MAGNETRONS

YJ1160
YJ1162

QUICK REFERENCE DATA

Magnetrons for microwave heating applications.
YJ1160 is water cooled
YJ1162 is forced-air cooled

Frequency	2.45	GHz
Power output	2.5	kW
Construction	Packaged, high stability ticonal magnet	

Unless otherwise shown data is applicable to both types

To be read in conjunction with
GENERAL OPERATIONAL RECOMMENDATIONS - MICROWAVE DEVICES

CHARACTERISTICS

	Min.	Max.	
Frequency fixed within the band	2.425	2.475	GHz
Operating voltage range (d.c.), within the range (at I_a = 750mA d.c., v.s.w.r. < 1.05)	4.4	4.8	kV
Operating voltage range (d.c.), within the range (at I_a = 800mA d.c., v.s.w.r. = 3.0 in "phase of sink")	4.6	5.0	kV
"Phase of sink" from the reference plane (see drawings) towards load (nominal)	0.40		λ

OPERATION IN MICROWAVE OVEN WITH FIELD STIRRER, WITH SINGLE-PHASE FULL-WAVE RECTIFIER WITHOUT SMOOTHING FILTER

OPERATING CONDITIONS

For this condition the centre of the locus of the load impedance seen by the magnetron to be at v.s.w.r. = 3.0 in "phase of sink".

The impedance of the h.t. supply should be greater than 500Ω. In addition, a limiting resistor of 300Ω should be inserted in series with the magnetron.

Heater voltage (running)	1.7	V
Mean anode current	800	mA
Peak anode current	2.0	A
Load mismatch (v.s.w.r.)		
in the region of ±0.1λ		
about "phase of sink"	3.0	
instantaneous value*	5.0	
in the remaining region	2.5	
Power output (v.s.w.r. = 3.0 in "phase of sink")	2.5	kW

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Min.	Max.	
Heater voltage (starting)	4.5	5.2	V
Mean anode current	100	850	mA
Peak anode current	-	2.1	A
Load mismatch (v.s.w.r.)			
in the region of ±0.1λ			
about "phase of sink"	-	4.0	
instantaneous value*	-	10	
in the remaining region	-	4.0	

*Maximum duration 20ms, maximum duty ratio 0.2. Moding must be avoided by the use of an appropriate coupling system.

OPERATION IN MICROWAVE OVEN WITHOUT FIELD STIRRER OR INDUSTRIAL APPLICATION WITH SINGLE-PHASE FULL-WAVE RECTIFIER WITHOUT SMOOTHING FILTER

OPERATING CONDITIONS

The impedance of the h.t. supply should be greater than 500Ω. In addition, a limiting resistor of 300Ω should be inserted in series with the magnetron.

Heater voltage (running)	2.0	V
Mean anode current	750	mA
Peak anode current	2.0	A
Load mismatch (v.s.w.r.)	3.0	
*Power output (matched load)	2.0	kW

*For the output power under conditions of mismatch, see the Rieke diagram on page 17.

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Min.	Max.	
Heater voltage (starting)	4.5	5.2	V
Mean anode current	100	800	mA
Peak anode current	-	2.1	A
Load mismatch (v.s.w.r.)			
in the region of ±0.03λ about "phase of sink"	-	4.0	
in the remaining region	-	5.0	

OPERATION IN MICROWAVE OVEN WITHOUT FIELD STIRRER FROM SINGLE-PHASE SUPPLY WITHOUT RECTIFIER

OPERATING CONDITIONS

A limiting inductance of 2.25H must be inserted in series with the magnetron.

Heater voltage (running)	3.4	V
Mean anode current	400	mA
Peak anode current	2.0	A
Load mismatch (v.s.w.r.)	2.0	
*Power output (matched load)	1.0	kW

*For the output power under conditions of mismatch, see the Rieke diagram on page 17.

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Min.	Max.	
Heater voltage (starting)	4.8	5.2	V
Mean anode current	-	500	mA
Peak anode current	-	2.1	A
Load mismatch (v.s.w.r.)			
in the region of ±0.03λ about "phase of sink"	-	4.0	
in the remaining region	-	5.0	

OPERATION IN INDUSTRIAL APPLICATION WITH FIXED REFLECTION ELEMENT AND THREE-PHASE HALF-WAVE RECTIFIER WITHOUT SMOOTHING FILTER

To obtain optimum power output, it is necessary to insert between the magnetron and the load, a fixed reflection element (see page 9) giving a mismatch with v.s.w.r. of 1.5 in "phase of sink".

OPERATING CONDITIONS

The impedance of the h.t. supply should be greater than 350Ω.

Heater voltage (running)	1.5	V
Mean anode current	850	mA
Peak anode current	2.0	A
*Load mismatch (v.s.w.r.)	1.5	
*†Power output (matched load)	2.5	kW

†For the output power under conditions of mismatch, see the Rieke diagram on page 16.

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Min.	Max.	
Heater voltage (starting)	4.5	5.2	V
Mean anode current	100	900	mA
Peak anode current	-	2.1	A
*Load mismatch (v.s.w.r.)			
in the region of ±0.03λ in "phase of sink"	-	2.5	
in the remaining region	-	4.0	

*Excludes fixed reflection element

CATHODE

Indirectly heated, dispenser type

*V_h (starting)	5.0	V
I_h (at V_h = 5.0V)	35	A
r_h (cold)	0.02	Ω
$I_{h\ (surge)}$ max.	140	A

For a heater starting voltage in the range 5.0 to 5.2V the cathode must be heated for at least 2 minutes before the application of h.t. At a heater starting voltage of 4.5V the heating time must be increased to at least 3 minutes. For a heater starting voltage in the range 4.5 to 5.0V the minimum heating time can be determined by linear interpolation.

It is necessary to reduce the heater voltage immediately after the application of anode power to compensate for additional heating of the cathode by back bombardment. The correct value of the nominal heater voltage is given by the curve (full line) on page 18.

Where it is required to design a heating generator for several fixed output power levels, the heater voltage may be reduced in one or two steps depending on the anode current range. The appropriate nominal value of heater voltage is that which falls within the limit curves (dotted lines) for the appropriate operating currents. The deviation from the nominal should be kept to a minimum.

*Temporary fluctuations not exceeding +5% and -10% of the nominal heater voltage are permissible.

COOLING

Maximum temperatures

Anode block reference point (see page 9)	125	^{o}C
Cathode radiator	180	^{o}C

Cathode

Cooling clips 40634 and 40649 should be attached to the heater and cathode terminals respectively.

A flow of air should be directed at the cathode radiator in order to keep it below the stated maximum. This should not be allowed to cool the supporting glassware.

Due to the thermal capacity of the cathode if heater and air flow are switched off simultaneously the maximum temperature of the cathode radiator will be exceeded unless the cathode radiator is kept at approximately $100^{o}C$ during operation. This requires a minimum air flow of $0.22m^3$/min ($8.0ft^3$/min). If after blowing is provided the minimum air flow may be reduced to $0.06m^3$/min ($2.0ft^3$/min).

YJ1160

Water cooled (see curve on page 14)

A plate is provided on the anode block for the mounting of a thermal switch to protect the valve in the event of water failure. This switch should come into operation at a temperature not higher than $120^{o}C$.

YJ1162

Forced-air cooled (see curve on page 15)

Example:-

Under open bench conditions with a matched load, for operation from three-phase or single-phase supplies with rectifier $T_{in} = 25^{o}C$, the minimum air flow is $1.7m^3$/min ($60ft^3$/min) at pressure of 15mm water.

When operating in a confined enclosure causing an increased ambient temperature around the magnetron and with conditions of load mismatch causing reduced efficiency the amount of forced-air cooling will need to be increased.

A plate is provided on the anode block for the mounting of a thermal switch to protect the tube in the event of failure of the cooling air. This switch should come into operation at a temperature not higher than $105^{o}C$.

MOUNTING POSITION

In equipment, the following minimum distances should be maintained between the magnet and magnetic materials (see outline drawings).

direction a	60	mm
direction b	100	mm
direction c	110	mm

OUTPUT CONNECTION

50Ω coaxial transmission line with 16mm inner conductor and 39mm outer conductor.

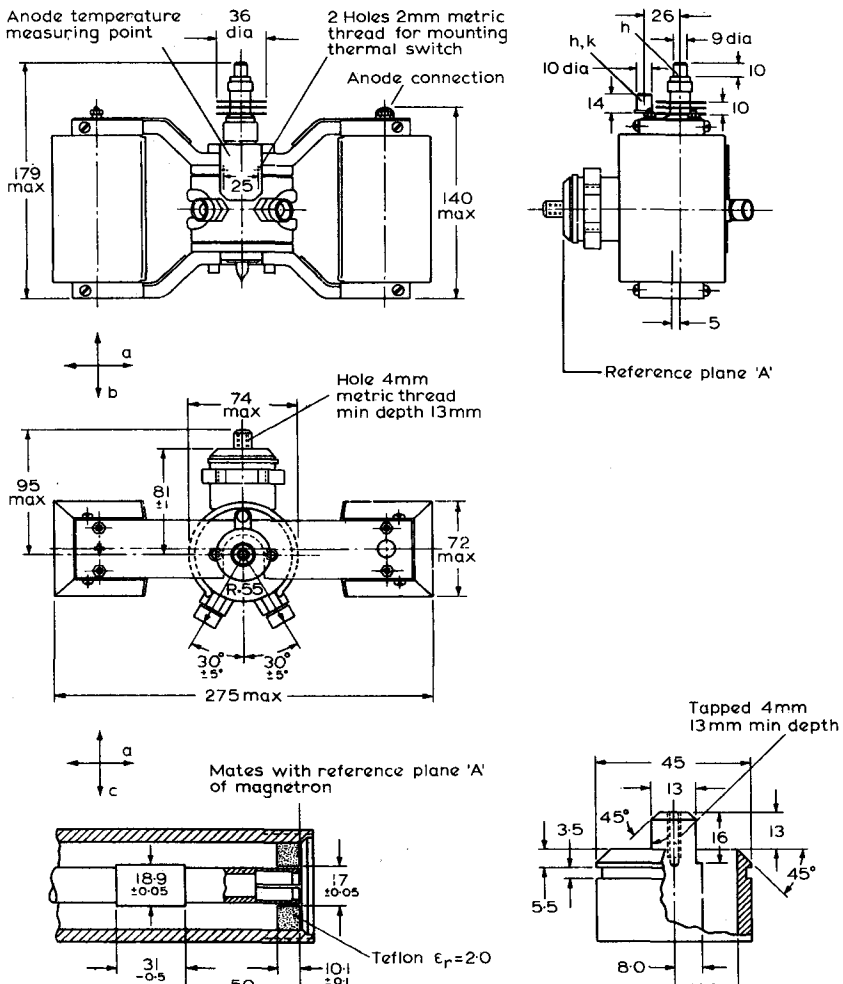
PHYSICAL DATA

	YJ1160	YJ1162	
Net weight of magnetron	5.1	7.9	kg
	11.2	17.4	lb

ACCESSORIES

Cap nut	55312
Split spring ring	55313
Heater terminal cooling clip	40634
Cathode terminal cooling clip	40649

OUTLINE DRAWING OF YJ1160



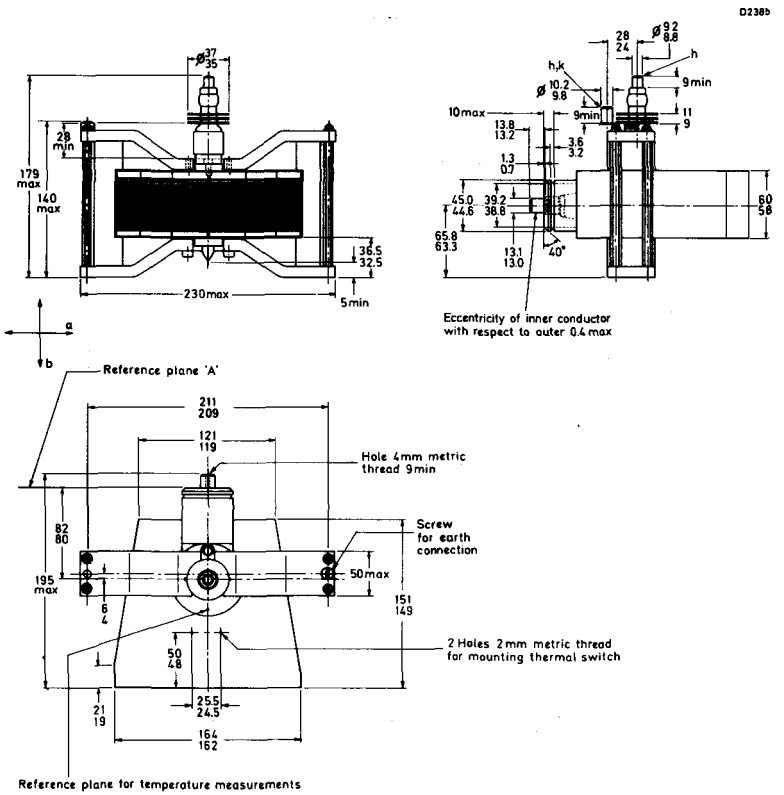
Fixed reflection element

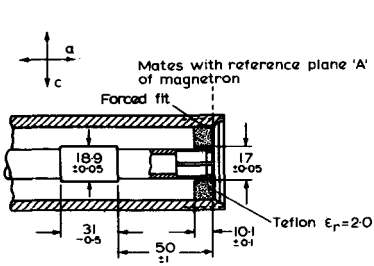
Output terminal

All dimensions in mm

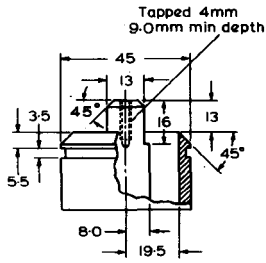
B5059

OUTLINE DRAWING OF YJ1162





Fixed reflection element

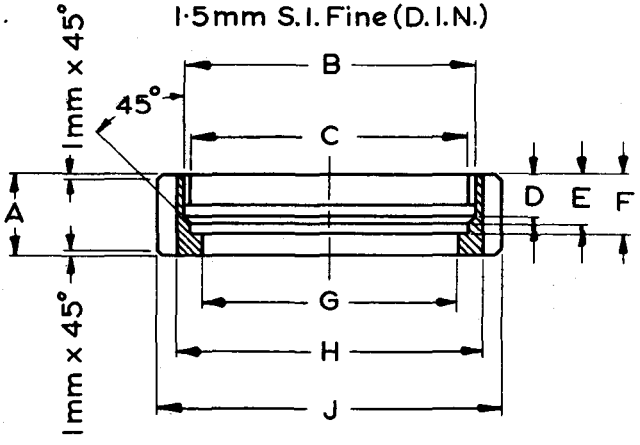


Output terminal

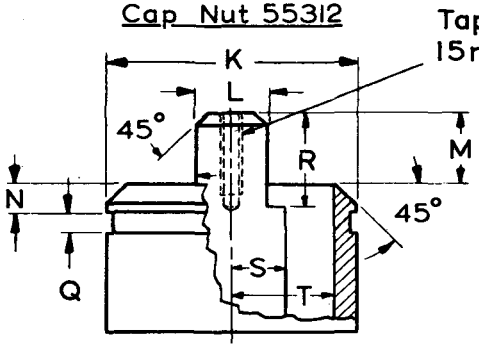
All dimensions in mm

OUTLINE AND DIMENSIONS OF CAP NUT AND COAXIAL OUTPUT

	Inches	Millimetres		Inches	Millimetres
A	0.5905±0.0078	15.0±0.2	K	1.77	45
B	2.05	52	L	0.51	13
C	1.9528±0.0020	49.6±0.05	M	0.51	13
D	0.3149±0.0039	8.0±0.1	N	0.217	5.5
E	0.3740±0.0039	9.5±0.1	Q	0.138	3.5
F	0.4330±0.0039	11.0±0.1	R	0.63	16
G	1.7913±0.0020	45.5±0.05	S	0.315	8.0
H	2.1653±0.0078	55.0±0.2	T	0.768	19.5
J	2.4409±0.0078	62.0±0.2			



Cap Nut 55312

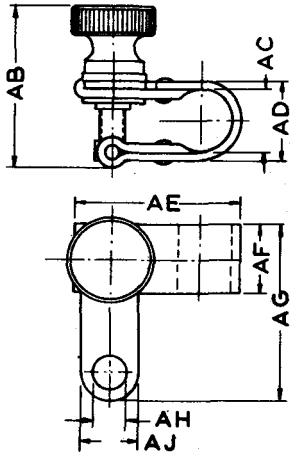


Output Terminal

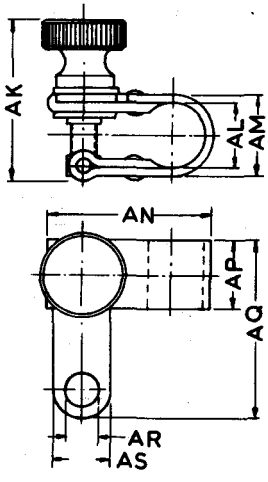
9379

OUTLINE AND DIMENSIONS OF COOLING CLIPS

	Inches	*Millimetres*		*Inches*	*Millimetres*
AB	1.06	27	AK	1.02	26
AC	0.41	10.5	AL	0.35	9
AD	0.51	13	AM	0.47	12
AE	1.10	28	AN	1.10	28
AF	0.47	12	AP	0.47	12
AG	1.18	30	AQ	1.18	30
AH	0.26	6.5	AR	0.26	6.5
AJ	0.47	12	AS	0.47	12

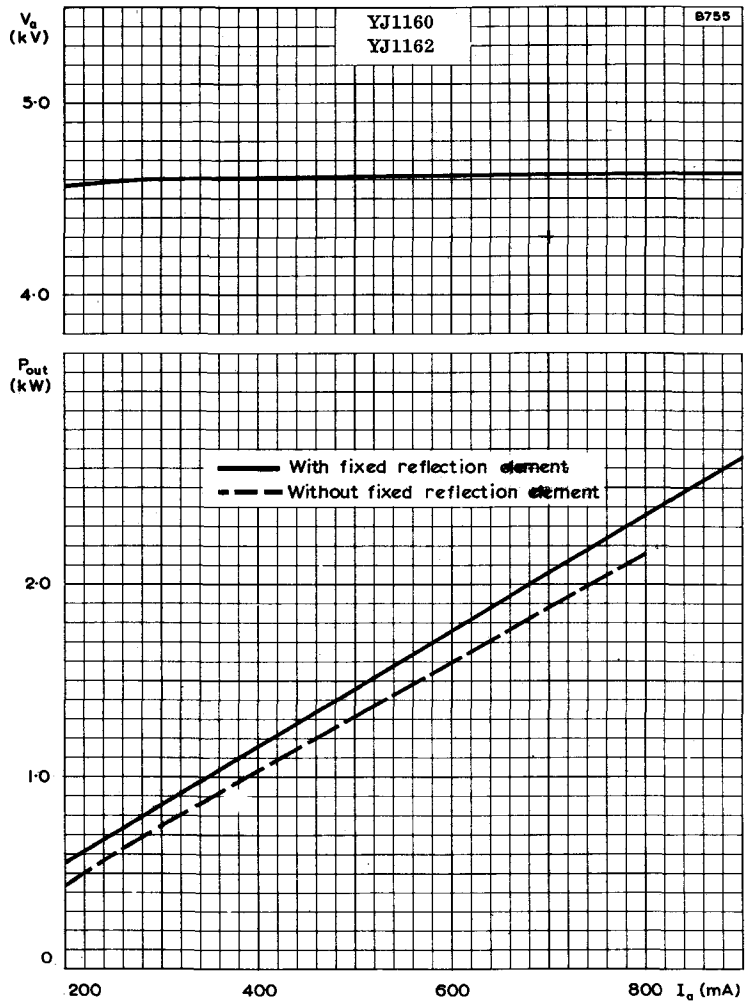


Cathode terminal
cooling clip 40649

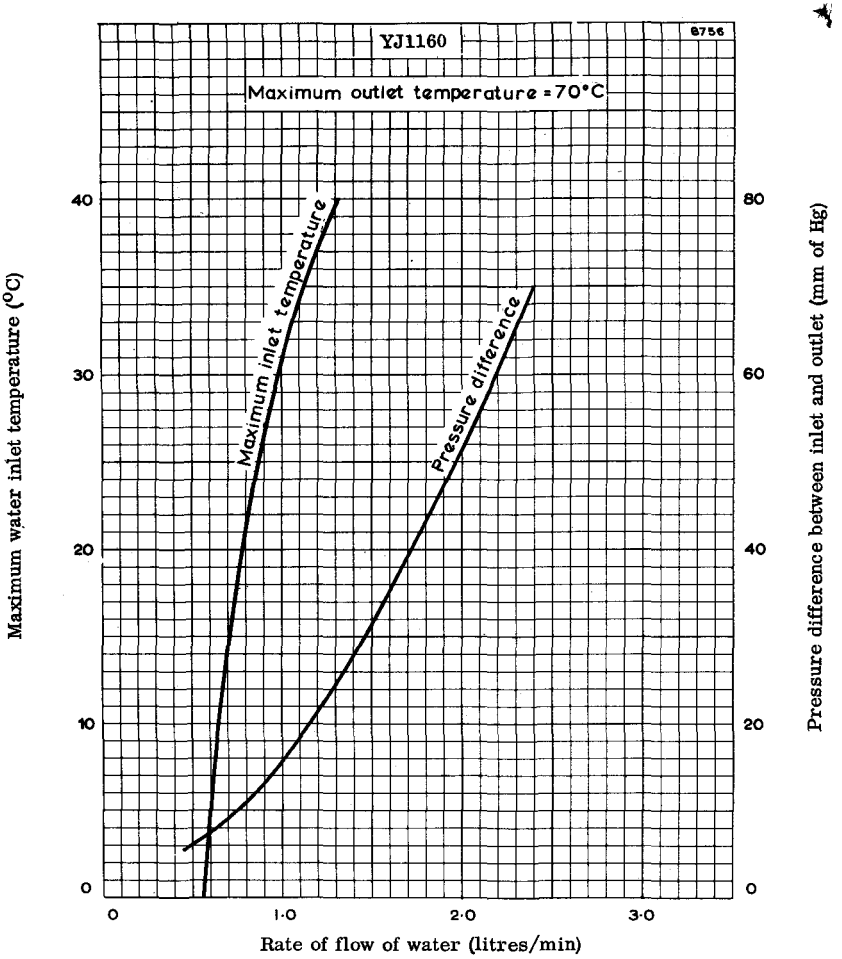


heater terminal
cooling clip 40634

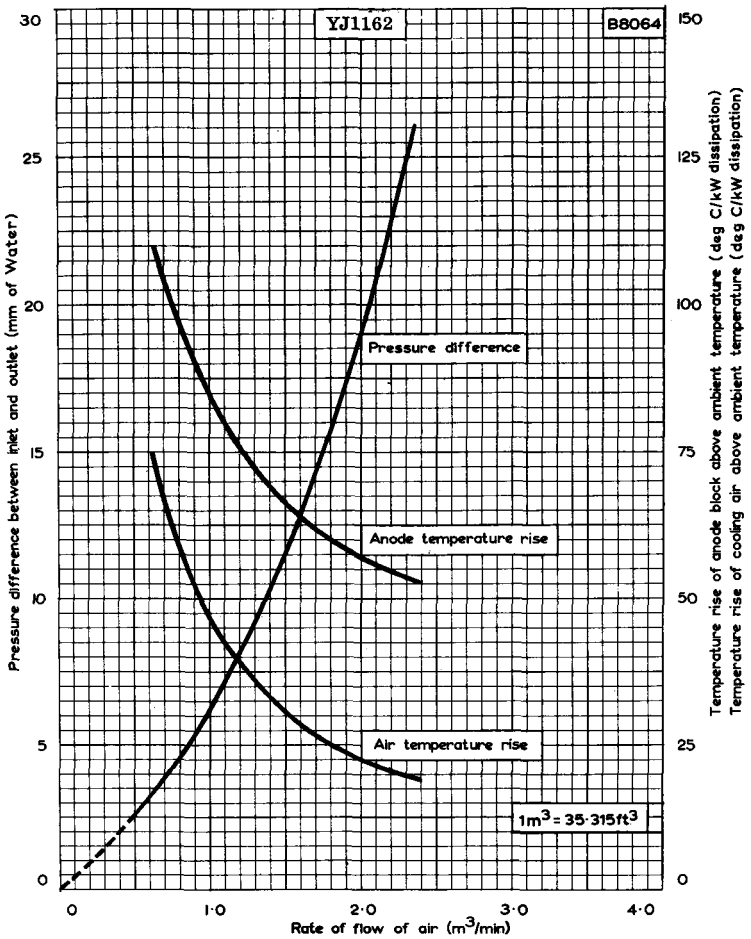
9177



OUTPUT POWER AND ANODE VOLTAGE PLOTTED AGAINST MEAN ANODE CURRENT



COOLING CURVES FOR YJ1160



COOLING CURVES FOR YJ1162