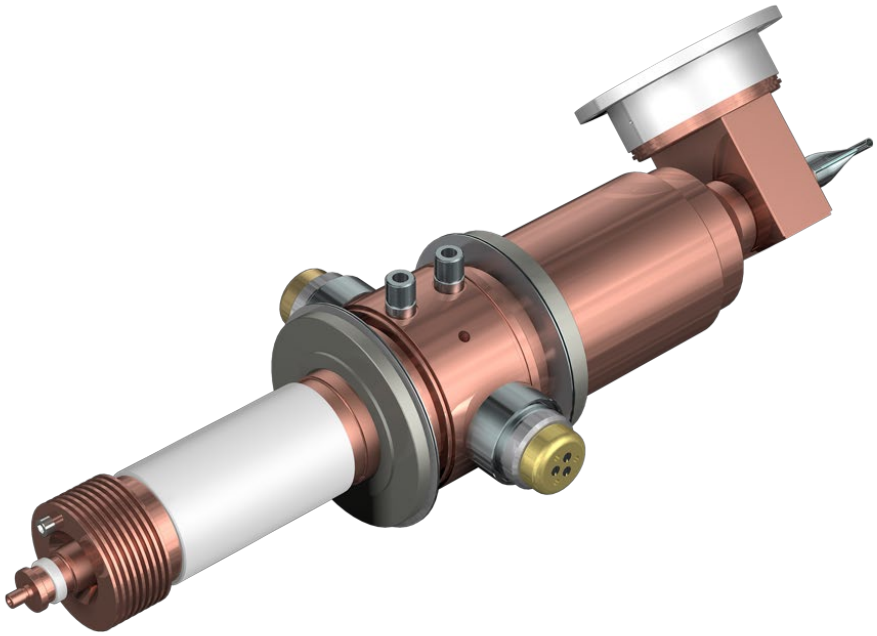
MG8076
7.5 MW S-Band Magnetron

The data to be read in conjunction with the Magnetron Preamble.



ABRIDGED DATA

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

Peak output power	-	7.5 MW
Centre frequency	-	2998 MHz
Magnet	-	Integral magnet or separate electromagnet
Output	-	WR284 waveguide (Pressurized) Provided Flange 154IEC-UAR32 Mating flange 154IEC-CAR32
Overall dimensions	-	See outline
Net weight including magnet	-	14kg approx.
Cooling	-	Water and air
Mounting orientation	-	Any
Tube connections	-	See outline

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Approved for public release: Teledyne e2v APPROVED *(CM 5002604)*

A1A-768825 Version 7, June 2023

GENERAL DATA

Electrical

Cathode	-	Indirectly heated
Heater voltage	-	42V dc
Heater current (note 1)	-	17A
Maximum starting heater current	-	20A
Cathode pre-heating time	-	10 mins

Mechanical

Overall dimensions	-	See outline
magnetron weight	-	14 kg approx.
Electromagnet weight	-	110 kg approx.
Mounting position	-	Any

MAXIMUM AND MINIMUM RATING

(Absolute values)

These rating cannot necessarily be used simultaneously, and no individual rating should be exceeded

		Mi n	Max	
Frequency range (note 2)	-	2993	3002	MHz
Peak output power	-	2.0	7.5	MW
Average output power	-	--	7.5	kW
Peak anode current	-	70	250	A
Pulse duration	-	--	6	µs
Duty cycle (note 3)	-	--	0.1	%
Magnetic field (note 4)	-	203	223	mT
Load VSWR (note 5)	-	--	1.15:1	
Water cooling flow rate	-	15	25	l/min
Inlet water temperature (note 6)	-	30	40	°C
Sidearm air-cooling flow rate (note 7)	-	15	--	m/s
Waveguide pressure (absolute) (note 8)		--	6	bar

LIMITS

		Min	Max	
Peak anode voltage (note 9)	-	--	60	kV
Rate of rise of voltage	-	80	100	kV/µs
Input power (mean)	-	--	15	kW
Pulse stability (note 10)	-	--	0.025	%
Frequency pulling @ 1.15:1	-	--	2.2	MHz

NOTES

1. It is recommended that a DC power supply is used to operate the heater. The use of an AC heater supply during HT operation may result in frequency modulation of the RF pulses.

   The heater current must be reduced within 2 seconds after the application of HT in accordance with the heater cut back schedule.

   The heater power supply is to be connected across the cathode and heater such that the cathode is positive with respect to the heater.

   A capacitor must be used to prevent pulse voltages being applied to the heater, either from unbalanced bifilar pulse transformer or by induction from the pulse current. In some cases, a capacitance as high as 20 µF may be necessary depending on the equipment design.

2. The magnetron frequency will remain within the operating bandwidth after any drift inherent within the design or application. The magnetron frequency tuning will be achieved using two tuners simultaneously operated.

3. Maximum duty applies at 7.5MW peak power. The duty can be greater than 0.1% if mean power maximum limit is not exceeded.

4. Measured mid-way between the cathode and the anode.

   At peak powers less than 3MW, it may be necessary to reduce the magnetic field below the minimum limit when using modulators comprising transformers.

5. The nominal operating load VSWR only applies over 20 MHz frequency band nominally centred at 2998 MHz. Outside this frequency band the load VSWR can be up to 10:1.

6. Chemical additive to coolant will be required to prevent freezing.

7. The air flow must cover the entire copper cooling fins.
8. A pressure of 2 bar of Sulphur Hexafluoride (SF_6) (absolute) is required to prevent RF breakdown in the waveguide.
9. The magnetron should be protected by a spark gap set to limit the anode voltage to a maximum of 63 kV when using modulators comprising transformers.
10. Pulses are defined as missing when the RF energy is less than 70% of the normal energy level in the frequency range 2993 to 3002 MHz. Missing pulses are expressed as a percentage of the number of input pulses applied during any 5-minute interval.

ENVIRONMENTAL REQUIREMENTS

AMBIENT TEMPERATURE

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

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

ATMOSPHERIC PRESSURE

(Reference Standard Atmosphere USA 1974)

		Min	Max	
Storage and transport		100	1100	mbar
Operational	-	700	1100	mbar

Note: 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 (noncondensing).

SHOCK and VIBRATION (Non-operational

The magnetron shall meet FedEx transportation specification of Testing Packaged Weighing to 68 kg; International Shipment of Regular package: conditions apply to packed magnetron.

IONISING RADIATION

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

RF RADIATION

The magnetron will emit RF radiation and it may be necessary to use an absorber on the cathode sidearm. e2v can supply a suitable absorber.

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

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

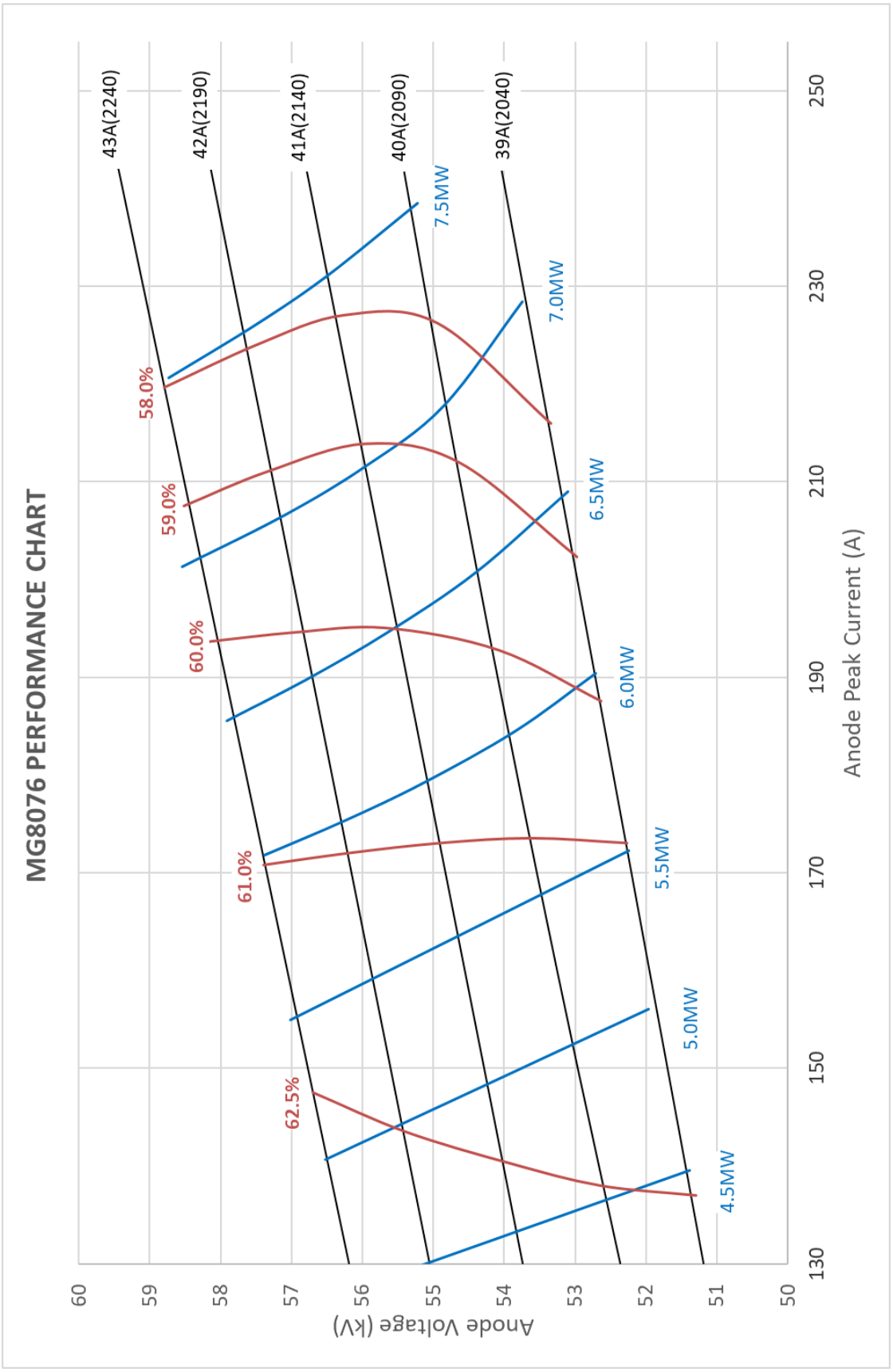
RF Radiation

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 energized. 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 of 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

TUBE PERFORMANCE



MAGNETRON OUTLINE (All dimensions nominal and in millimetres)