TH 3060B
TUNABLE HIGH-POWER S-BAND MAGNETRON

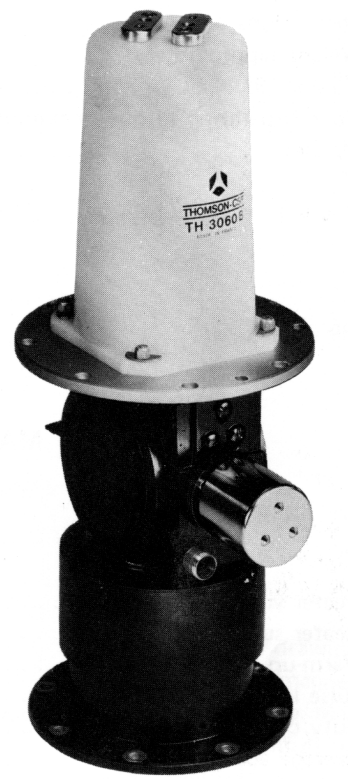
The TH 3060B magnetron is a pulsed, high-power oscillator, capable of delivering a minimum peak power output of 1.9 megawatts over its entire tunable band, 2992 to 3001 MHz.

Finding wide application in medical and industrial linear accelerators, the TH 3060B features a high-precision mechanical tuner and exceptional frequency stability. A particularly advantageous feature of this magnetron is that it can be rotated a full 360° about its long axis during operation, without disturbing the tube's correct operation.

Since it has an antenna output, this magnetron requires a special transition section, with a waveguide output, which can be furnished with the tube. (see drawing)

Long operating life is assured by the incorporation of an impregnated tungsten cathode.

The TH 3060B is cooled by demineralized water, or a water/ethylene glycol mixture, circulating through its integral water jacket, thus no complicated vapor-condensation system is needed.



GENERAL CHARACTERISTICS

Electrical

Operating frequency	2992 to 3001	MHz
Peak power output, typical	2.0	MW
Average power output, minimum	1.9	kW
Heating	indirect	
Cathode	impregnated tungsten	
Heater voltage (AC or DC)	14	V
Heater current	7 to 9	A
Peak anode voltage	36 to 46	kV

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Mechanical

Mounting position (1)	any	
Output (2)	see drawing	
Dimensions	see drawing	
Weight (approximate)	8.2	kg
Tuning (3)	mechanical	
Tuner operating torque, maximum	12	oz-in
Magnet	separate permanent magnet (not supplied with the tube)	
Cooling	by liquid circulation	

MAXIMUM AND MINIMUM RATINGS

(no single rating should be exceeded)

	min.	max.	units
Heater voltage (4)	13.3	14.7	V
Heater surge current	-	15	A
Warm-up time (4)	3	-	mn
Pulse length	-	4.5	μs
Duty cycle	-	0.0015	
Average applied power	-	5	kW
Peak anode voltage	35	47	kV
Peak anode current	-	110	A
Rate of rise of voltage	-	100	kV/μs
Load VSWR (5)	-	1.5 : 1	
Magnetic field	1350	1600	G
Coolant flow	1.06	-	gpm
Coolant outlet temperature	-	50	°C
Coolant pressure	-	100	psi
RF-output pressurization	-	45	psig

(1) In medical applications, where the magnetron is mounted with its long axis horizontal, it can be rotated 360° around that axis without disturbing its normal operation.

(2) The output RF power is sent to the waveguide via a special transition section, which must have a VSWR of less than 1.1 : 1, and be free of resonances in the 2,91 - 3.09 GHz band.

(3) The tube's entire frequency range is covered by approximately 4.5 turns of the mechanical-tuner shaft.

(4) No anode voltage may be applied until the cathode has been warmed up. During tube operation, the heater voltage must be adjusted according to the curve on page6, reducing the magnetron filament power as the average RF power is increased.

(5) For maximum tube operating life, the load VSWR should always be as low as possible.

TYPICAL OPERATION

Heater voltage	0	V
Pulse length	4	μs
Rate of rise of voltage	100	kV/μs
Duty cycle	0.001	
Peak anode current	100	A
Peak power output	2	MW
Load VSWR	1.1 : 1	
Magnetic field	1550	G
Coolant inlet temperature	40	°C
Coolant flow	1.5	gpm

ACCESSORIES

Output transition section	TV 19367 (see drawing)
Magnet	Separate permanent magnet, not supplied with the tube. Magnetic field : 1550 G (consult us for additional information).

APPLICATION NOTES

These application notes provide basic information concerning the storage, installation and operation of the TH 3060B magnetron. More complete information, required, for example, for the construction of a new type of of equipment, can be furnished upon request.

STORAGE AND INSTALLATION

Stored magnetrons are much more likely to remain in a ready-to-operate condition if left in their original packing or placed in correctly designed storage racks. Whenever transported, they should be correctly packed to guard against subjecting the tube to undue vibration, shock or tress.

Care must be taken whenever handling these magnetrons; they can be permanently damaged if subjected to rough handling. This is especially true when fitting the magnetron into its permanent magnet. Additionally, steel, nickel or any other magnetic materials must be kept from close contact with the magnet; only non-magnetic tools should be used during installation operations.

The following procedure is recommended for installating the TH 3060B magnetron :

1 - Verify the tube position with respect to the magnet. The tube must be mounted with its cathode side next to the magnet's north seeking pole.

2 - Install the magnetron, being sure not to subject the tube to shock or strain. Never overstress the glass-to-metal seal of the output section. Any mechanical pressure applied should be uniform, and a flexible waveguide section should be inserted near the magnetron output.

3 - Connect the current leads to the magnetron base. The cathode is connected to pin "C", identified on the protective cover. The electrical connections to the heater and cathode terminals should be tight but not overly so. During tube operation the heater and cathode terminals operate at high temperature, so provision must be made for thermal expansion.

4 - As a protective measure, the anode voltage-supply return must be connected to the cathode terminal to prevent anode current and transients from passing through the heater and possibly causing burn-out. Also, a non-inductive capacitor of at least 0.004 μF must be connected in parallel with the filament, directly across the heater terminals, to protect the tube in case of arcing or flashover.

5 - Apply the heater voltage gradually. The heater surge current must not exceed 15 amperes. Allow at least three minutes for the cathode to fully warm up before applying any high voltage to the tube.

6 - Verify that the cooling system is operating correctly.

7 - Apply the high voltage. The central plate must be used as the grounding contact. In the normal operating modes, the observed pulse forms must correspond to the following characteristics :

a) Any spike on the pulse front must be suppressed.

b) Any ripple on the top of the current pulses must not exceed 10% of the average value of the peak current.

8 - Reduce the heater voltage as the applied power is increased, according to the curve on page 6.

STARTING A NEW MAGNETRON

A new magnetron, or one that has been idle or stored for a while, may contain small traces of gas. This gas can cause internal arcing to occur when the high voltage is applied. These arcs are generally evidenced by flustuations of the average anode current, and are usually short (less than two-seconds long) and harmless.

When, however, these arcs or flashes are persistent or severe, causing rapid and uncontrolled fluctuations of the average anode current, the following procedure must be followed to avoid damaging the tube :

1 - Reduce the current to the level just below that at which arcing begins. Hold the current at this value for several minutes (about five).

2 - When the operation of the tube is stable, gradually increase the anode current.

3 - Repeat this procedure as often as necessary until stable operation at the desired operating voltage is achieved.

WARNING

All magnetrons operate with high anode potentials, which can cause lethal shocks to operating personnel Suitable safety interlocks must be provided to avoid this shock hazard.

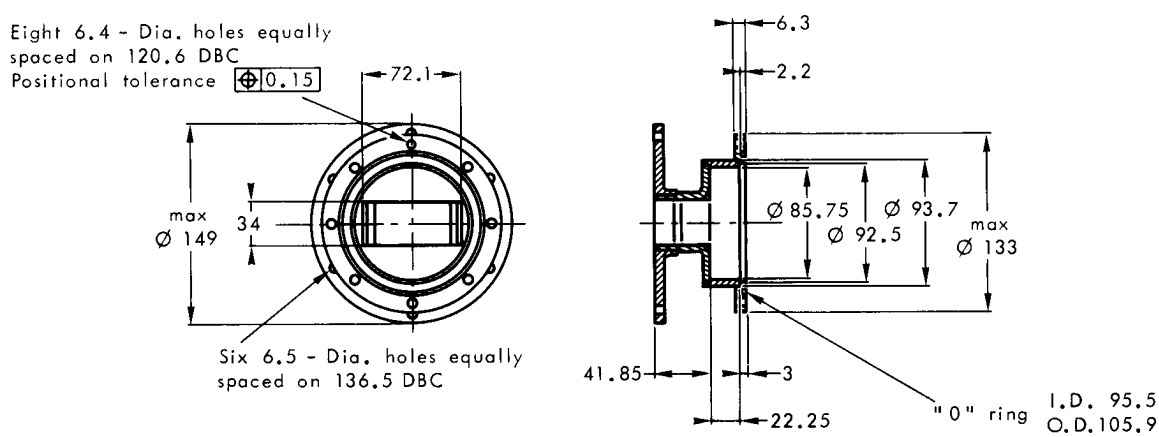
RF LEAKAGE

Sufficient RF power may be radiated through the cathode stem and other openings to interfere with adjacent circuit components. This radiation may be hazardous to human beings, especially to the eyes when arcing or the cathode temperature are being observed. Adequate precautions must be taken to guard against these hazards.

X-RAYS

High-power magnetrons emit a significant level of X-rays in the areas of the cathode and the RF output. Appropriate shielding should be installed to protect the operating personnel.

TRANSITION TV 19367



Dimensions in mm, nominal except for those marked "max"

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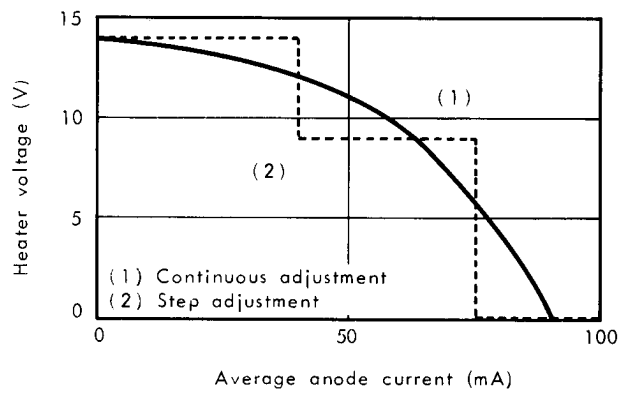
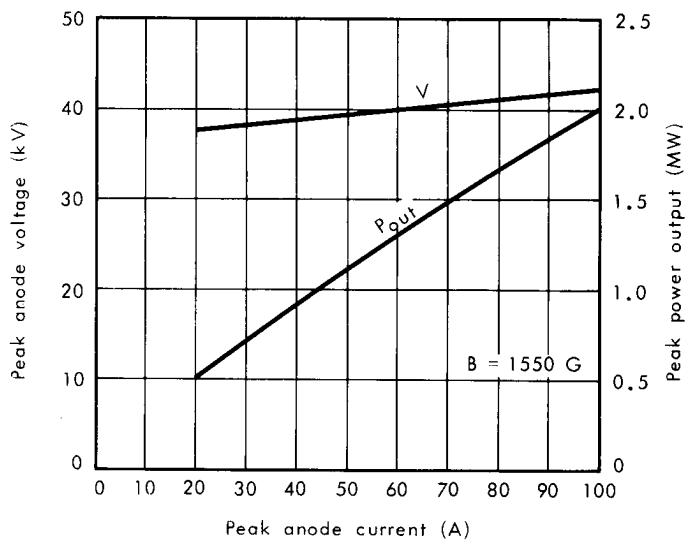
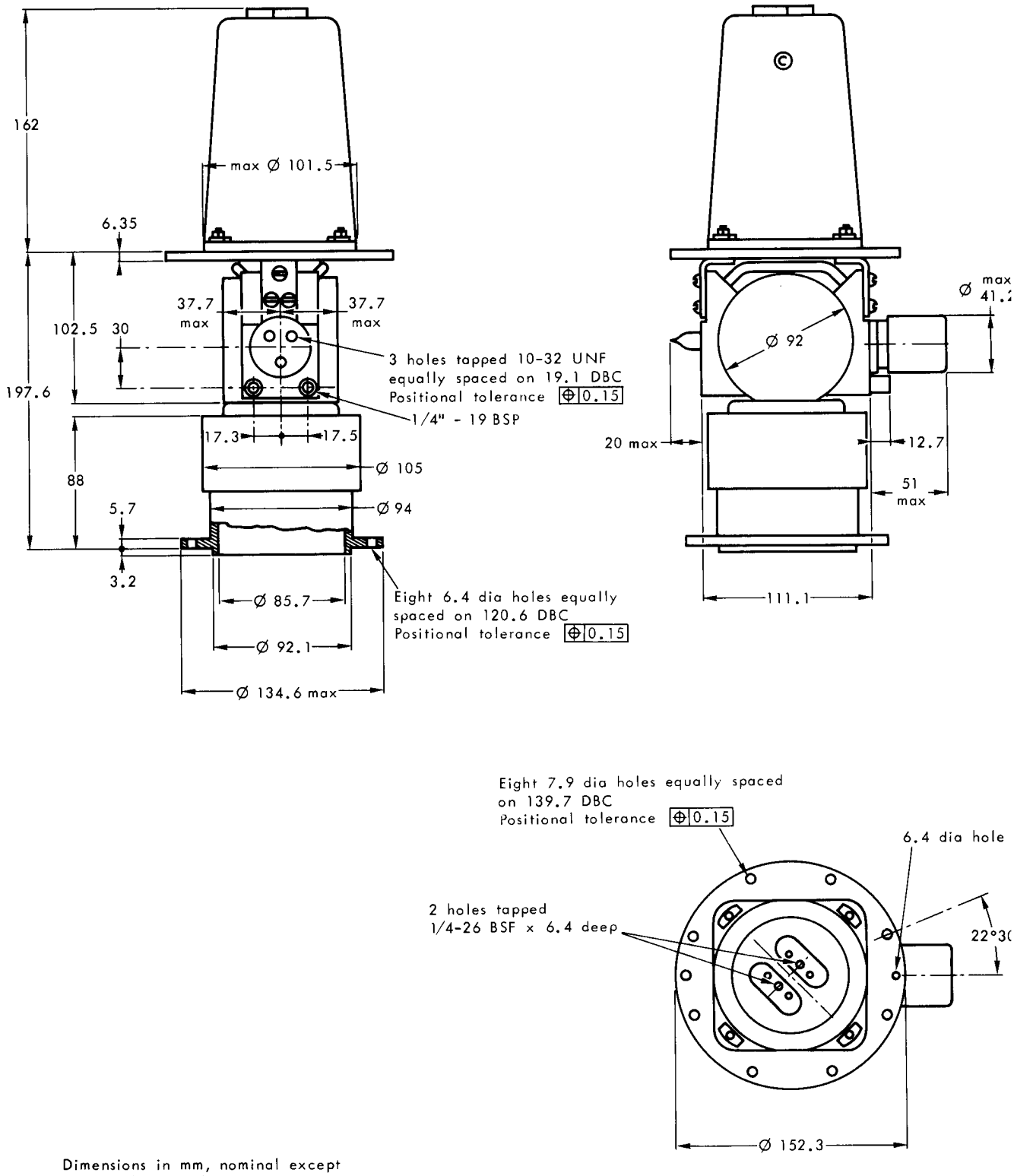
HEATER VOLTAGE ADJUSTMENT



PEAK ANODE VOLTAGE (V) AND PEAK POWER OUTPUT (P_{out}) AS A FUNCTION OF THE PEAK ANODE CURRENT



OUTLINE DRAWING



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