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JEDEC Designation 8356

INTRODUCTION

The 8356 is a forced-air cooled multi-resonator pulse operated Magnetron with a peak input power rating of 64kW and operates at a fixed frequency within the limits of 9345 and 9405Mc/s, when used under the conditions specified below.

The valve has a packaged integral magnet. It is fitted with flying leads and the output waveguide is sealed with a vacuum-tight window to allow operation at high altitude without pressurising.

The waveguide output flange is designed for coupling directly to waveguide No. 16, 0.900 inch \times 0.400 inch internal dimensions (22.86mm \times 10.16mm), by means of coupler type UG-40A/U (Z830051).

It is necessary to keep all magnetic material as far as possible (at least 2 inches —50mm approx.) from the magnet and mounting plate.

GENERAL DATA

Electrical

Cathode	Indirectly Heated, Oxide Coated
Heater Voltage (<i>See Note 1</i>)	6.3 V
Heater Current	0.5 A
Heater Starting Current:	
Peak Value, not to be exceeded	3 A
Cathode Heating Time (Minimum)	<i>See Note 2</i>

Mechanical

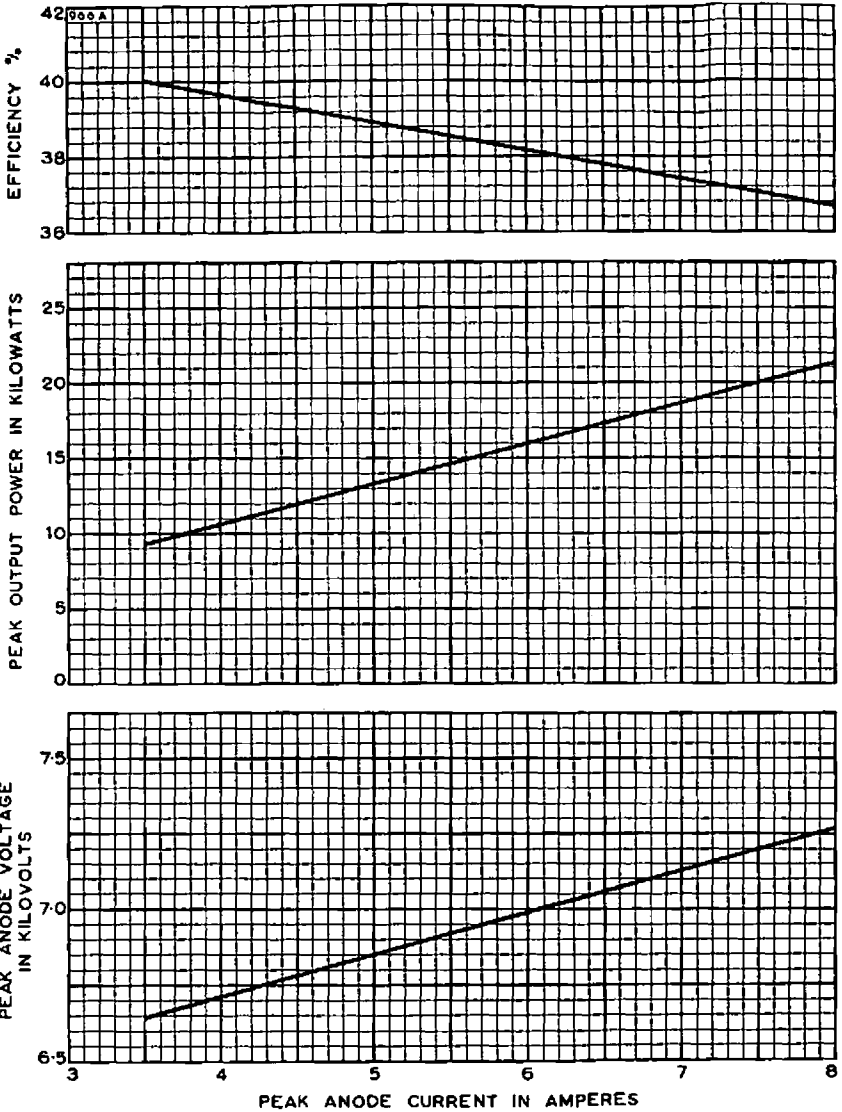
Overall Dimensions	5.38 \times 4.47 \times 3.31 inches	Max
	137 \times 114 \times 84.1 mm	Max
Net Weight	3½ pounds (1.5 kg)	Approx
Mounting Position		Any

The valve is vibration tested to ensure that it will withstand normal conditions of service.

Cooling	<i>See Note 3</i>
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ENGLISH ELECTRIC VALVE CO. LTD.

CHELMSFORD ENGLAND

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MAXIMUM AND MINIMUM RATINGS

(Absolute Values)

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

	<i>Min</i>	<i>Max</i>	
Heater Voltage (See Note 1)	5.7	6.9	V
Heater Current at heater voltage 6.3V	3.43	0.60	A
Anode Voltage (Peak)	6.0	8.0	kV
Anode Current (Peak)	3.5	8.0	A
Input Power (Peak)	21	64	kW
Input Power (Mean)	—	80	W
Duty Cycle	—	0.0025	
Pulse Length (See Note 4)	—	2.5	μsec
Rate of Rise of Voltage Pulse (See Note 5)	—	100	kV/μsec
Anode Temperature	—	120	°C
Frequency Change with Anode Temperature Change (after warming)	—	—0.25	Mc/s/°C
Altitude:			
Output System (See Note 6)	—	45 000	feet
	—	13.5	km
Input Terminals	—	60 000	feet
	—	18.3	km
V.S.W.R. at the output coupler	—	1.5:1	

TYPICAL OPERATION

Operational Conditions

Heater Voltage	4.5	V
Anode Current (Peak)	7.5	A
Pulse Length	2.5	μsec
Pulse Repetition Rate	400	p.p.s.

Typical Performance

Anode Voltage (Peak)	7.2	kV
Output Power (Peak)	20	kW
Output Power (Mean)	20	W



TEST CONDITIONS AND LIMITS

The valve is tested to comply with the following electrical specification

Test Conditions

	Oscillation		
	1	2	
Heater Voltage (for test)	6.3	4.5 (See Note 7)	V
Anode Current (Mean)	7.5	7.5	mA
Duty Cycle	0.001	0.001	
Pulse Length (See Note 4)	1.0	2.5	µsec
V.S.W.R. at the output coupler (Maximum)	1.15:1	1.15:1	
Rate of Rise of Voltage Pulse (See Note 5)	100	100	kV/µsec

Limits

	Min		Max		
	Min	Max	Min	Max	
Anode Voltage (Peak)	6.4	7.4	—	—	kV
Output Power (Mean)	18	—	18	—	W
Frequency (See Note 8)	9345	9405	—	—	Mc/s
R.F. Bandwidth at ¼ Power (See Note 9)	—	2.5	—	1.0	Mc/s
Frequency Pulling (V.S.W.R. not less than 1.5:1)	—	15	—	—	Mc/s
Stability (See Note 10)	—	0.25	—	0.25	%

LIFE TEST

The quality of all production is monitored by the random selection of valves which are then life-tested under Oscillation 2 conditions. If the valve is to be run continuously under different conditions, the English Electric Valve Co. Ltd. should be consulted to verify that the life of the valve will not be impaired.

END OF LIFE CRITERIA

(under Test Conditions Oscillation 1)

Output Power (Mean)	13.5 W Min
R.F. Bandwidth at ¼ Power	1.2 Mc/s Max
Frequency: Must be within Test Limits above, Oscillation 1	
Stability (See Note 10)	1.0 % Max

NOTES

1. With no anode input power.

For average pulse input powers greater than 25 watts the heater voltage shall be reduced within 3 seconds after the application of h.t. according to the following schedule:

$$V_h = 6.3 \left(1 - \frac{P_i}{180} \right) \text{volts}$$

where P_i = mean input power in watts.

The valve heater shall be protected against arcing by the use of a minimum capacitance of 4000pF shunted across the heater directly at the input terminals; in some cases a capacitance as high as 2μF may be necessary depending on the equipment design.

2. The minimum cathode heating time for ambient temperatures above -55°C is 20 seconds from the heater voltage reaching 5.7 volts. If the valve has been stored for six months or more without h.t. being applied, a longer initial cathode heating time may be required.
3. Convection cooling is usually adequate but at high ambient temperatures and in confined surroundings a degree of forced-air cooling may be necessary.
4. Tolerance $\pm 10\%$.
5. The rate of rise of voltage is the slope of the steepest tangent to the leading edge of the voltage pulse above 80% amplitude. Any capacitance used in the viewing system must not exceed 6.0pF.
6. This rating applies when the magnetron is operated at the maximum power input and pulse length into a mismatched load of V.S.W.R. 1.5:1 at the worst phase for breakdown, via a coupler UG-40A/U of standard manufacture.
7. The heater voltage shall be reduced to 4.5 volts three seconds after applying the h.t.
8. Temperature of anode block $40 \pm 5^{\circ}\text{C}$, measured at the point indicated on the outline drawing.
9. The bandwidth in Mc/s is given by 2.5/pulse length in microseconds.
10. With the valve operating into a V.S.W.R. of 1.5:1 phased to give maximum instability. Pulses are defined as missing when the r.f. energy level is less than 70% of the normal energy level in the frequency range 9345 to 9405Mc/s. Missing pulses are expressed as a percentage of the number of input pulses applied during any consecutive 5 minute interval of a 15 minutes test period.

NOTES FOR OUTLINE

1. Reference plane A contains the mounting surface of the valve as shown.
2. Reference plane B passes through the centres of the two holes of the mounting plate as shown, and is perpendicular to plane A.
3. Reference plane C passes through the centre of the lower right hole of the mounting plate as shown, and is perpendicular to planes A and B.
4. With the valve resting on a plane surface, the flatness of the mounting plate will be such that a feeler gauge 0.015 inch (0.38mm) thick and 0.125 inch (3.18mm) wide will not enter more than 0.125 inch (3.18mm) at any point.
5. The anode temperature to be measured at this point which is on the centre-line of the anode and at 45° to the horizontal (approximately).
6. The north seeking pole of the magnet will be adjacent to the cathode leads.
7. These holes will be within 0.005 inch (0.13mm) of the indicated centres. The clearance between the centre line of the holes and the magnet will be 0.165 inch (4.19mm) minimum.
8. The axis of the heater lead cover will be perpendicular to reference plane C within 5°.
9. The position of the waveguide and fixing holes will be such that the valve operates into coupler type UG-40A/U.
10. The centre of this hole will lie within 0.004 inch (0.102mm) of the reference plane C.

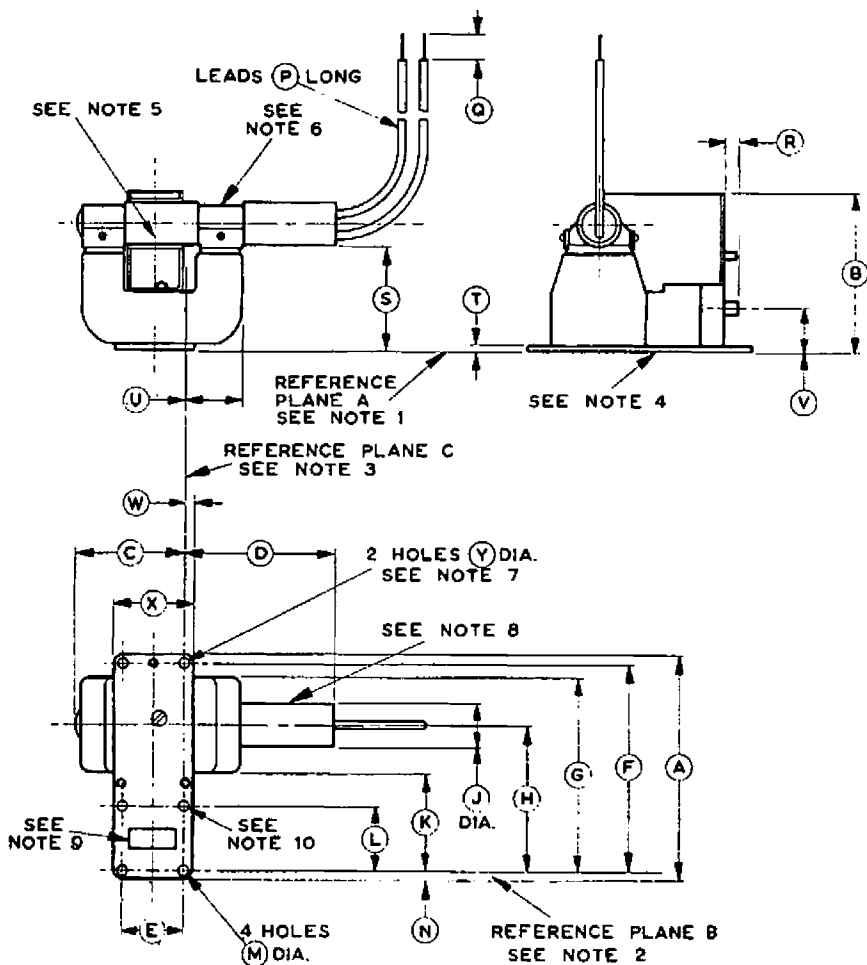
OUTLINE DIMENSIONS

Ref.	Inches	Millimetres	Ref.	Inches	Millimetres
A	4.453 ± 0.015	113.11 ± 0.38	N	0.187 Max	4.75 Max
B	3.313 Max	84.15 Max	P	6.000	152.4
C	2.187 Max	55.55 Max	Q	0.500	12.70
D	3.187 Max	80.95 Max	R	0.375 Max	9.53 Max
E	1.220 ± 0.004	30.988 ± 0.102	S	2.000 Min	50.80 Min
F	4.103 ± 0.004	104.2 ± 0.102	T	0.125	3.18
G	4.000 Max	101.6 Max	U	1.187 Max	30.15 Max
H	2.937 ± 0.250	74.60 ± 6.35	V	0.875	22.23
J	1.000 Max	25.40 Max	W	0.218 Max	5.54 Max
K	1.811 Min	46.00 Min	X	1.625	41.28
L	1.280 ± 0.004	32.512 ± 0.102	Y	0.175 ± 0.003	4.445 ± 0.076
M	0.170 ± 0.003	4.318 ± 0.076			

Millimetre dimensions have been derived from inches

OUTLINE

719 C



COLOUR	ELEMENT
GREEN	HEATER
YELLOW	CATHODE & HEATER

LEAD CONNECTIONS