

This data should be read in conjunction with the Magnetron Preamble.

ABRIDGED DATA

Peak power output7.5 MW
Centre frequency2998 MHz
Magnet.....integral magnet or separate electromagnet
Output..... WR284 waveguide

Mechanically, or fast electromechanically, tuned pulse magnetron intended primarily for medical linear accelerators. The magnetron may be fitted with permanent magnets for other applications.

TECHNICAL REQUIREMENTS

Frequency

Frequency range
(with cooling water at 40 °C) 2998 MHz \pm 5 MHz
The steady-state temperature coefficient of frequency is approximately -50 kHz/°C.

Power Output

Max peak output power (see Performance Chart).....7.5 MW
Max mean output power.....7.5 kW

Power Input

The maximum power input is 17 kW (mean).

Pulse Width

The maximum pulse width is 6 μ s.

Rate of Rise of Voltage Pulse

The steepest tangent to the leading edge of the voltage pulse above 80% amplitude must be between 80 kV/ μ s and 120 kV/ μ s. Any capacitance in the monitoring system must not exceed 6.0 pF.

Missing Pulses

Missing pulses for new magnetrons will not exceed 0.025%. Test duration is a minimum of 3 minutes. A pulse is defined as missing when the RF energy is less than 70% of the normal energy level.

Heater

The required heater current on standby is about 14 A, requiring a voltage of about 31 V. The cathode pre-heating time is 10 minutes. When the anode is powered, the heater current must be reduced in accordance with the Heater Current Reduction Schedule graph.

Water Cooling

The magnetron is water-cooled and has an integral water jacket. The water flow is 25 litres per minute. The inlet water temperature must not exceed 40 °C.

Weight

Magnetron net weight 13 kg approx
Electromagnet..... 110 kg approx

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Configuration

The magnetron may be operated while in motion and in any orientation.

Output Waveguide

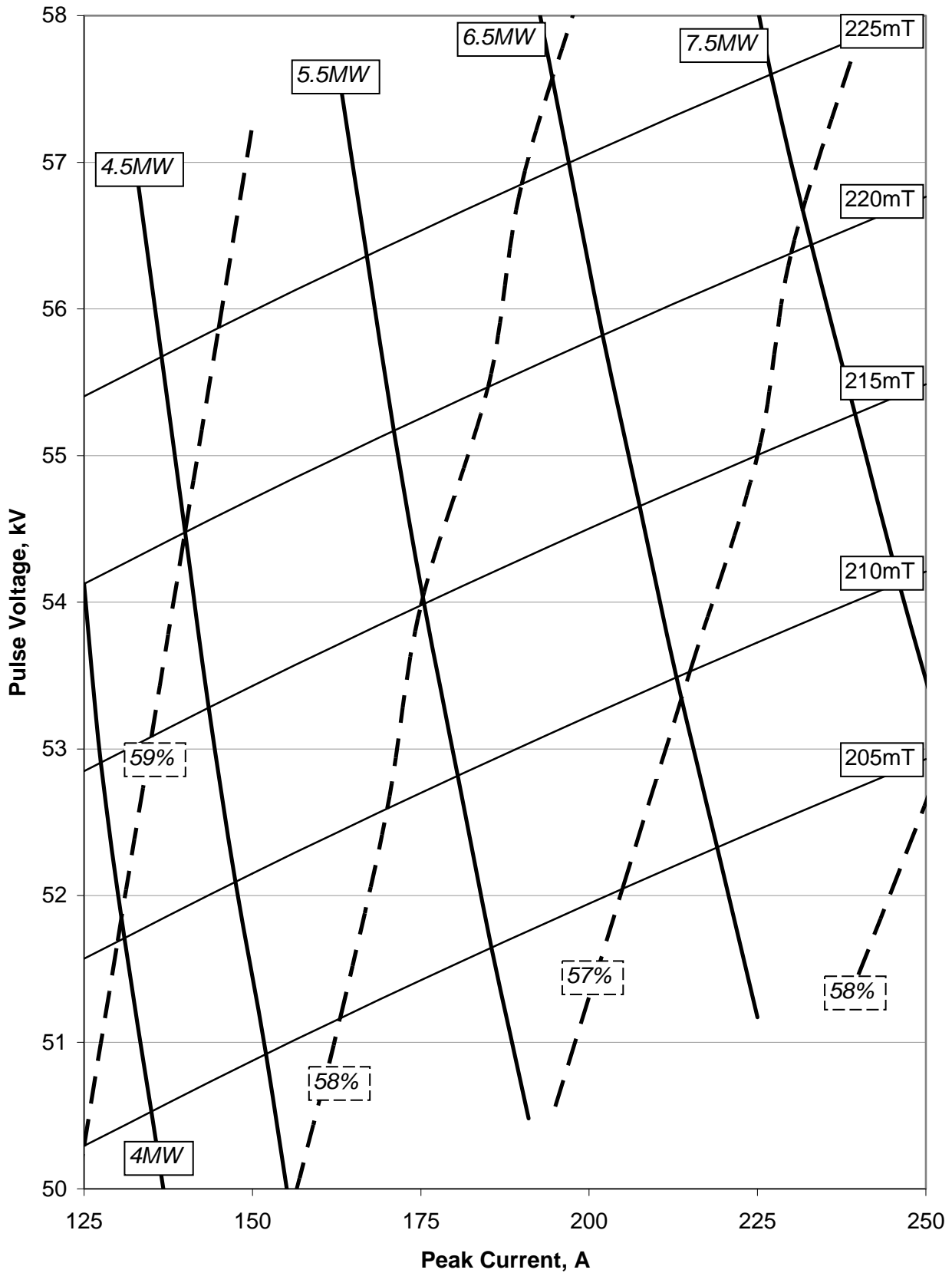
Output is WR284, 74.14 x 34.04 mm internal with flange 154IEC-UAR32. The recommended mating flange is 154IEC-CAR32. The waveguide must be pressurised to prevent RF breakdown. The maximum pressure is TBA, with a target of 600 kPa (abs). The VSWR should not exceed 1.15:1.

Electromagnet (see outline dimensions)

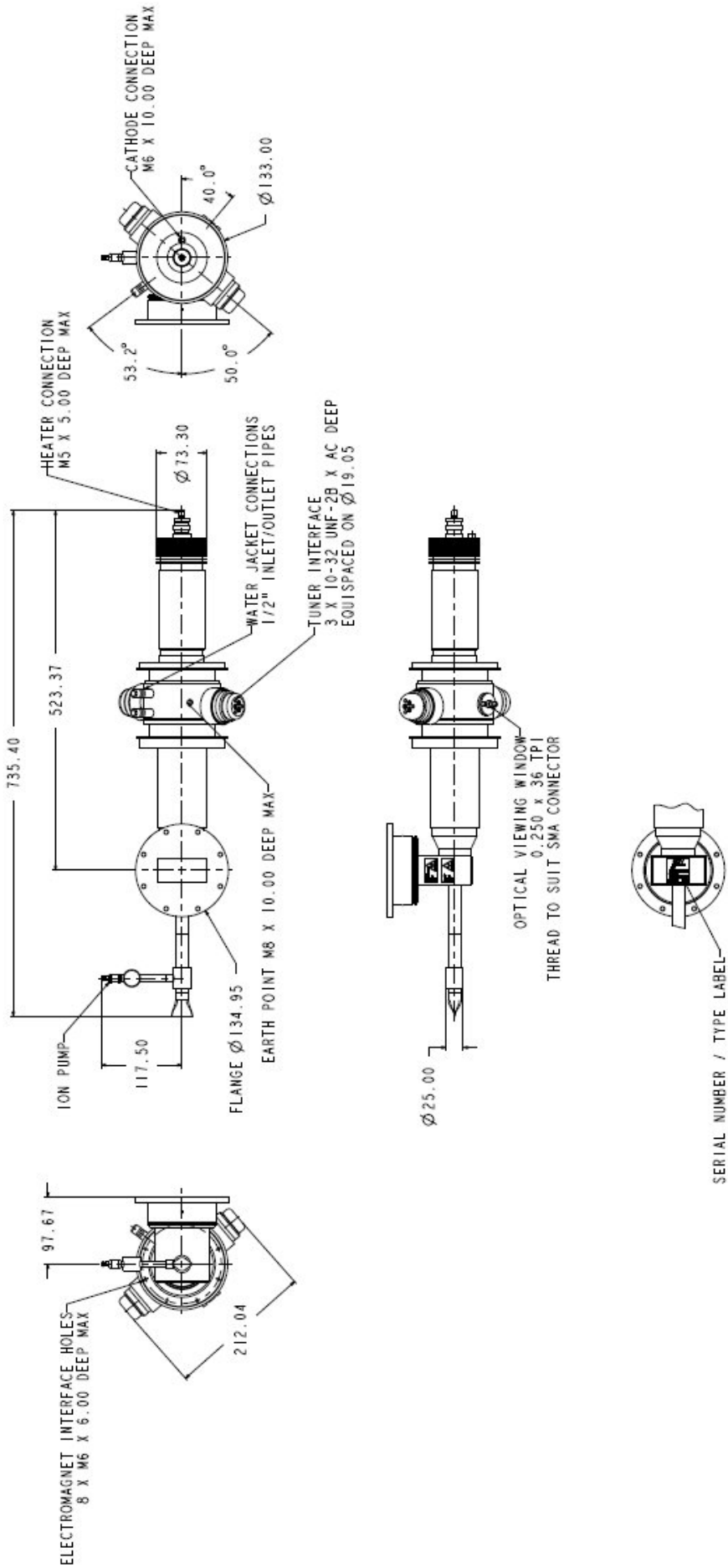
The electromagnet comprises two coils, with access between the two for tuner drive and magnetron cooling water. The coils are wired in series and will require approximately 1.6 kW to provide 220 mT for the magnetron. Target operation is 41 A, 40 V. The magnet assembly is water-cooled and will require a minimum of 6.0 l/min and a maximum of 12 l/min, with a maximum inlet temperature of 40 °C.

TUBE PERFORMANCE

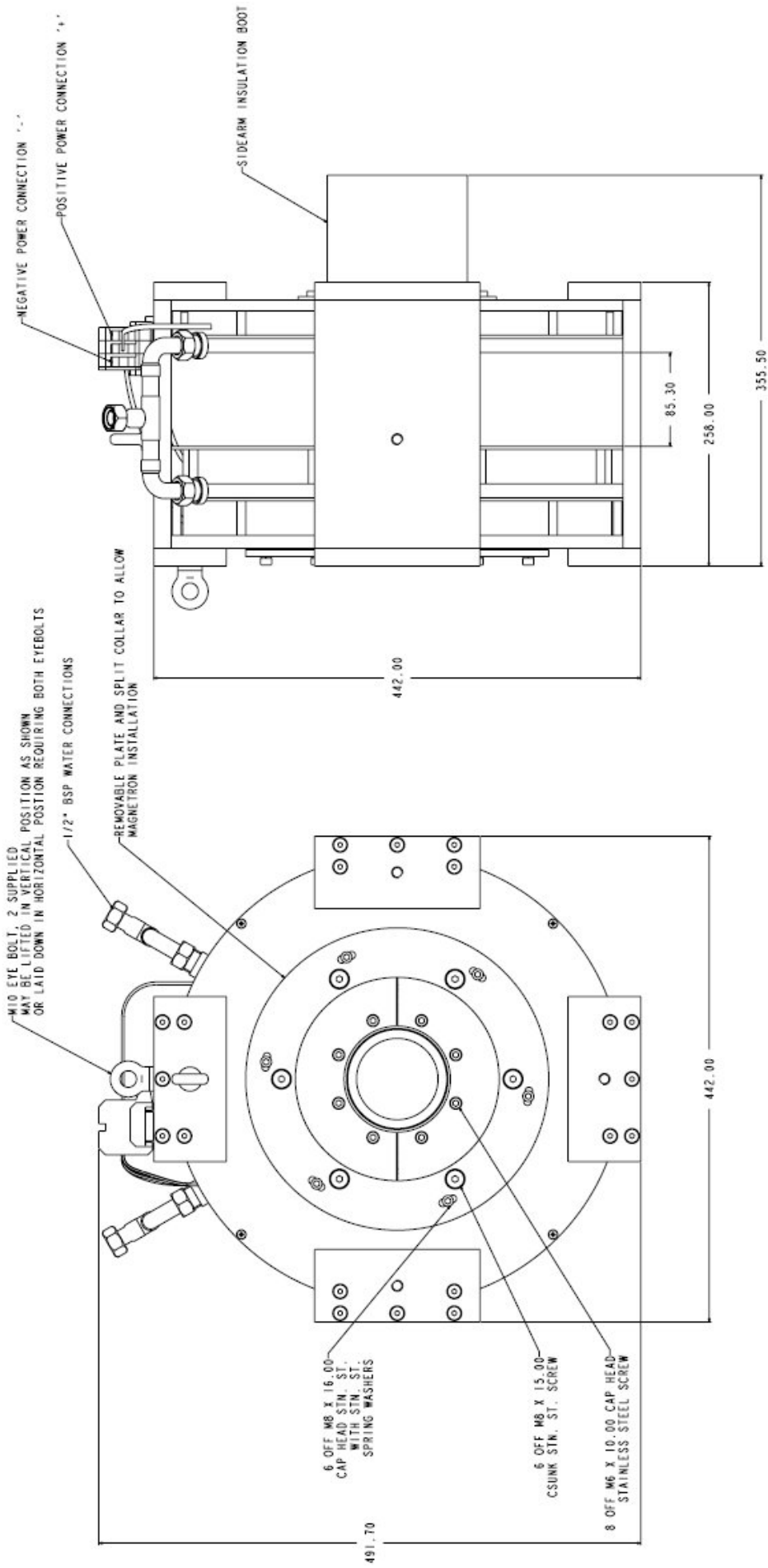
Theoretical Performance Chart



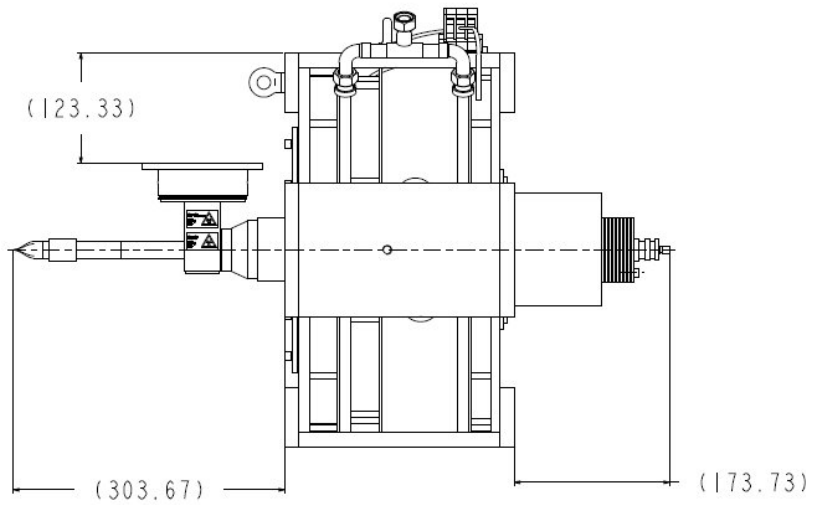
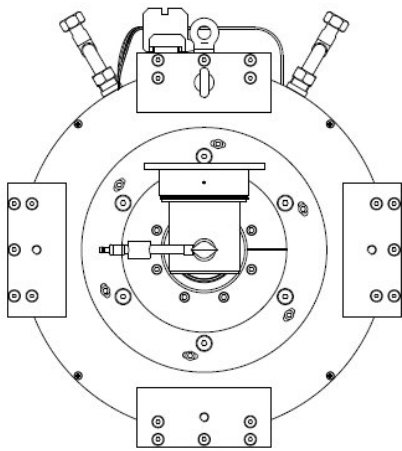
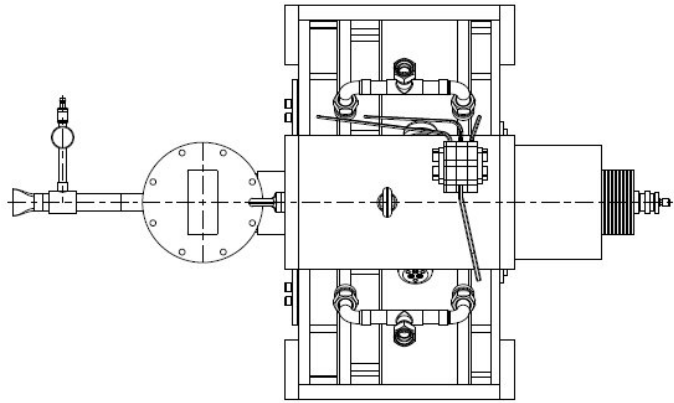
MAGNETRON OUTLINE (All dimensions nominal and in millimetres)



ELECTROMAGNET OUTLINE (All dimensions nominal and in millimetres)



ASSEMBLY OUTLINE (All dimensions nominal and in millimetres)



ENVIRONMENTAL REQUIREMENTS

AMBIENT TEMPERATURE

Storage and transport -25 °C to +70 °C
Operational +10 °C to +50 °C

Note: Ensure water is fully drained from cooling system prior to storage at low temperatures.

ATMOSPHERIC PRESSURE (Reference Standard Atmosphere USA 1974)

Storage and transport 100 mbar to 1100 mbar
Operational 700 mbar to 1100 mbar
Tested by DC breakdown test only.

HUMIDITY (Operational)

Relative humidity shall not exceed 80% for temperatures up to 31 °C, decreasing linearly to 20% at 50 °C (non-condensing).

SHOCK (NON-OPERATING)

From BS EN 60721-3-2 'Classification of environmental conditions' Part 3: conditions apply to packed magnetron.

Acceleration	Duration	Pulse Shape
300 m.s ⁻² (30.59 gn)	6 ms	Half-sine

VIBRATION (NON-OPERATING)

From BS EN 60721-3-2 'Classification of environmental conditions' Part 3: conditions apply to packed magnetron. This level simulates 40 hours of transportation.

Acceleration rms	Hz	gn ² .Hz ⁻¹
21.6 m.s ⁻² (2.20 gn)	20 - 200	0.0255

IONISING RADIATION

The magnetron will operate successfully when exposed to 500 gray from an external source.

EMC and EMI

Meeting the limits is a system responsibility, and the magnetron cannot be tested as a component.

PACKING

The pack will be as compact as may reasonably be achieved while complying with the environmental specification above, and the requirements of European directive 93/339/EEC. Also, the packing will be free of CFCs, chlorinated polymers, and reusable, or easily recyclable.

HEALTH AND SAFETY HAZARDS

e2v technologies magnetrons are safe to handle and operate, provided that the relevant precautions stated herein are observed. e2v technologies does not accept responsibility for damage or injury resulting from the use of the electronic devices it produces. Equipment manufacturers and users must ensure that adequate precautions are taken. Appropriate warning labels and notices must be provided on equipments incorporating e2v technologies devices and in operating manuals.



High Voltage

Equipment must be designed so that personnel cannot come into contact with high voltage circuits. All high voltage circuits and terminals must be enclosed and fail-safe interlock switches must be fitted to disconnect the primary power supply and discharge all high voltage capacitors and other stored charges before allowing access. Interlock switches must not be bypassed to allow operation with access doors open.



RF Radiation

Personnel must not be exposed to excessive RF radiation. All RF connectors must be correctly fitted before operation so that no leakage of RF energy can occur and the RF output must be coupled efficiently to the load. It is particularly dangerous to look into open waveguide or coaxial feeders while the device is energised. Screening of the cathode sidearm of high power magnetrons may be necessary.



X-Ray Radiation

High voltage magnetrons emit a significant intensity of X-rays not only from the cathode sidearm but also from the output waveguide. These rays can constitute a health hazard unless adequate shielding for X-ray radiation is provided. This is a characteristic of all magnetrons and the X-rays emitted correspond to a voltage much higher than that of the anode.