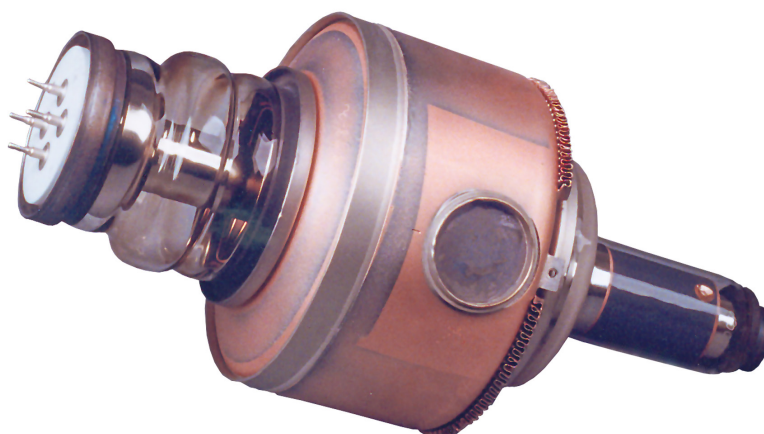


Rotating Anode X-Ray Tube
Tubes Radiogènes à Anode Tournante
Röntgenröhre mit rotierender Anode
Tubos de Rayos-X con Ánodo Giratorio



Note: Document originally drafted in the English language.

Product Description

The G-1087 is a 4.25" (108 mm) 150 kV, 740 kJ (1.0 MHU) maximum anode heat content, rotating anode insert. This metal center section insert is designed for radiography, cineradiography, digital and film screen angiography procedures. The insert features a 12° rhenium-tungsten facing on molybdenum with a graphite backed target and is available with the following nominal focal spots:

0.3 - 1.2
IEC 60336

Reference Axis:

Perpendicular to port face.

Nominal Anode Input Power

Small - 12 kW IEC 60613

Large - 100 kW IEC 60613

For the equivalent anode input power of 235 Watts

G-1087 models have grid control capability.

Grid Control Voltages:

Typical Bias Voltage for Cutoff at 150 kV-3700Vdc

Grid Voltage for Exposure 0 Vdc

Description du Produit

Le tube G-1087, à anode tournante de 108 mm, (4,25 pouces), 150 kV, avec une capacité calorifique maximale de 740 kJ (1,0 MUC). Cette section métallique centrale a été conçue pour les procédures radiographiques, cinéradiographiques, et angiographiques numérisés et sur film. L'tube est pourvu d'une anode avec pente de 12° en rhénium - tungstène sur une base de molybdène et avec un doublage de graphite. Il est disponible avec les foyers suivantes:

0,3 - 1,2
CEI 60336

Référence Axe:

Perpendiculaire à la face de sortie.

Puissance anodique nominale de l'anode

Petit foyer - 12 kW CEI 60613

Grand foyer - 100 kW CEI 60613

Pour la puissance anodique d'équilibre thermique de 235 Watts

Les Modèles G-1087 ont une fonction de commande de grille.

Potentiel de controle de grille:
Voltage typique pour coupure et 150 kV -3700 Vcc

Voltage de grille pendant exposition 0 Vcc

Description du Produit

Le tube G-1087, à anode tournante de 108 mm, (4,25 pouces), 150 kV, avec une capacité calorifique maximale de 740 kJ (1,0 MUC). Cette section métallique centrale a été conçue pour les procédures radiographiques, cinéradiographiques, et angiographiques numérisés et sur film. L'tube est pourvu d'une anode avec pente de 12° en rhénium - tungstène sur une base de molybdène et avec un doublage de graphite. Il est disponible avec les foyers suivantes:

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Pour la puissance anodique d'équilibre thermique de 235 Watts

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Voltage typique pour coupure et 150 kV -3700 Vcc

Voltage de grille pendant exposition 0 Vcc

Descripcion del Producto

El G-1087 es un tubo de ánodo giratorio de 108 mm (4.25"), 150 kV, 740 kJ (1.0 MUC). Este tubo de metal en la parte central es diseñado específicamente para radiografía, cineradiográfica, digital, y procedimientos de angiografía con película de pantalla. El blanco emisor es una combinación de renio, tungsteno y molibdeno con grafito en la parte posterior con un rayo central de 12 grados. Disponible con las siguientes combinaciones de marcas focales:

0.3 - 1.2
IEC 60336

Referencia de Axes:

Perpendicular a la abertura facial.

Potencia nominal de entrada del anodo

Foco fine - 12 kW IEC 60613

Foco grueso - 100 kW IEC 60613

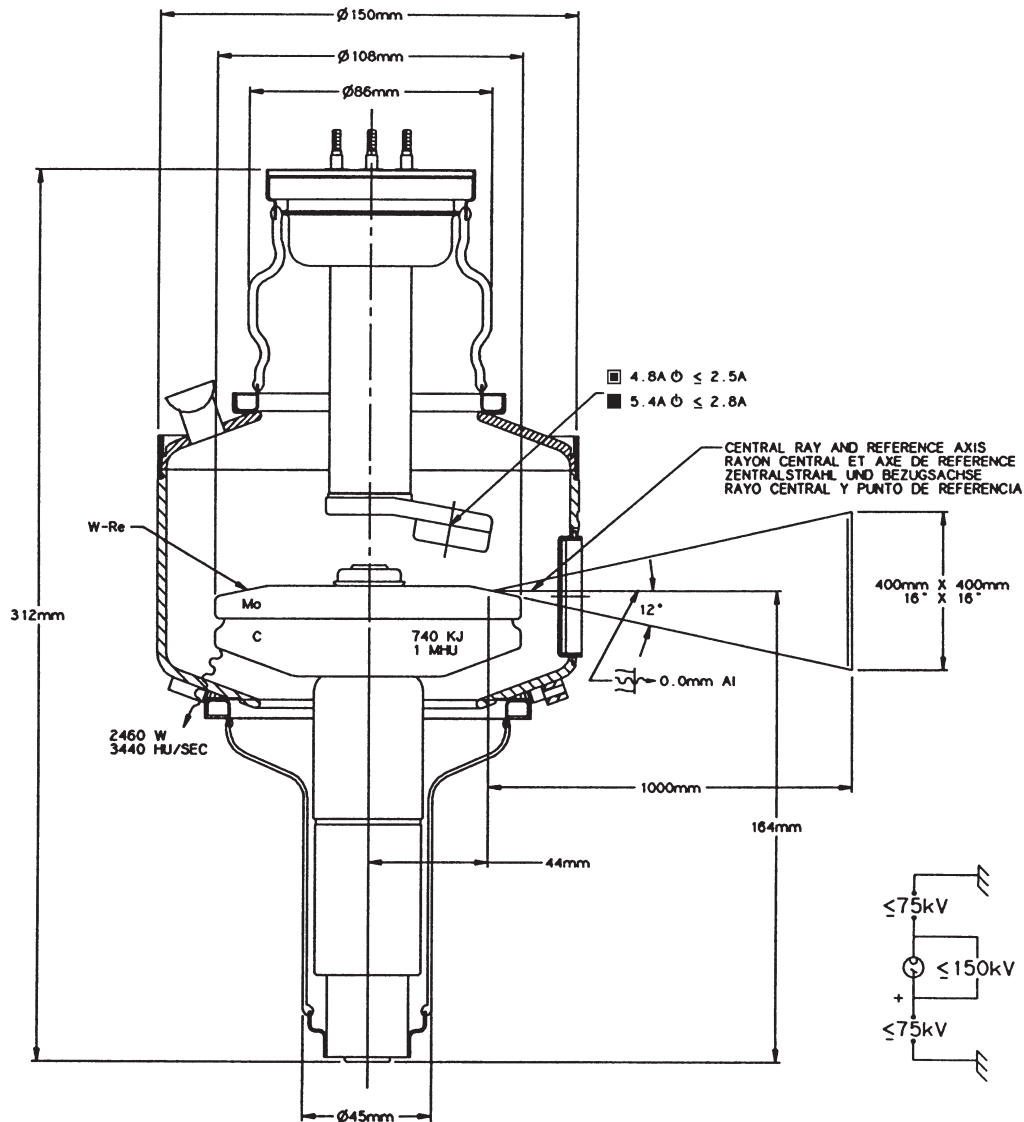
Para una potencia equivalente del anodo de 235 W

El modelo G-1087 tiene capacidad para de rejillas controlar los electrones.

Voltaje de Rejillas Controlada:
Voltaje controlado tipico con interruptor a 150 kV -3700 Vdc

Voltaje de rejillas con exponición 0 Vdc

Tube Outline Drawing
Dessin d'Encombrement de la Tube
Maßzeichnungen des Drehanoden-Röntgenröhre
Esquema Detallado del Tubo



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

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

Stand - By
Attente
Bereit Stehen
En Espera

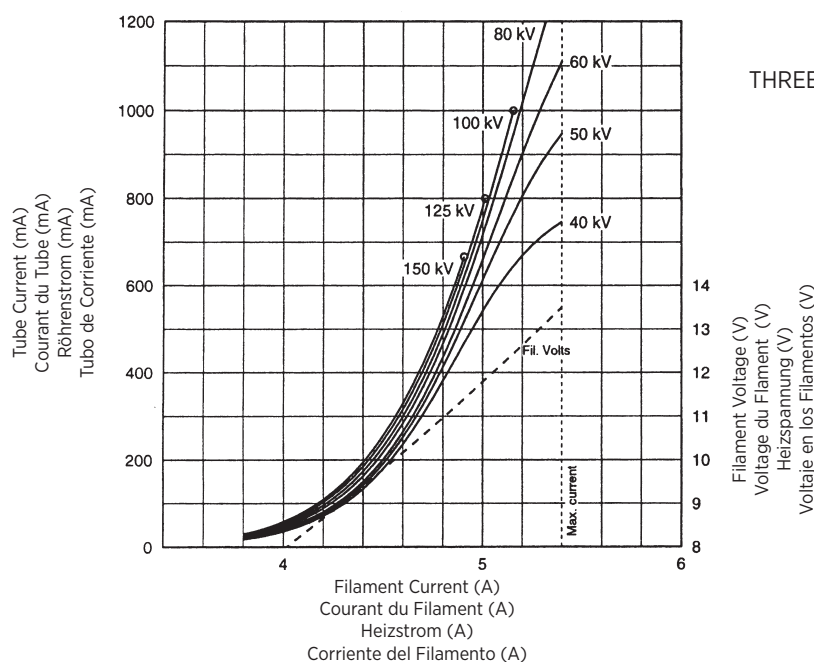
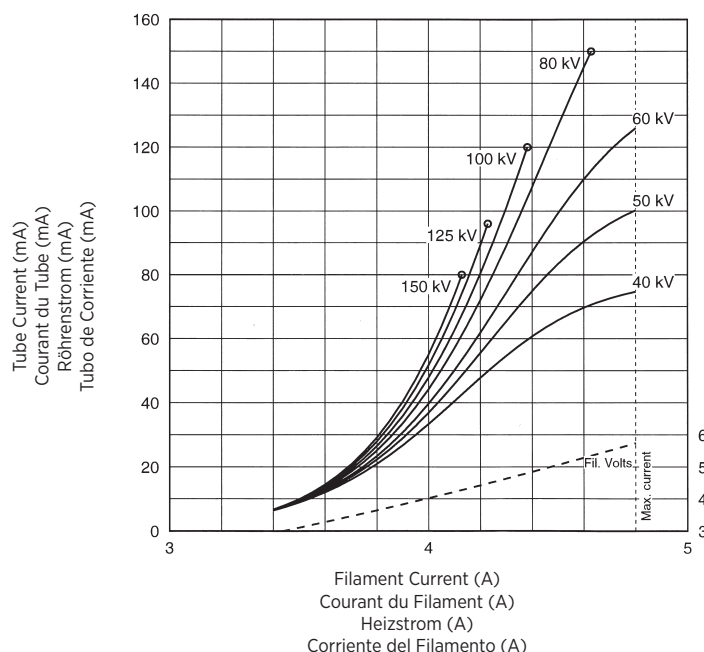
Frame or Chasis
Masse
Chassis
Soporte o Chasis

X-Ray Tube
Tube Radiogène
Röntgenröhre
Tubo de Rayos X

Radiation Filter or Filtration
Filtre de rayonnement
Filterung
Filtración de Radiación

3 Ø Full Wave

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, Heizstrom, und Anodendrehzahl.

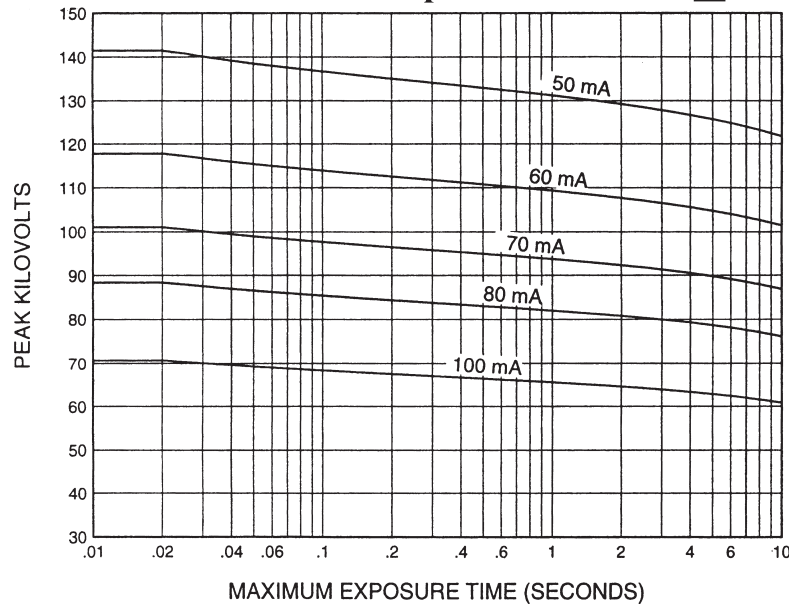
Nota:
Si utiliza estas curvas de emisión para exposiciones de prueba, refiérase a las curvas de gradación de potencia para el máximo de kV, tubo de emisión, corriente en los filamentos, tiempo de exposición, y a las curvas de velocidad del objetivo.

3 Ø Constant Potential

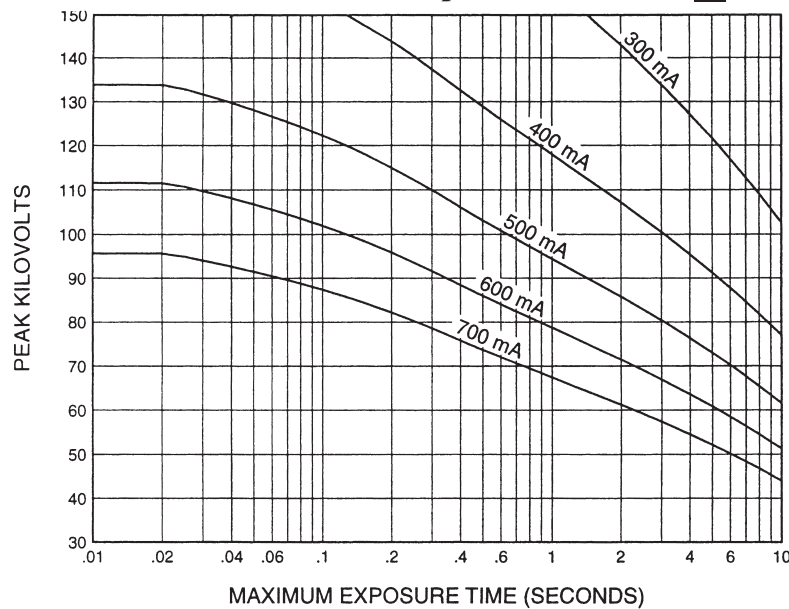
Single Load Ratings IEC 60613
Abaques de Charge pour Pose Unique CEI 60613
Brennfleck - Belastungskurven IEC 60613
Diagramas de Exposición Radiográfica IEC 60613

50 Hz

Nominal Focal Spot Size - 0.3



Nominal Focal Spot Size - 1.2



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

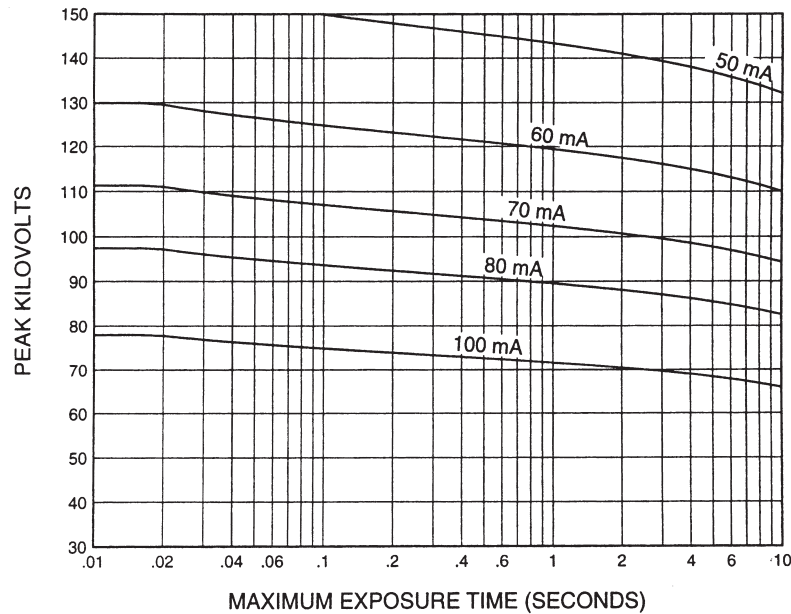
Aproximadamente el poder de penetración para obtener un almacenaje de calor del anodo de 40%. IEC 60613

3 Ø Constant Potential

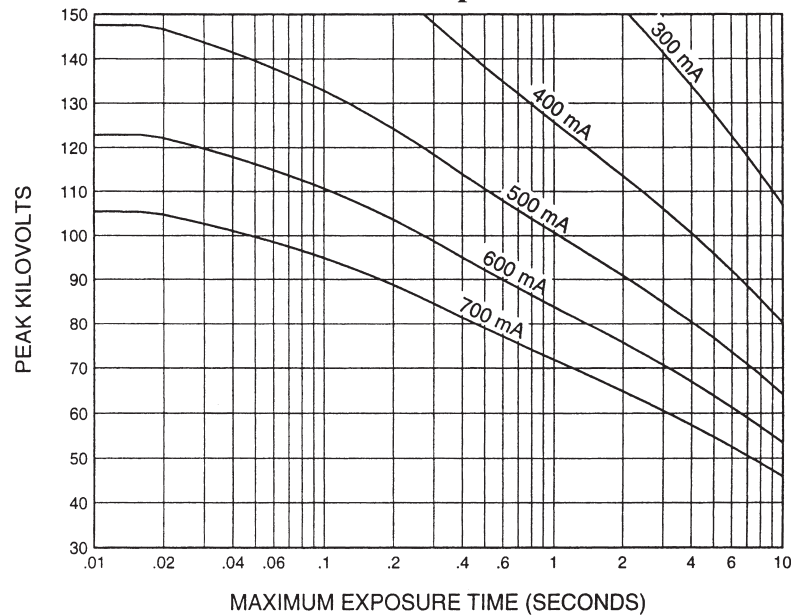
Single Load Ratings IEC 60613
Abaques de Charge pour Pose Unique CEI 60613
Brennfleck - Belastungskurven IEC 60613
Diagramas de Exposición Radiográfica IEC 60613

60 Hz

Nominal Focal Spot Size - 0.3



Nominal Focal Spot Size - 1.2



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

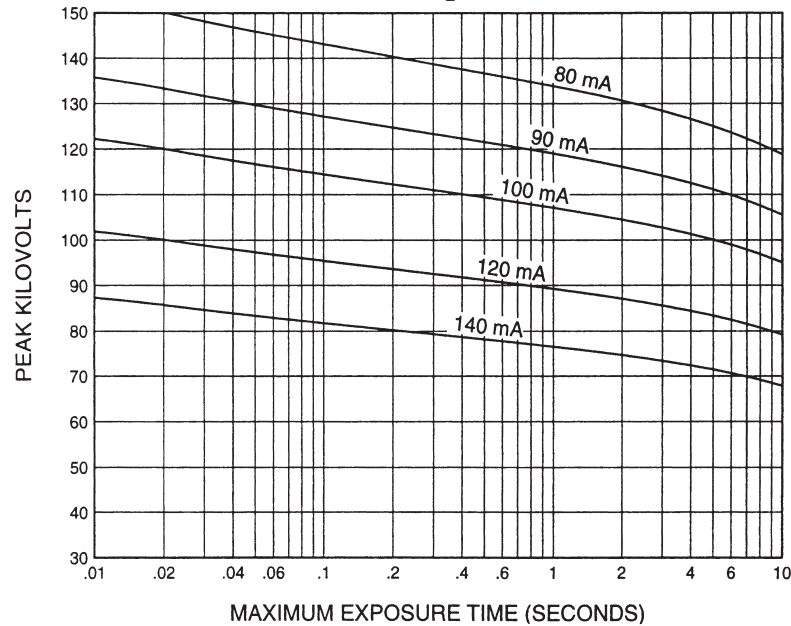
Aproximadamente el poder de penetración para obtener un almacenaje de calor del anodo de 40%. IEC 60613

3 Ø Constant Potential

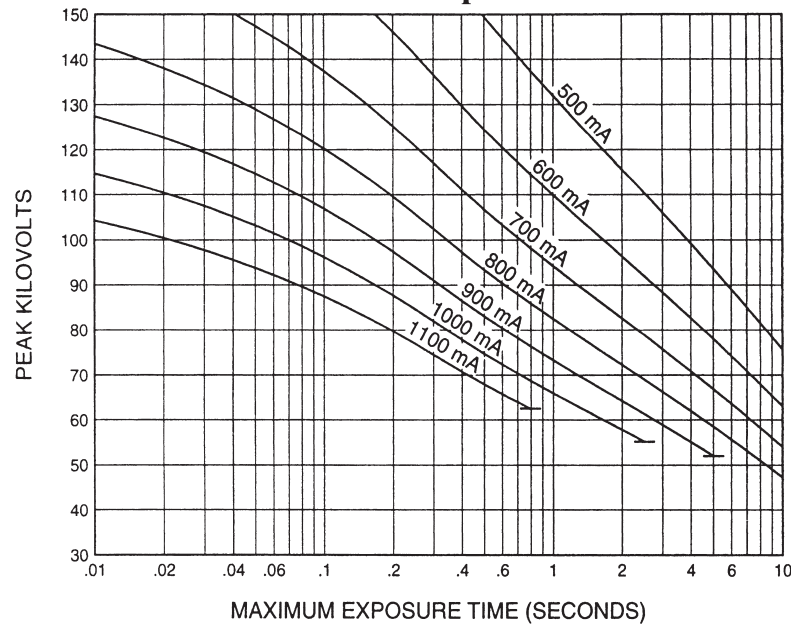
Single Load Ratings IEC 60613
Abaques de Charge pour Pose Unique CEI 60613
Brennfleck - Belastungskurven IEC 60613
Diagramas de Exposición Radiográfica IEC 60613

150 Hz

Nominal Focal Spot Size - 0.3



Nominal Focal Spot Size - 1.2



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

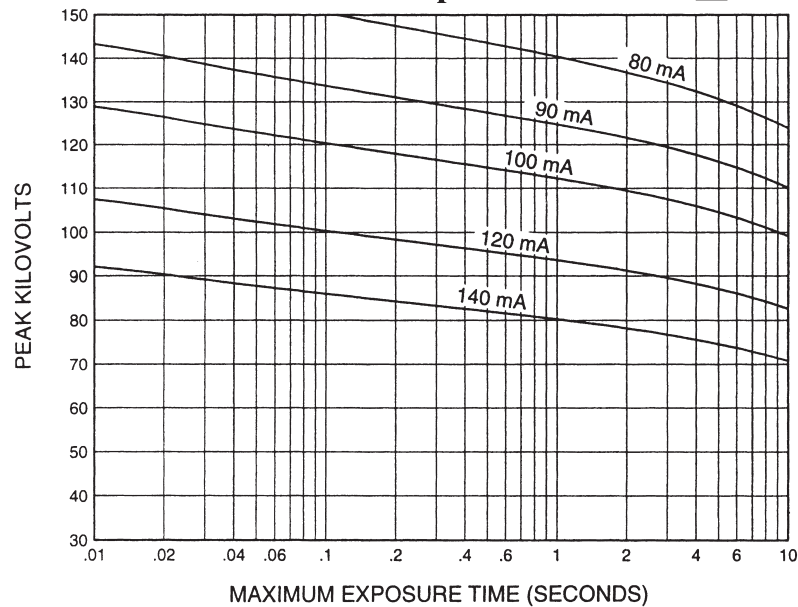
Aproximadamente el poder de penetración para obtener un almacenaje de calor del anodo de 40%. IEC 60613

3 Ø Constant Potential

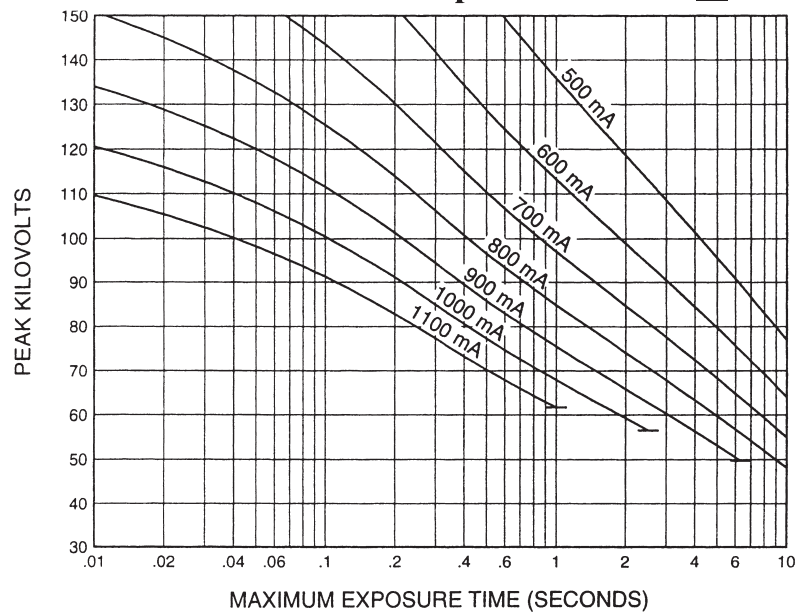
Single Load Ratings IEC 60613
Abaques de Charge pour Pose Unique CEI 60613
Brennfleck - Belastungskurven IEC 60613
Diagramas de Exposición Radiográfica IEC 60613

180 Hz

Nominal Focal Spot Size - 0.3



Nominal Focal Spot Size - 1.2



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 4 msec pulse width and 60 exposures per second the x-ray tube will be producing x-rays for a total of 240 msec each second or 24% 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

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

USING THE CINE RATING CHARTS:

G-1087 150/180 Hz 3 Phase 1.2 Focal Spot

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

Maximum Pulse Width 4 msec

Exposures per Second60

Maximum Cine Run Time10 seconds

Calculate Duty Factor: (DF%)

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

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

Refer to Rating Chart G-1087 150/180 Hz 3 Phase 1.2 Focal Spot:

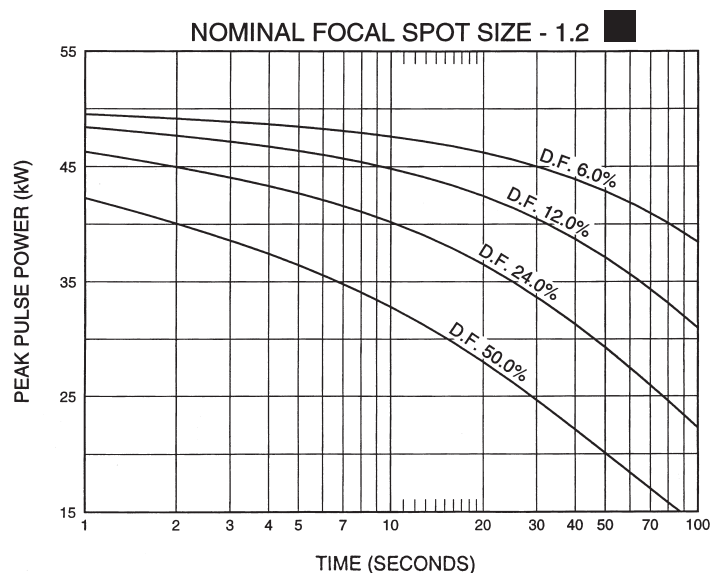
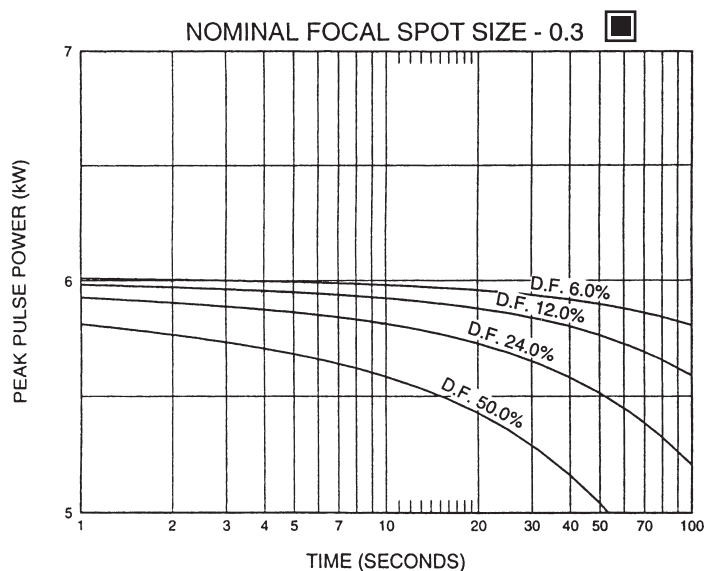
At bottom of chart find 10 second line. Move vertically to intersection with 24% DF curve. Make a horizontal reference to left side of rating chart and note kW rating of 60 kW.

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.

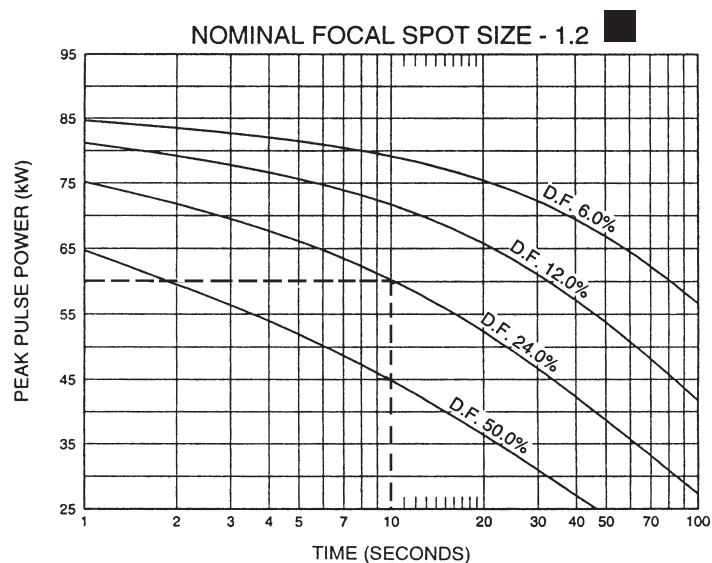
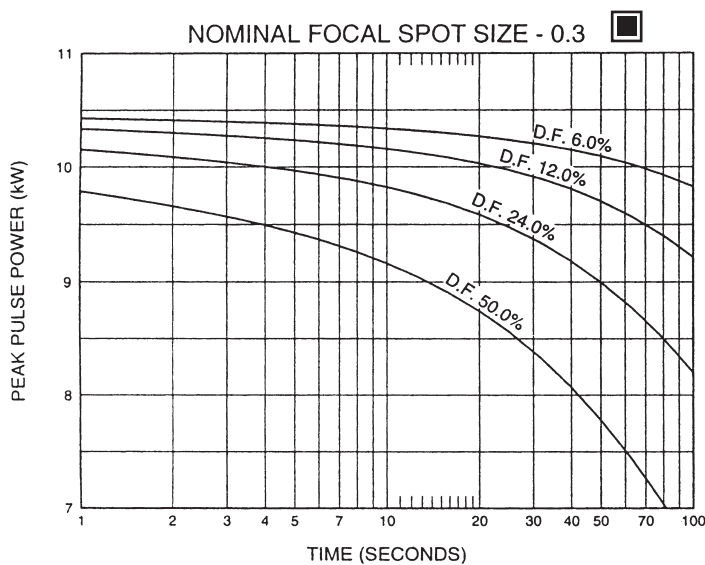
The Cine rating charts are usable to 100% anode heat storage. Exceeding 100% anode heat storage will cause anode track erosion with high risk of tube destruction.

3 Ø Constant Potential

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:

3 phase generator
50/60 or 150/180 Hz
0.3 or 1.2 Focal Spot

Note: 1150/180 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 G-1087 150/180 Hz 3 Phase 1.2 Focal Spot, determine kW allowed with following known factors.
Maximum number of exposures40
Exposure time .050 second (50 milliseconds)
Maximum Exposures 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 61.7 kW.

1.2 Focal Spot $\varnothing$ 12 Degrees 150/180 Hz
1,2 Dimension Focale $\varnothing$ 12 Degrés 150/180 Hz
1.2 Brennfleck $\varnothing$ 12 Grad 150/180 Hz
1.2 De Marcas Focales $\varnothing$ 12 Grados 150/180 Hz

Serial Load Ratings IEC 60613
Abaques de charges successives CEI 60613
Serienbetrieb-Belastungskurven IEC 60613
Ratio de carga en serie IEC 60613

Exposure rate per second	Tube load (kW) as a function of the exposure time (seconds) of the individual radiographs of the series															Number of exposures in series
	0.010	0.020	0.030	0.040	0.050	0.060	0.080	0.100	0.120	0.140	0.160	0.180	0.200	0.225	0.250	
1	85.7	81.8	79.0	76.6	74.5	72.7	69.5	66.8	64.4	62.3	60.4	58.6	57.0	55.1	53.4	10
2	85.3	81.0	77.8	75.1	72.8	70.8	67.2	64.2	61.6	59.2	57.1	55.2	53.5	51.5	49.7	
3	84.8	80.1	76.6	73.7	71.2	69.0	65.1	61.9	59.1	56.6	54.4	52.4				
4	84.3	79.3	75.6	72.4	69.7	67.3	63.2	59.8	56.9	54.3						
8	83.0	76.9	72.3	68.5	65.2	62.4										
15	81.1	73.9	68.3	63.8												
30	78.6	69.8														
1	85.0	80.5	77.2	74.4	71.9	69.7	66.0	62.7	59.9	57.4	55.2	53.1	51.3	49.2	47.3	20
2	84.4	79.5	75.7	72.6	69.9	67.5	63.3	59.8	56.8	54.1	51.7	49.6	47.7	45.5	43.6	
3	83.8	78.5	74.4	71.0	68.0	65.4	61.0	57.2	54.1	51.3	48.8	46.7				
4	83.3	77.5	73.1	69.4	66.3	63.5	58.8	55.0	51.7	48.9						
8	81.5	74.5	69.1	64.7	61.0	57.8										
15	79.0	70.4	64.0	58.9												
30	75.2	64.6														
1	83.8	78.3	74.1	70.6	67.6	64.9	60.3	56.4	53.1	50.2	47.7	45.4	43.4	41.1	37.0	40
2	83.1	77.1	72.5	68.7	65.5	62.6	57.6	53.6	50.1	47.2	44.6	42.3	40.2	38.0	36.0	
3	82.4	76.0	71.0	67.0	63.5	60.4	55.3	51.1	47.6	44.5	41.9	39.7				
4	81.8	74.9	69.6	65.3	61.7	58.5	53.1	48.9	45.3	42.3						
8	79.6	71.4	65.2	60.2	56.0	52.5										
15	76.5	66.6	59.4	53.8												
30	71.7	59.6														
1	82.6	76.2	71.4	67.4	63.9	60.8	55.7	51.5	47.9	44.0	38.5	34.3	30.8	27.4	24.7	60
2	81.8	75.0	69.8	65.5	61.8	58.6	53.2	48.8	45.2	42.1	38.5	34.3	30.8	27.4	24.7	
3	81.1	73.8	68.3	63.7	59.9	56.5	51.0	46.5	42.9	39.8	37.2	34.3				
4	80.4	72.7	66.8	62.1	58.1	54.6	49.0	44.5	40.9	37.8						
8	78.1	69.0	62.3	56.9	52.5	48.8										
15	74.8	64.0	56.3	50.5												
30	69.5	56.6														
1	81.4	74.3	68.9	64.4	60.6	57.3	51.8	46.2	38.5	33.0	28.9	25.7	23.1	20.6	18.5	80
2	80.7	73.1	67.3	62.6	58.6	55.2	49.5	45.0	38.5	33.0	28.9	25.7	23.1	20.6	18.5	
3	79.9	71.9	65.8	60.9	56.8	53.2	47.5	42.9	38.5	33.0	28.9	25.7				
4	79.2	70.8	64.4	59.3	55.1	51.5	45.6	41.1	37.4	33.0						
8	76.8	67.0	59.8	54.2	49.7	45.9										
15	73.3	61.9	53.9	47.9												
30	67.7	54.4														
1	80.3	72.5	66.6	61.8	57.7	54.2	46.2	37.0	30.8	26.4	23.1	20.6	18.5	16.4	14.8	100
2	79.6	71.3	65.1	60.0	55.8	52.2	46.2	37.0	30.8	26.4	23.1	20.6	18.5	16.4	14.8	
3	78.8	70.1	63.6	58.4	54.1	50.4	44.5	37.0	30.8	26.4	23.1	20.6				
4	78.1	69.0	62.2	56.8	52.4	48.7	42.8	37.0	30.8	26.4						
8	75.6	65.2	57.7	51.9	47.3	43.5										
15	72.1	60.1	51.9	45.8												
30	66.3	52.5														
1	77.8	68.4	61.5	56.1	49.3	41.1	30.8	24.7	20.6	17.6	15.4	13.7	12.3	11.0	9.9	150
2	77.0	67.2	60.1	54.5	49.3	41.1	30.8	24.7	20.6	17.6	15.4	13.7	12.3	11.0	9.9	
3	76.2	66.1	58.7	53.0	48.4	41.1	30.8	24.7	20.6	17.6	15.4	13.7				
4	75.5	65.0	57.5	51.6	47.0	41.1	30.8	24.7	20.6	17.6						
8	73.0	61.4	53.3	47.2	42.5	38.6										
15	69.3	56.4	47.8	41.6												
30	63.4	49.0														

Note:

1. (kW) of Exposure Equals mA x kV. For Example: 70 kV x 300 mA = 21 kW.
2. Exposures less than .010 seconds will have a kW rating same as .010 seconds.

Remarque:

1. (kW) en exposition égale kV x mA. Par exemple: 70 kV x 300 mA = 21 kW.
2. Les expositions inférieures à 0.010 sec. ont les mêmes valeurs en kW que celles de 0.010 sec.

Anmerkungen:

1. (kW) der Belichtung ist gleich mA x kV Zum Beispiel: 70 kV x 300 mA = 21 kW.
2. Belichtungen von weniger als .010 Sekunden haben die gleichen kW Werte wie die von .010 Sekunden.

Nota:

1. (kW) De exposición se calcula multiplicando mA x kV-por ejemplo: 70 kV x 300 mA = 21 kW.
2. Para exposición de menos de .010 segundos, el resultado en (kW) sería lo mismo que el de .010 segundos.

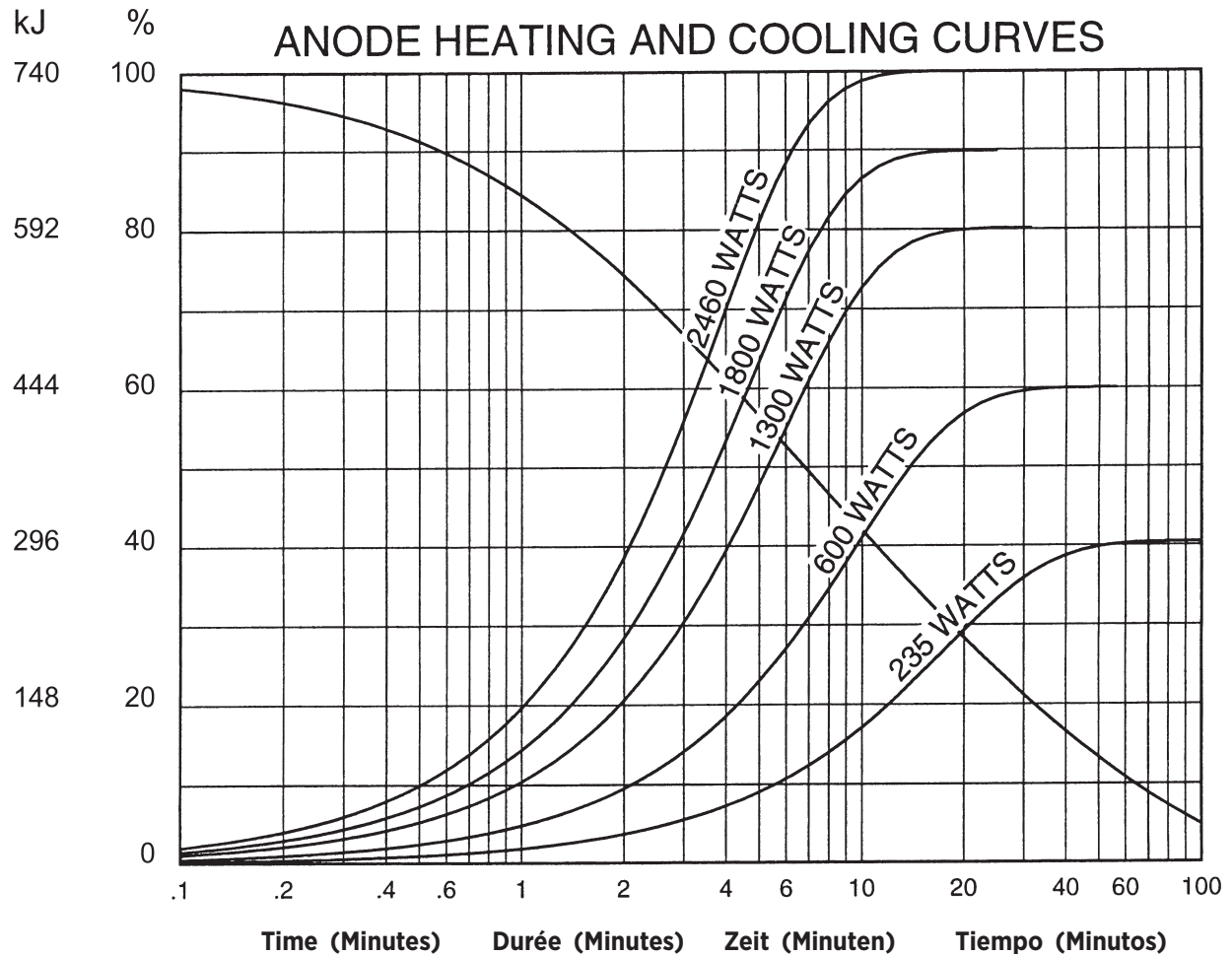
Nominal anode input power for the anode heat content 70%. IEC 60613

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

Anode Heating & Cooling Chart
 Abaques d' Échauffement et de Refroidissement de L'Anode
 Anoden Aufheiz - und Abkühl Kurven
 Curvas de Calentamiento y Enfriamiento del Anodo





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