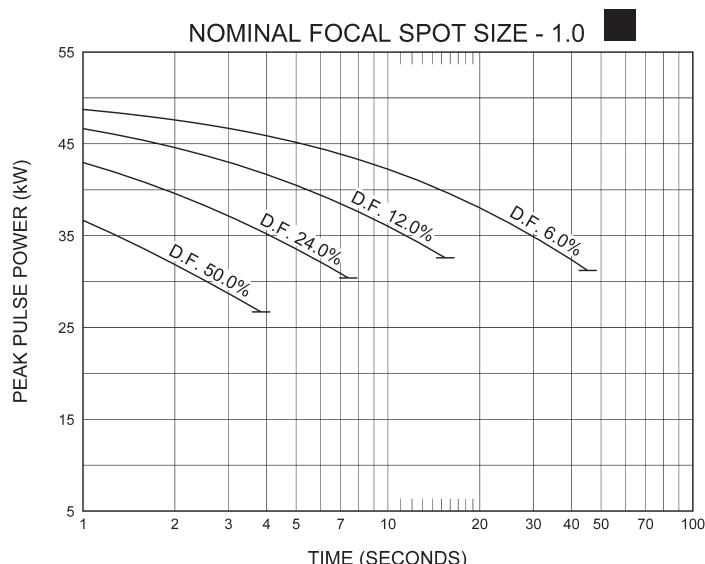
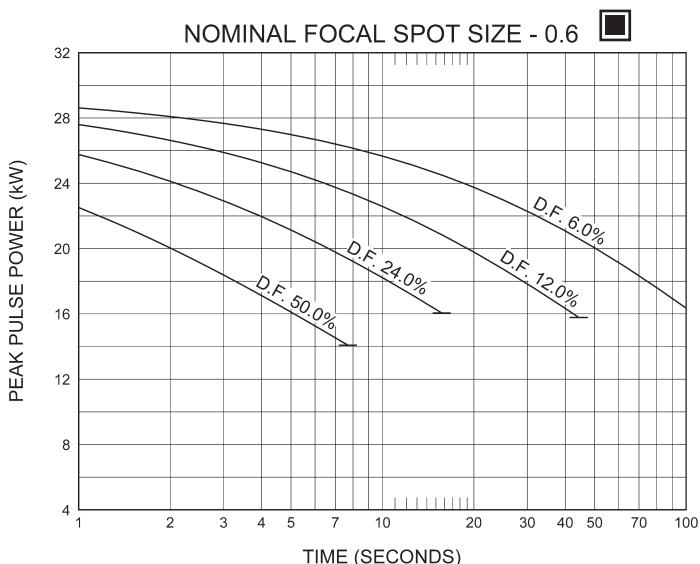
3 Ø Constant Potential ---

Cineradiographic Exposure Charts IEC 60613
 Abaques de Cinéradiographie CEI 60613
 Belastungskurven für den Kinobetrieb IEC 60613
 Diagramas de Exposición Cineradiográfica IEC 60613

50/60 Hz



150/180 Hz



Nominal anode input power for the anode heat content 70%. IEC 60613

Puissance calorifique nominale de l'anode: 70%, CEI 60613

Thermische Anodenbezugsleistung bei einer Wärmespeicherung von 70%. IEC 60613

Aproximadamente el poder de penetración para obtener un almacenaje de calor del anodo de 70%. IEC 60613

ANGIOGRAPHIC RATINGS

HOW TO USE ANGIOGRAPHIC CHARTS

General: Serial Radiography puts a severe demand on the x-ray tube due to the large number of exposures made in rapid succession. Intervals between exposures are fixed and so short that it is not possible for the anode track to cool to any extent during the exposure series. Therefore, the temperature of the anode track increases from exposure to exposure. The kW values used in the angiographic charts have been determined to prevent damage to the anode. The angiographic rating charts are usable to 100% anode heat storage. Exceeding 100% anode heat storage will cause anode track erosion with high risk of tube destruction.

Definition of Terms

Number of Exposures in Series: The number of exposures made in succession or the number of exposures made during one contrast injection.

Exposure Rate: The number of exposures made per second. For a series of exposures where the exposure rate changes, it must be assumed that all exposures will be made at the maximum rate. For example, if during a series 10 exposures will occur at one per second and 30 exposures at 4 per second, use the kW ratings in the 40 exposure column at 4 per second rate.

Exposure Time: Time in seconds of each exposure.

USING THE CHARTS:

Select Correct Chart:

50/60 or 150/180 Hz

0.6 or 1.0 Focal Spot

Note: 150/180 Hz rotor speed recommended for all angiography.

Determine the number of exposures in Series: With cut film angiography the number of exposures are known, however in Digital Angiography the number of exposures commonly are not known. When determining the number of exposures, assume worst case or past history.

Note: Most angiographic x-ray tubes fail from underestimating the number of exposures made in a series.

Determine kW of each exposure in Series: Referring to chart —find block under “Number of Exposures in Series” that is greater than or equal to expected number of exposures in Series. On left side directly opposite this block under “Exposure Rate per Second” column, select maximum rate per second that will be used for the exposure series. At the intersection of exposure rate and exposure time in seconds, find maximum kW allowed for each exposure.

kW = pkV x mA: The kW of the exposure can be any combination of mA and pkV allowed by the Radiographic and Filament Emission charts.

For Example: 80 pkV and 500 mA = 40 kW

Example: From chart RAD-50 150/180 Hz 3 Phase 1.0 Focal Spot, determine kW allowed with following known factors.

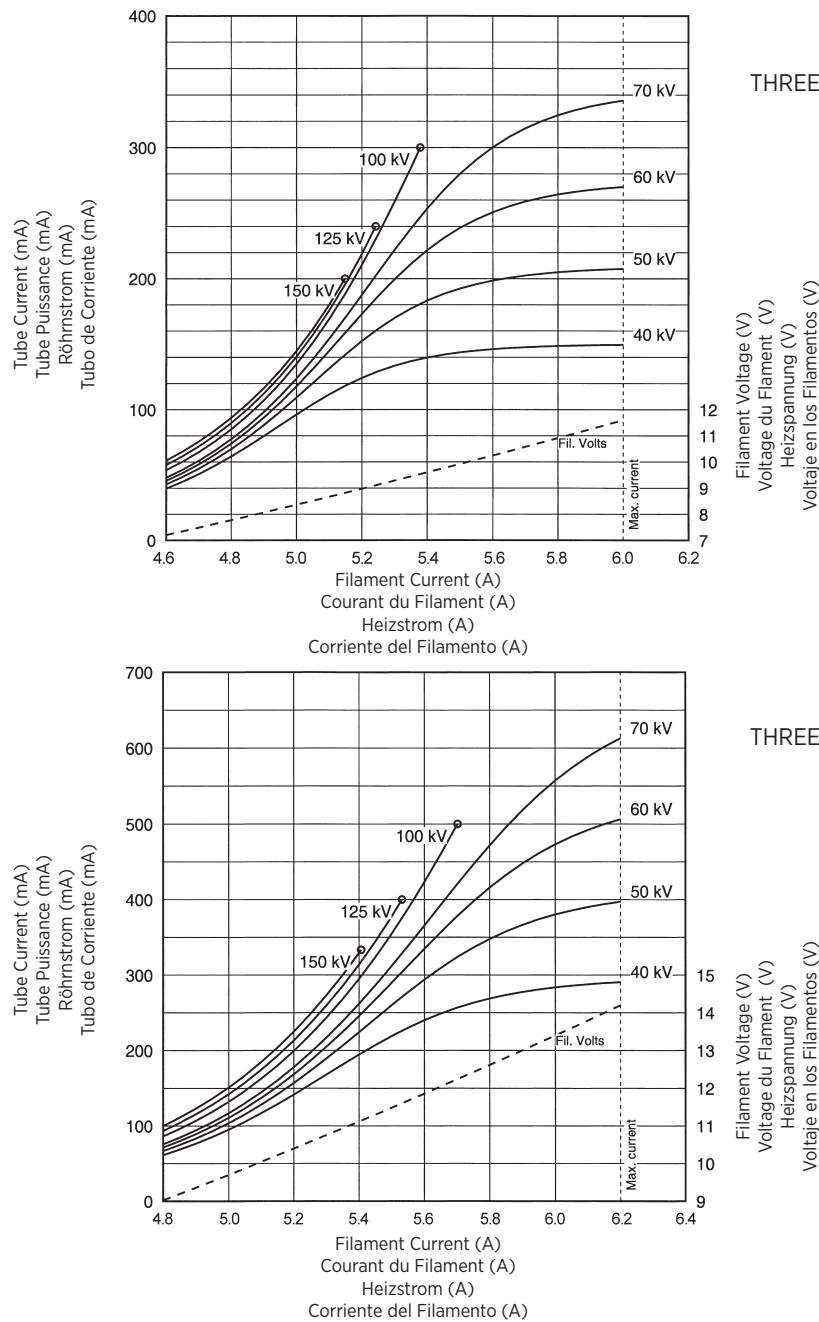
Maximum number of exposures40

Exposure time .050 second (50 milliseconds)

Maximum Exposure per second4

From chart find 40 exposure block. On left side directly opposite this block under “Exposure Rate per Second” column, select 4 exposures per second. Find .050 seconds at top of chart. At intersection of exposure rate line and exposure time, find 29.2 kW.

Filament Emission Charts IEC 60613
 Abaques d' Émissions des Filaments CEI 60613
 Glühfadenemissionsdiagramm IEC 60613
 Curvas de Emisión de los Filamentos IEC 60613



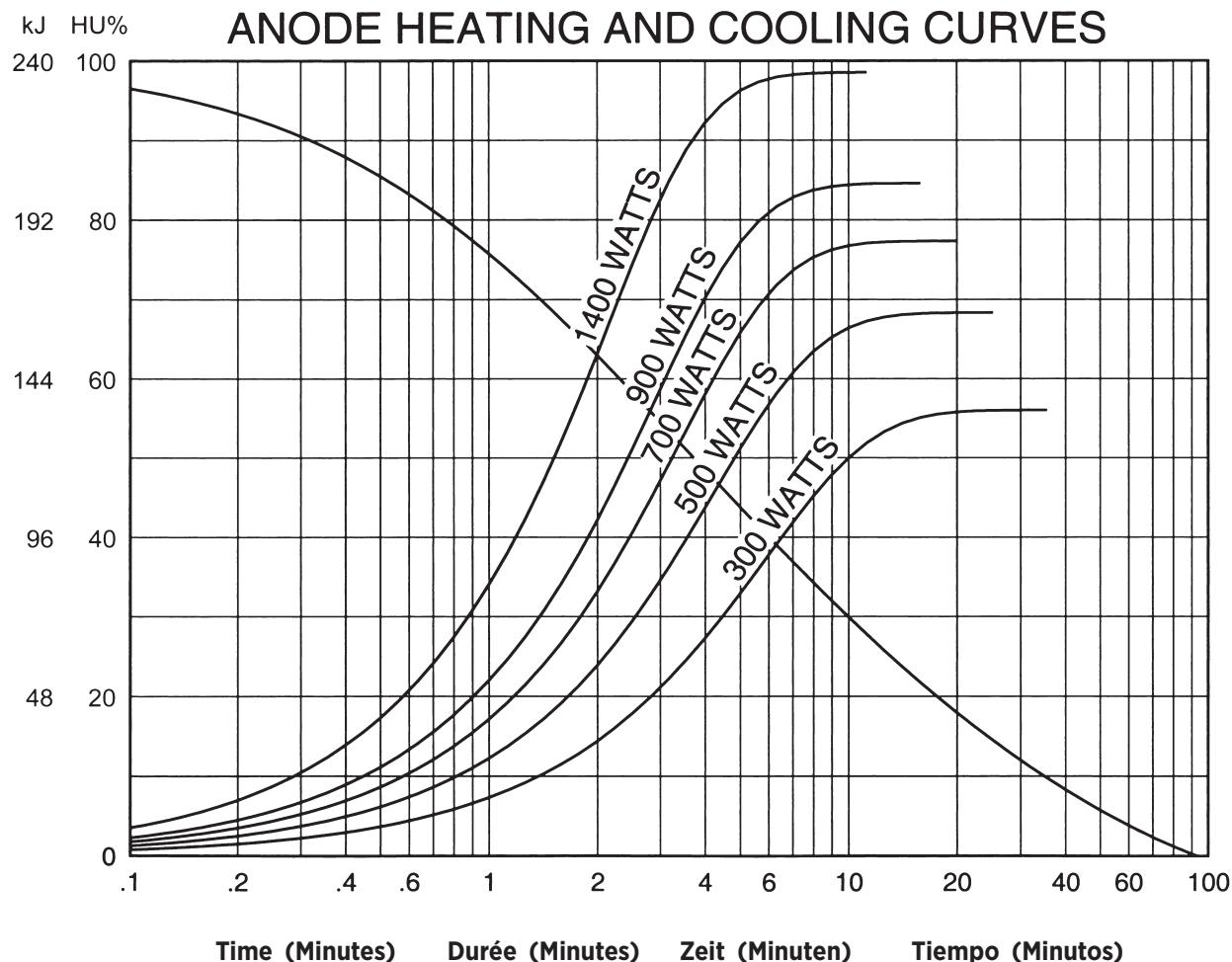
Note: When using these emission curves for trial exposures, refer to the power rating curves shown for maximum kV, tube emission, filament current, exposure time, and target speed.

Remarque: Lors de l'utilisation de ces abaques pour des expositions d'essai, référez-vous aux courbes maximales de kV, d'émission du filament, de temps d'exposition et de vitesse de rotation.

Anmerkung: Wenn Sie diese Emissionskurven für Testaufnahmen verwenden, beziehen Sie sich hierbei auf die entsprechenden Nennleistungskurven für max. kV-Werte, Röhrenemission, Heizström, und Anodendrehzahl.

Nota: Si utiliza estas curvas de emisión para exposiciones de prueba, refiérase a las curvas de gradación de potencia para el máximo de kV, tubo de emisión, corriente en los filamentos, tiempo de exposión, y a las curvas de velocidad del objetivo.

Anode Heating & Cooling Chart
 Abaques d' Échauffement et de Refroidissement de L'Anode
 Anodenerhitzungs und Kühlungsdiagramm
 Curvas de Calentamiento y Enfriamiento del Anodo



Salt Lake City, UT

1-801-972-5000

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