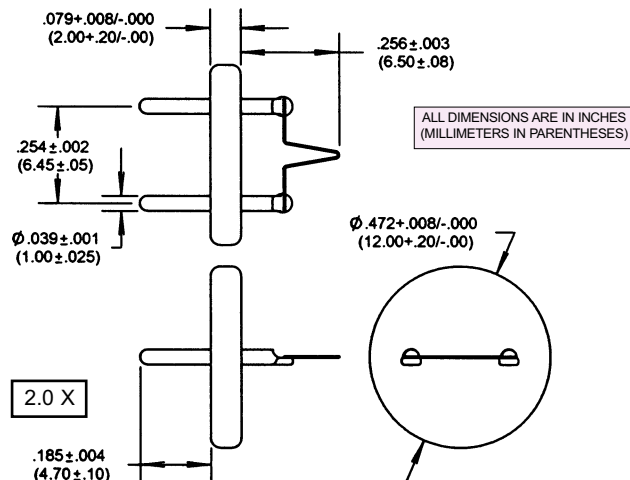


### FEATURES / OPTIONS

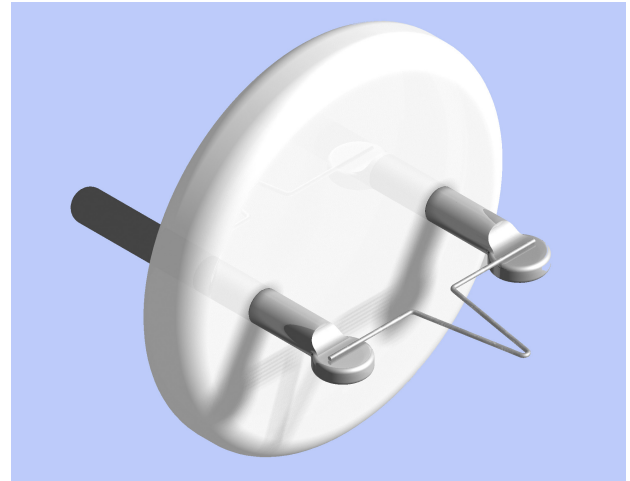
HIGH QUALITY / PRECISION ALIGNED  
 FULLY ANNEALED / STRAIN FREE  
 EXCEPTIONAL STABILITY  
 SPECIAL WIRE / SHOCK RESISTANT  
 PRE-FIRED / INSPECTED  
 INTERNATIONAL STANDARD AEI BASE  
 NON-STANDARD MOUNTING AVAILABLE  
 NEW PACKAGING / INDIVIDUALLY SECURED

### ES-020 Tungsten (W) Filament

The Kimball Physics Tungsten Filament is a hairpin style thermionic emitter. This refractory metal filament is quite sturdy and provides stable and uniform electron emission, primarily used in scanning electron microscopy. The standard model ES-020 consists of a 0.005 inch (0.13 mm) diameter tungsten-3%-rhenium heater wire mounted on a standard glass AEI base. Custom tungsten filament cathodes in a variety of filament sizes and configurations and a variety of glass or ceramic AEI bases are available. Some combinations of various options may not be possible due to design considerations. All tungsten cathodes are shipped pre-fired, vacuum clean, and ready to install. The standard model ES-020 is usually shipped in packages of ten filaments, on glass AEI bases.



ES-020 Tungsten Filament mounted on standard AEI glass base  
 (other filament sizes and AEI base styles available)



Tungsten (W) Filament Cathode  
 mounted on standard AEI glass base (4 X)

### ES-020

FILAMENT MATERIAL	Tungsten, 3% Rhenium
DISC SIZE	None, Filament only
FILAMENT WIRE SIZE	0.005 in dia. (0.13 mm dia.)
HEIGHT ABOVE BASE	0.256 in (6.5 mm)
EMITTING TIP SIZE	Elliptical: 50 by 100 $\mu$ m
EMISSION AREA	$5 \times 10^{-5}$ $\text{cm}^2$
EMISSION CURRENT	50 $\mu$ A typical
HEATING CURRENT	2.5 A to 2.8 A
POWER SUPPLY CAPABILITY	Voltage regulated power supply recommended, 2 V, 3 A
CATHODE LOADING	1.0 A/ $\text{cm}^2$ recommended, typical; High loadings result in reduced lifetime.
WORK FUNCTION	4.5 eV
OPERATING TEMP	2500 K typical
ENERGY SPREAD	approx. 0.7 eV
LIFETIME	One hundred hours at medium currents
VACUUM LEVEL	$10^{-5}$ torr or better, recommended

MANY OTHER FILAMENT / BASE STYLES AVAILABLE,  
 ESPECIALLY FOR USE IN SEM AND TEM  
 Exclusive retail sales in North America, see our distributor:



P.O. Box 492477, Redding, CA 96049-2477  
 Tel: (800) 237-3526 Tel: (530) 243-2200  
 Fax: (530) 243-3761 Email: sales@tedpella.com

### Technical Notes for All Refractory Metal and Coated Thermionic Emitters:

Kimball Physics cathodes/filaments are shipped pre-fired and vacuum clean. When handling cathodes (or any surface intended for vacuum), the use of clean-room gloves is recommended to keep surfaces free of fingerprints and other contaminants. Cathodes/filaments should not be exposed to mechanical or thermal shock which can damage the emission surface. It is suggested (but not required) that cathodes be brought up to temperature using a 30 or 60 second time frame; longer lifetimes may result. It is desirable to wait a few minutes for the cathode/filament to cool down prior to venting the vacuum system. This latter procedure will help reduce oxidation in the gun structure, particularly if the cathode/filament has been run very hot.

The Ta disc cathodes, Ytria cathodes, BaO cathodes, and Tungsten filaments are quite sturdy; they will survive shipping while in the original container, and will remain stable under use in vacuum; however, cathodes/filaments are easily damaged if struck or dropped. Please handle with care during installation.

The most critical parameters in the setting up of a triode gun are:

1) height setting of the cathode (or filament) with respect to the front face of the Wehnelt aperture, and 2) the axial alignment of the cathode/filament tip within the Wehnelt aperture. Height adjustment is best done using a metallurgical microscope with a focus knob calibrated in micrometers.