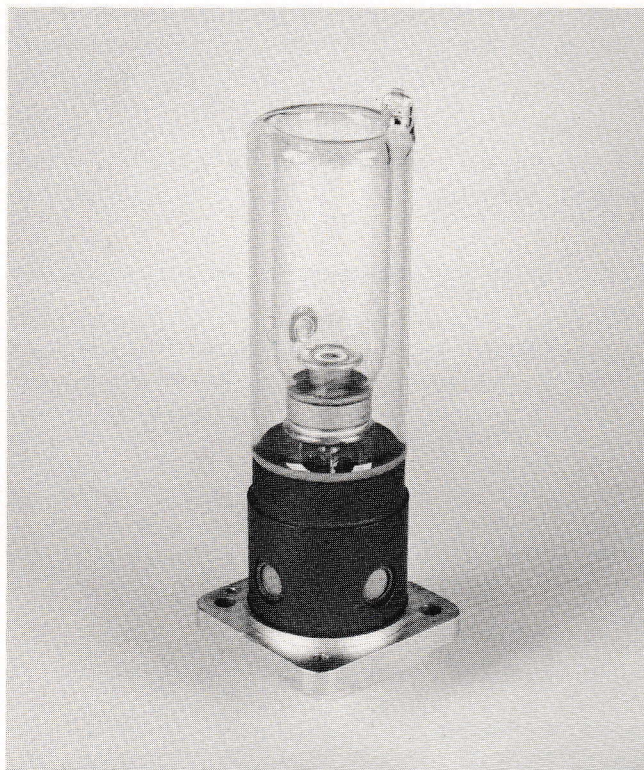




X-RAY DIFFRACTION EUROPEAN STANDARD TUBE

Industrial X-Ray Tubes



DESCRIPTION

The Varian European Standard diffraction tube replaces, and is interchangeable with, the types by Amperex, Philips, AEG, Siefert, Enraf-Nonius and Toshiba.

These tubes are available in a wide range of target materials and a selection of focal spot sizes. They feature uniform focus, high beam intensity, long life and high spectral purity.

The tube envelope consists of a metal body containing the anode, which is at ground potential, and four brazed Beryllium exit windows. A glass section is sealed to the metal body and supports and isolates the cathode.

varian®

x-ray tube products

GENERAL INFORMATION

Focal Quality:

Conforms with COCIR specification.

Spectral Purity:

Foreign lines on delivery $<1\%$ measured with Beta filter at 40 kV as % of K alpha line.

Radiation Safety:

Less and 2 mR/hr at two inches.

Electrical Safety & Mechanical Strength:

Conforms to IEC 348.

Cooling:

Tap water = 3.8L (4 qts.)/minute.

Maximum inlet temperature = 35°C (95°F)

Pressure Drop = $1.5 \pm 0.3 \text{ Kg/cm}^2$ (21 lb/in 2)

Maximum water pressure = 8 Kg/cm^2 (114 lb/in 2).

Water hardness:

Must not exceed 180 PPM CaCO_3 or equivalent.

Energy Limiting Resistance:

Minimum of 50,000 ohms directly in series with the tube is recommended.

SPECIFICATIONS

Maximum Peak Voltage 60 pkV

Nominal Focal Spot Sizes:

Fine Focus $0.4 \times 8 \text{ mm}$

Long Fine Focus $0.4 \times 12 \text{ mm}$

Normal Focus $1.0 \times 10 \text{ mm}$

Inherent Filtration Be .010" (.25 mm)

Window Diameter 14.5 mm

Target Angle Zero Degrees

Take-Off Angle With No

Intensity Loss Over Range Line = $0-12^{\circ}$

..... Point = $0-20^{\circ}$

Filament Characteristics Refer to

Filament Emission Curves

Anode Materials Copper, Tungsten,

Molybdenum, Chrome (special order),

Iron, Cobalt, Silver

Power Rating See Power Rating Curves

Weight 2.2 Kg (4.8 lbs)

X-RAY DIFFRACTION TUBES

Varian X-ray Tube Products offers universally compatible high power X-ray diffraction tubes with a wide choice of focus size and anode material. The Varian tubes are ideally suited for both powder diffraction and single crystal applications.

Varian's 55 year commitment to developing and manufacturing high power electron tubes has resulted in improved life, spectral purity, enhanced X-ray intensity, and high voltage stability. Even while operating at maximum rated power levels, Varian's reliable tubes maintain these high performance characteristics.

Varian shares your dedication to quality, precision, and reliability, and our quality systems have earned us ISO 9001 registration. For our customers, this means we have implemented a system of continuous feedback so that we're responsive to your needs and can achieve even higher levels of quality in the future.

SELECTING TUBE FOR APPLICATION

Normal Focus - Provides for flexible application of both point and line focus through a compromise between intensity and 1 x 10 mm line resolution.

Fine Focus - Provides an intense beam for high resolution camera work.
0.4 x 8 mm

Long Fine Focus - Provides both high resolution and high intensity, with similar applications as fine focus, but at higher power levels.
0.4 x 12 mm

Selection of XRD Tubes According to Anode Material

Anode Material	Atomic Number	Application
Copper (Cu)	29	Suitable for most diffraction examinations - most widely used anode material.
Moly (Mo)	42	Preferably used for examinations on steels and metal alloys with elements in the range Titanium (Ti) (atomic No. = 22) to approx. Zinc (Zn) (atomic No. = 30)
Cobalt (Co)	27	Often used with ferrous samples, the Iron (Fe) fluorescence radiation would cause interference and cannot be eliminated by other measures.
Iron (Fe)	26	Examination of ferrous samples. Also, for use with minerals where Co and Cr tubes cannot be used.
Chromium (Cr)	24	Used for complex organic substances and also radiographic stress measurements on steels.
Tungsten (W)	74	Used where an intensive white spectrum is of more interest than the characteristic radiation.

UNIVERSAL COMPATIBILITY

The Varian "European Standard" x-ray diffraction tube replaces and is interchangeable with the types offered by Philips, AEG, Siemens, Enraf-Nonius and Toshiba.

Since various equipment manufacturers have two different tube tower configurations, Varian offers two different X-ray tube assemblies. These two assemblies are commonly referred to as short anode, "A" version, or long anode, "B" version.

The difference between the two configurations is the distance between the center line of the Be window and the underside surface of the cooling cap. On the "A" version this distance is 21 mm and on the "B" version this distance is 34 mm (see Figure A).

Therefore, when ordering, it is necessary that the customer specify either the "A" version short anode or the "B" version long anode.

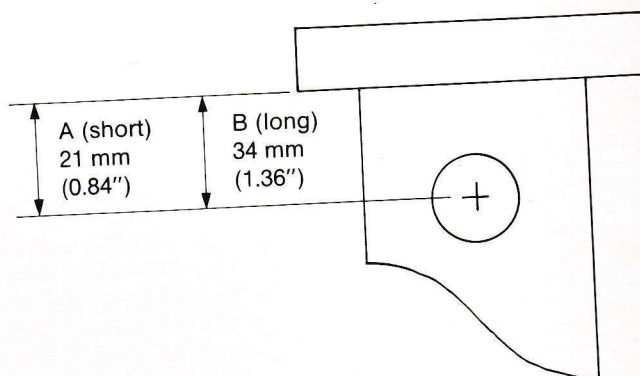


Figure A

The following applies only to Varian diffraction x-ray tubes with the prefix D7 in their type designation.

Varian is the only manufacturer of a diffraction x-ray tube that offers a 7 volt filament, our designation D7, is a replacement tube for use in older Philips type equipment, such as XRG 2500 and others.

The availability of such a tube permits the life of the equipment to be extended and eliminates the need for expensive equipment modification so as to accommodate x-ray tubes that operate at higher filament voltages.

The older type 7 volt filament version (D7) differs from the other more current standard tubes primarily in the type of cooling cap employed ("old style", see Figure B), and the need to add a 7mm spacer in order to achieve the required 34mm distance between the underside of the cooling cap to the center of the window.

This is illustrated in the sketch below and also shows that unique curved profile of the old style cooling cap that is used on these tubes.

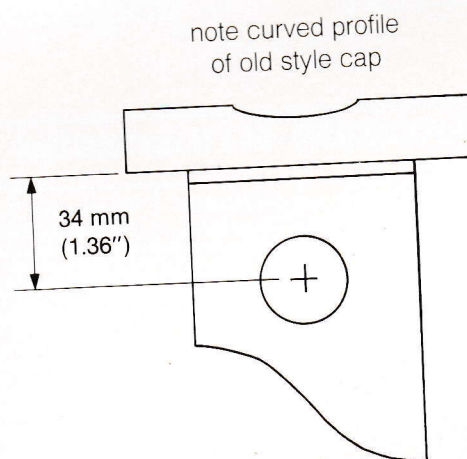


Figure B

VARIAN DIFFRACTION X-RAY TUBES REPLACEMENTS FOR PHILIPS, AEG, ENRAF-NONIUS, AND SEIFERT TYPES

All D7 tubes (7 volt filament) are intended for replacement use in older Philips type equipment, such as XRG2500.

NORMAL FOCUS (NF) - 1 x 10 mm Focal Spot

			"A" Version Type No.s	"B" Version Type No.s			"A" Version Type No.s	"B" Version Type No.s
Target Material	Max. Rating Watts (CP)	VARIAN	PHILIPS		AEG	ENRAF-NONIUS	SEIFERT SN60	
Cu	2000	D7NF-Cu or D9.5NF-Cu	PW 2233/20	PW 2243/20	FK-60-10-Cu	EN3502.243	907200	907201
W	2400	D7NF-W or D9.5NF-W	PW 2234/20	PW 2244/20	FK-60-10-W		907202	907203
Mo	2400	D7NF-Mo or D9.5NF-Mo	PW 2235/20	PW 2245/20	FK-60-10-Mo	EN3502.245	907204	907205
Co*	1800	D7NF-Co or D9.5NF-Co	PW 2236/20	PW 2246/20	FK-60-10-Co		907208	907209
Fe*	1500	D7NF-Fe or D9.5NF-Fe	PW 2237/20	PW 2247/20	FK-60-10-Fe		907210	907211
Cr	1800	D7NF-Cr or D9.5NF-Cr	PW 2238/20	PW 2248/20	FK-60-10-Cr		907206	907207
Ag*	2000	D7NF-Ag or D9.5NF-Ag	PW 2239/20	PW 2249/20	FK-60-10-Ag		907212	907213

*Special target material available upon request.

FINE FOCUS (FF) - 0.4 x 8 mm Focal Spot

			“A” Version Type No.s		“B” Version Type No.s				“A” Version Type No.s		“B” Version Type No.s	
Target Material	Max. Rating Watts (CP)	VARIAN	PHILIPS		AEG	ENRAF-NONIUS	SEIFERT SF60					
Cu	1500	D7FF-Cu or D8.5FF-Cu	PW 2213/20	PW 2223/20	FK-60-04-Cu	EN3502.223	907214				907215	
W	2000	D7FF-W or D8.5FF-W	PW 2214/20	PW 2224/20	FK-60-04-W		907216				907217	
Mo	2000	D7FF-Mo or D8.5FF-Mo	PW 2215/20	PW 2225/20	FK-60-04-Mo	EN3502.225	907218				907219	
Co*	1200	D7FF-Co or D8.5FF-Co	PW 2216/20	PW 2226/20	FK-60-04-Co		907222				907223	
Fe*	900	D7FF-Fe or D8.5FF-Fe	PW 2217/20	PW 2227/20	FK-60-04-Fe		907224				907225	
Cr	1300	D7FF-Cr or D8.5FF-Cr	PW 2218/20	PW 2228/20	FK-60-04-Cr		907220				907221	
Ag*	1500	D7FF-Ag or D8.5FF-Ag	PW 2219/20	PW 2229/20	FK-60-04-Ag		907226				907227	

*Special target material available upon request.

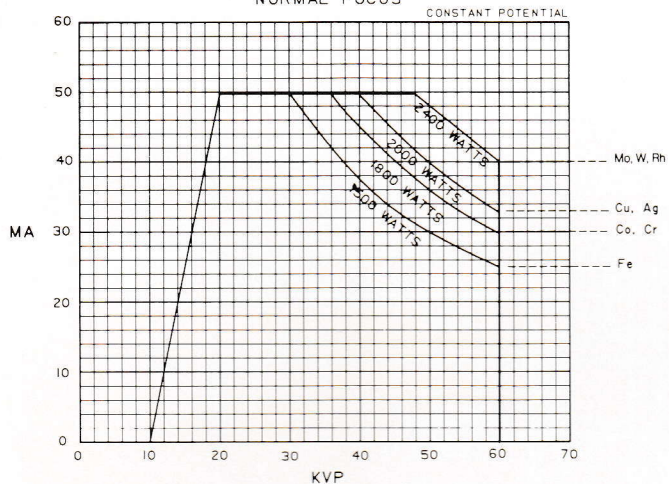
LONG FINE FOCUS (LFF) - 0.4 x 12 mm Focal Spot

Target Material	Max. Rating Watts (CP)	VARIAN	"A" Version Type No.s		"B" Version Type No.s	
			PHILIPS		AEG	
Cu	2200	D12LFF-Cu	PW 2273/20	PW 2283/20	FK-60-04x12-Cu	
W	3000	D12LFF-W	PW 2274/20	PW 2284/20	FK-60-04x12-W	
Mo	3000	D12LFF-Mo	PW 2275/20	PW 2285/20	FK-60-04x12-Mo	
Co*	1800	D12LFF-Co	PW 2276/20	PW 2286/20	FK-60-04x12-Co	
Fe*	1000	D12LFF-Fe	PW 2277/20	PW 2287/20	FK-60-04x12-Fe	
Cr	1900	D12LFF-Cr	PW 2278/20	PW 2288/20	FK-60-04x12-Cr	
Ag	2200	D12LFF-Ag	PW 2279/20	PW 2289/20	FK-60-04x12-Ag	

*Special target material available upon request.

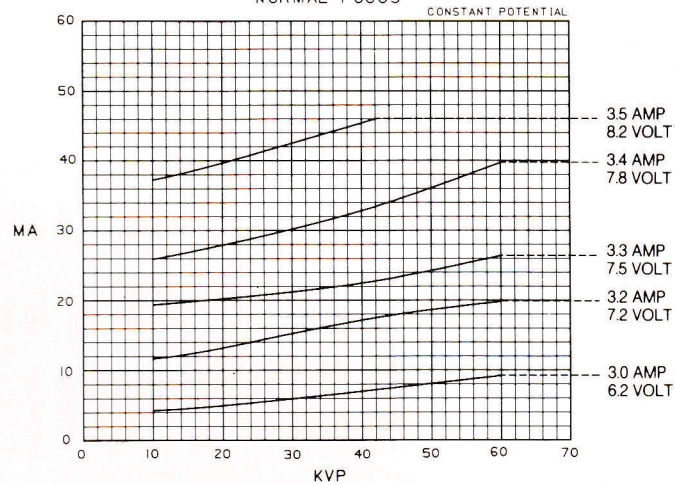
POWER CURVES

1.0 X 10.0
NORMAL FOCUS



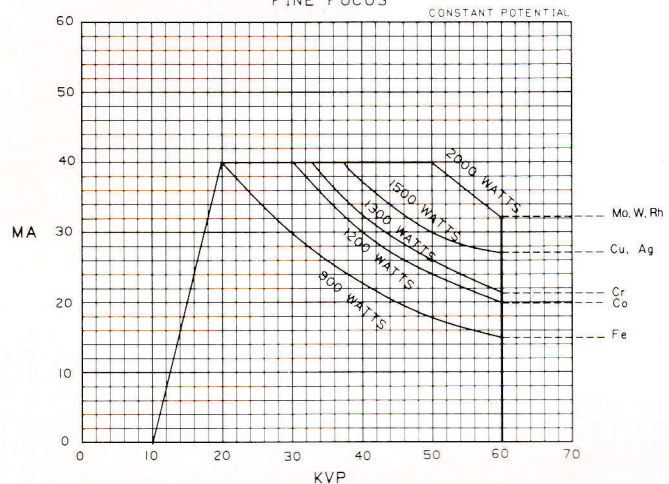
FILAMENT EMISSION CURVES

1.0 X 10.0
NORMAL FOCUS



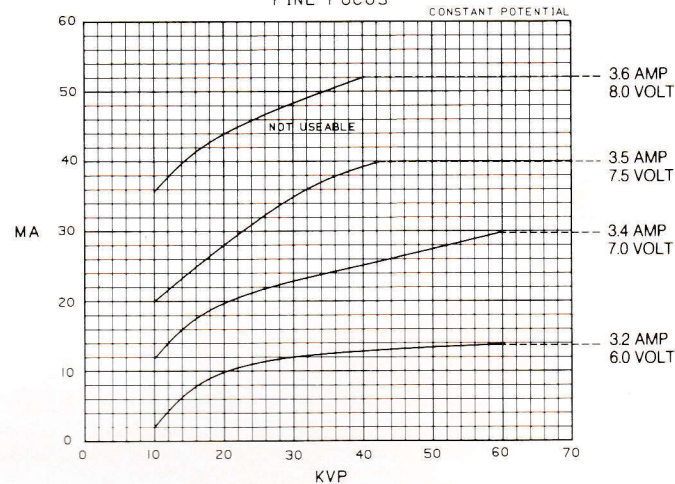
POWER CURVES

0.4 X 8.0
FINE FOCUS



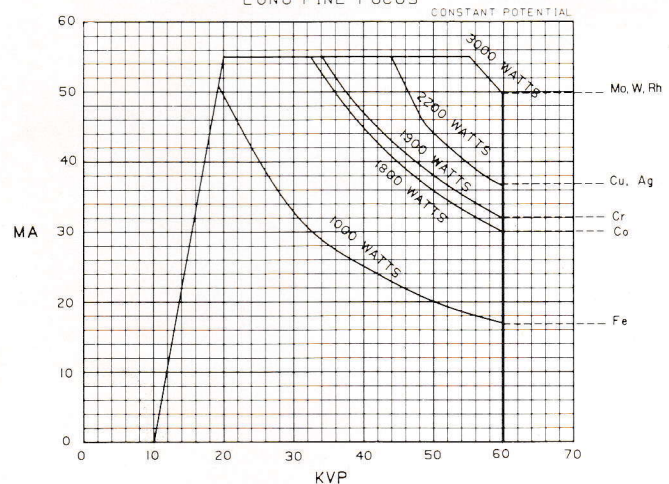
FILAMENT EMISSION CURVES

0.4 X 8.0
FINE FOCUS



POWER CURVES

0.4 X 12.0
LONG FINE FOCUS



FILAMENT EMISSION CURVES

0.4 X 12.0
LONG FINE FOCUS

