The data should be read in conjunction with the Power Tetrode Preamble.

ABRIDGED DATA

Vapour cooled tetrode of coaxial metal-ceramic construction, for audio amplifiers, RF linear amplifiers or class C amplifiers or oscillators.

Anode dissipation	150	kW max
Anode voltage	15	kV max
Frequency for full ratings	30	MHz max
Output power (class C, anode and screen modulated)	220	kW

GENERAL

Electrical

Filament	thoriated tungsten	
Filament voltage (see note 1)	21	V
Filament current	350	A
Filament starting current (peak) (see note 2)	3000	A max
Filament cold resistance	6.5	mΩ
Peak usable cathode current	280	A
Grid-screen amplification factor (V_a = 3.0 kV, V_{g2} = 1.0 kV, I_a = 10 A)	4.0	
Mutual conductance (V_a = 3.0 kV, V_{g2} = 1.0 kV, I_a = 10A)	130	mA/V
Perveance	8	$mA/V^{3/2}$
Inter-electrode capacitances:		
anode to grid (see note 3)	8.5	pF
anode to cathode (see note 3)	1.7	pF
anode to screen	118	pF
cathode to grid	260	pF
grid to screen	340	pF

Mechanical

Overall length	532.3 mm max
Overall diameter	317 mm max
Net weight	51 kg approx
Mounting position	vertical, anode down

Boiler Unit and Accessories

The CY4120 is a single boiler unit for use with CY1172. A separate condenser is required, with insulating pipes for the steam outlet and water return to the boiler. The tube is held in the boiler unit by its own weight.

The boiler unit may be mounted by means of the four pillars on the base, and these may also be used for HT supply connections.

Distilled or de-mineralised water should be used in the boiler unit.

Net weight (empty)	45 kg approx
Water capacity to maximum water level	30 litres approx
Sealing ring (supplied with boiler)	MA320
Socket (see pages 11 and 12)	MA226A
Thermal fuse	MA85D

COOLING AND INSTALLATION

The CY1172 is designed for cooling by vaporisation of water and is fitted with an integral anode block in which circulation holes are provided for the passage of water and steam. The tube is installed with the anode partly immersed in the liquid coolant (distilled or de-ionised water) inside the boiler unit (see list of accessories above). When the power supplies are switched on, the heat generated inside the tube evaporates some of the water in the circulation holes and jets of steam issue into the upper part of the boiler. The steam is either condensed directly by means of an internal water cooled condenser or led away by suitably insulated tubing for condensation at some convenient point external to the boiler (as in CY4120).

The services of our design staff are available for advice in matters of suitable condenser design and installation details.

The temperature of the metal-ceramic seals must not exceed 220 °C. A flow of air of 1.7 m^3/min must be directed into the filament header before and during the application of any voltages. Using the recommended socket MA226A, this requires a pressure drop of 10 mm w.g.

A thermal fuse (part number MA85D) is provided with each tube to give protection against anode overheating. A position for mounting the thermal fuse is provided by a threaded hole in the top surface of the anode ring. It should be connected by a non-conducting cord to a suitable switching device; a tension of about 450 g should be applied to the fuse via the cord. If the temperature exceeds a safe limit, the fuse core is pulled outwards; this should actuate the switching device and remove all electrical supplies from the tube. Replacement fuses can be supplied to order. An additional hole threaded M5 is provided, to accept existing fuses in certain equipments.

E2V Technologies Limited, Waterhouse Lane, Chelmsford, Essex CM1 2QU England Telephone: +44 (0)1245 493493 Facsimile: +44 (0)1245 492492
e-mail: enquiries@e2vtechnologies.com Internet: www.e2vtechnologies.com Holding Company: Redwood 2002 Limited

E2V Technologies Inc. 4 Westchester Plaza, PO Box 1482, Elmsford, NY10523-1482 USA Telephone: (914) 592-6050 Facsimile: (914) 592-5148
e-mail: enquiries@e2vtechnologies.us

ANODE AND SCREEN MODULATED RF POWER AMPLIFIER (Class C telephony, carrier conditions per tube for use with a maximum modulation factor of 1.0)

MAXIMUM RATINGS (Absolute values)

Anode voltage	11.5	kV
Screen voltage	1000	V
Grid voltage (negative value)	800	V
Cathode current	60	A
Anode dissipation (see note 4)	100	kW
Screen dissipation (see note 5)	2700	W
Grid dissipation	1200	W

TYPICAL OPERATING CONDITIONS (below 30 MHz)

Anode voltage	11	kV
Screen voltage	800	V
Grid voltage	−590	V
Peak RF grid voltage	910	V
Anode current	25	A
Screen current	2.2	A
Grid current	1.5	A
Anode dissipation	55	kW
Screen dissipation	1.8	kW
Grid dissipation	480	W
Driving power	1.2	kW
Output power	220	kW
Efficiency	80	%

RADIO FREQUENCY LINEAR AMPLIFIER (Class AB1) (See Note 6)

MAXIMUM RATINGS (Absolute values)

Anode voltage	15	kV
Screen voltage	1600	V
Grid voltage (negative)	800	V
Cathode current	60	A
Anode dissipation	150	kW
Screen dissipation	2700	W
Grid dissipation	1200	W

TYPICAL OPERATING CONDITIONS (below 30 MHz)

Anode voltage	9	kV
Screen voltage	1500	V
Grid voltage	−450	V

	zero signal	*single tone*	*two tone (average)*	
Peak RF grid voltage	0	450	450	V
Anode current	5	21	13.2	A
Screen current	0	0.8	0.5	A
Anode dissipation	45	69	58.5	kW
Screen dissipation	0	1200	750	W
Output power	0	120	60	kW
Efficiency	-	63.5	50.5	%

ANODE AND SCREEN MODULATED RF POWER AMPLIFIER (Class D Tyler high efficiency circuit, carrier conditions per tube for use with a maximum modulation factor of 1.0)

MAXIMUM RATINGS (Absolute values)

Anode voltage	11.5	kV
Anode current	40	A
Anode dissipation (see note 4)	100	kW
Screen voltage	1000	V
Screen dissipation	2700	W
Grid dissipation	1200	W

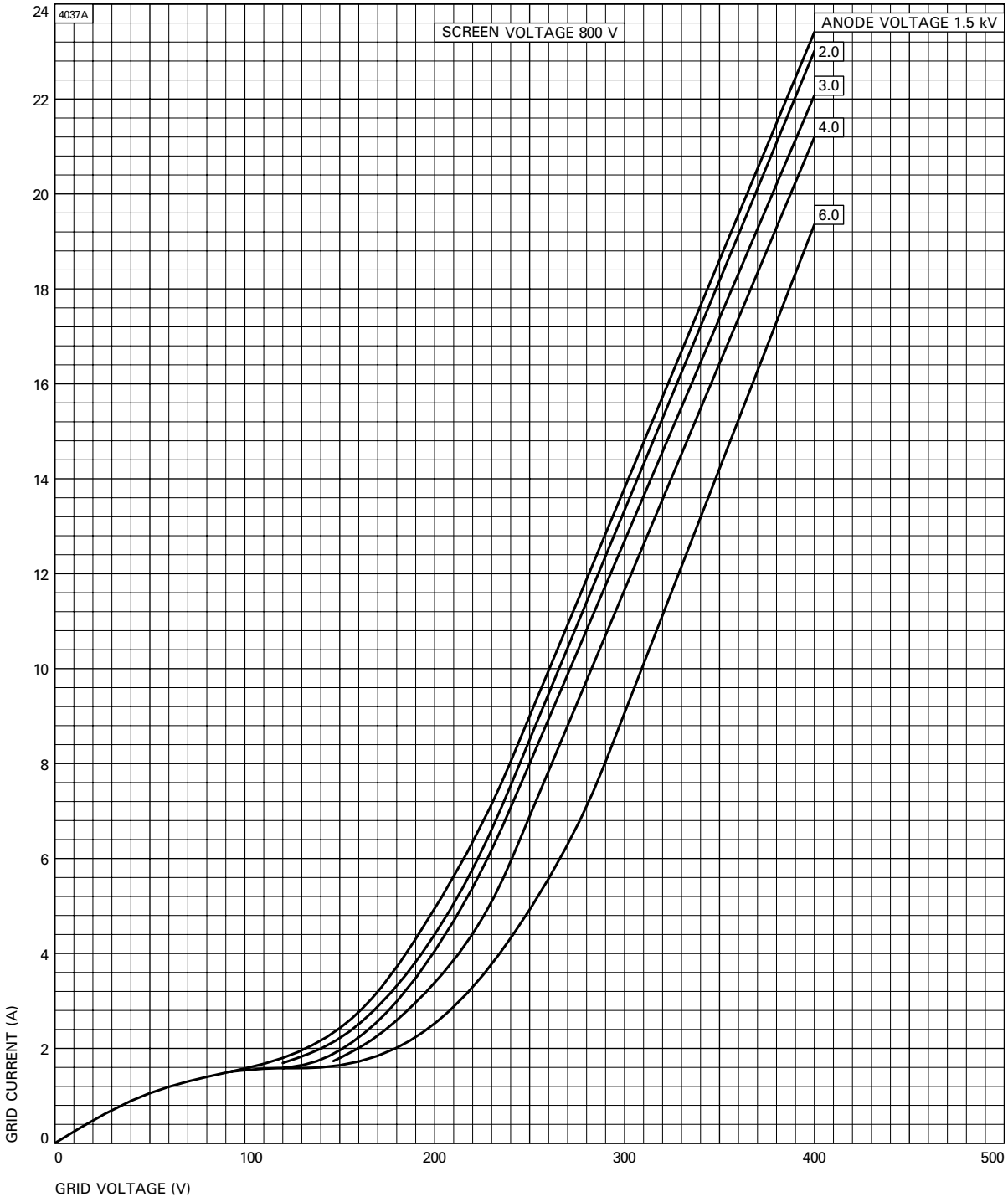
TYPICAL OPERATING CONDITIONS (below 3 MHz)

Anode voltage	11.5	kV
Screen voltage (see note 7)	825	V
Grid voltage (see note 8)	−800	V
Peak RF grid voltage	960	V
Anode current	26	A
Screen current	2.5	A
Grid current	1.0	A
Anode dissipation	40	kW
Nominal driving power	960	W
Output power	260	kW
Anode efficiency	86	%

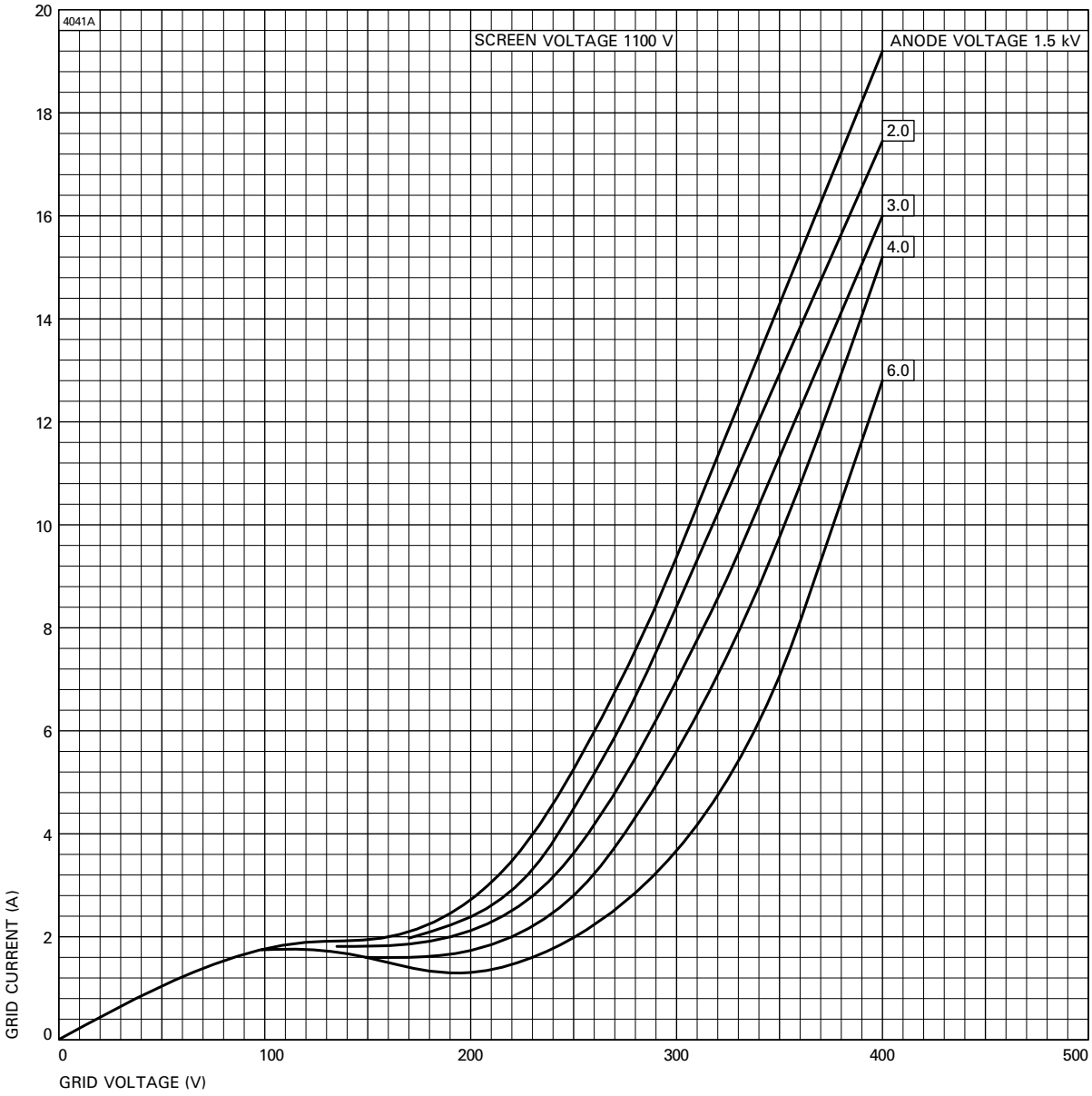
NOTES

1. In some applications, operation at a lower filament voltage may give enhanced tube life. The equipment design should allow for operation in the range 18 to 21 V; E2V Technologies should be consulted regarding optimum filament voltage.
2. The filament current must not exceed 3000 A, even momentarily, at any time.
3. Measured with a screening plate 50 cm diameter, mounted perpendicular to the tube axis on the screen contact.
4. This value corresponds to 150 kW anode dissipation at 100% sine wave modulation.
5. This value must not be exceeded at any level of modulation.
6. Grid current does not flow during any part of the drive cycle.
7. Derived via a series resistor of 270 Ω from a 1500 V HT line which is modulated by means of a tertiary winding on the anode modulation transformer.
8. The bias is obtained from an 800 V supply and 100 Ω grid resistor.

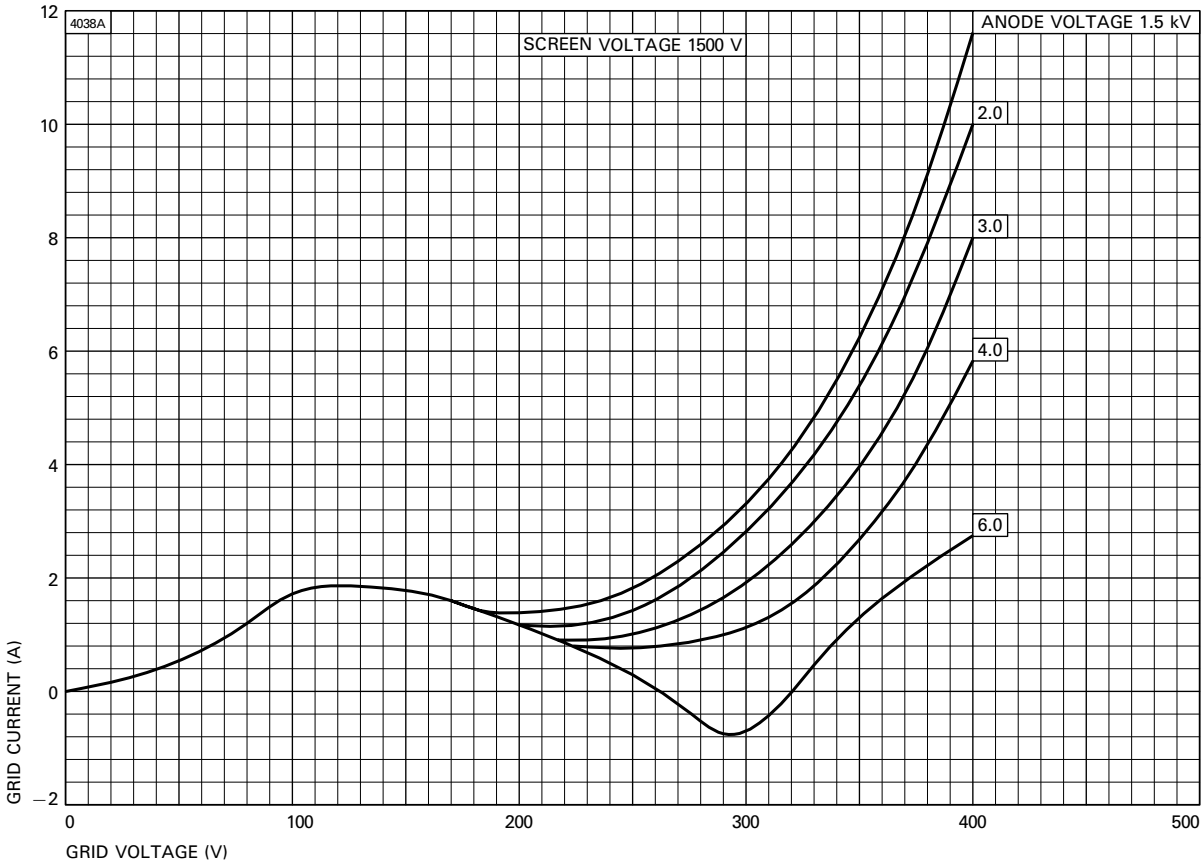
TYPICAL GRID CURRENT CHARACTERISTICS



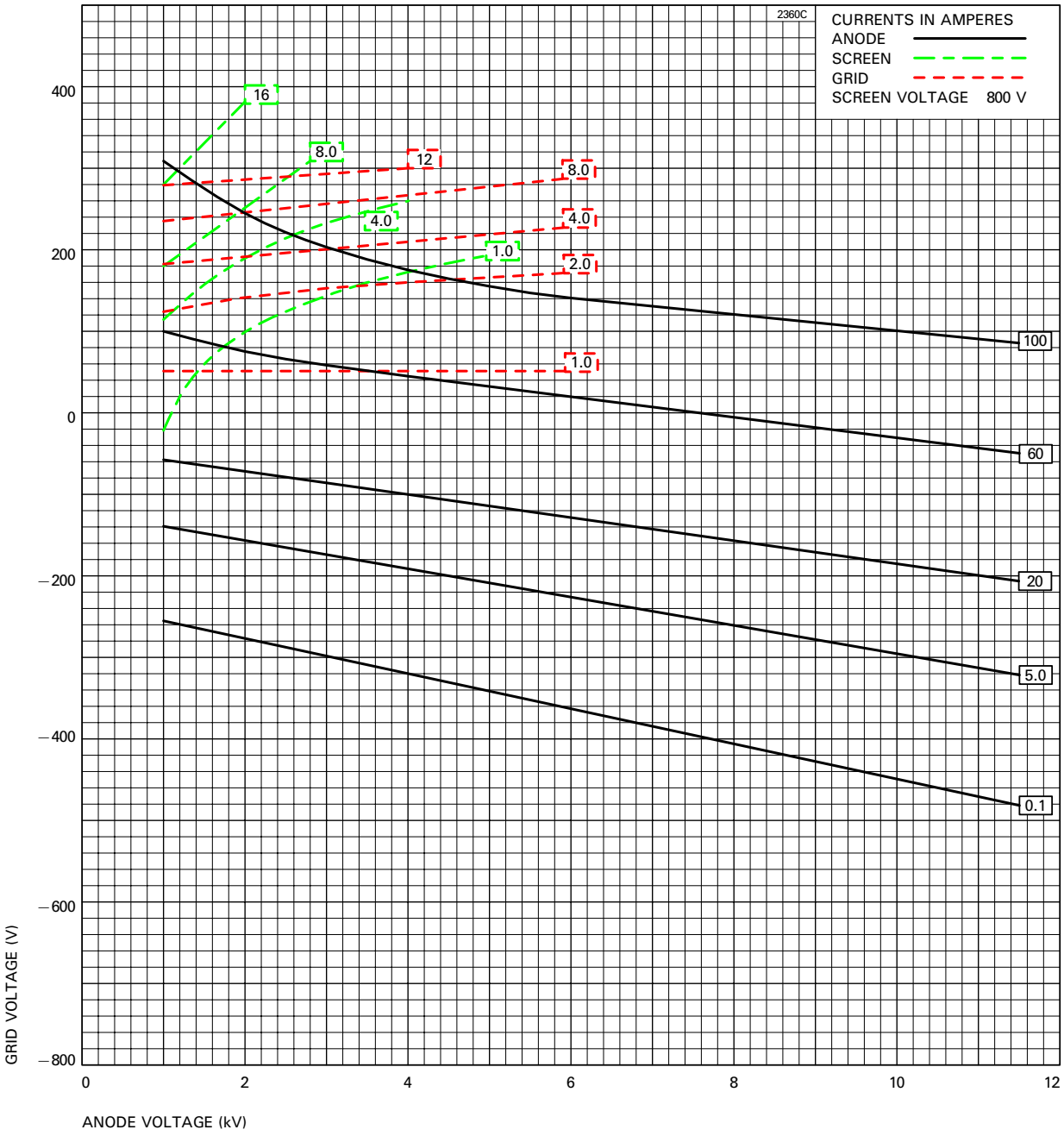
TYPICAL GRID CURRENT CHARACTERISTICS



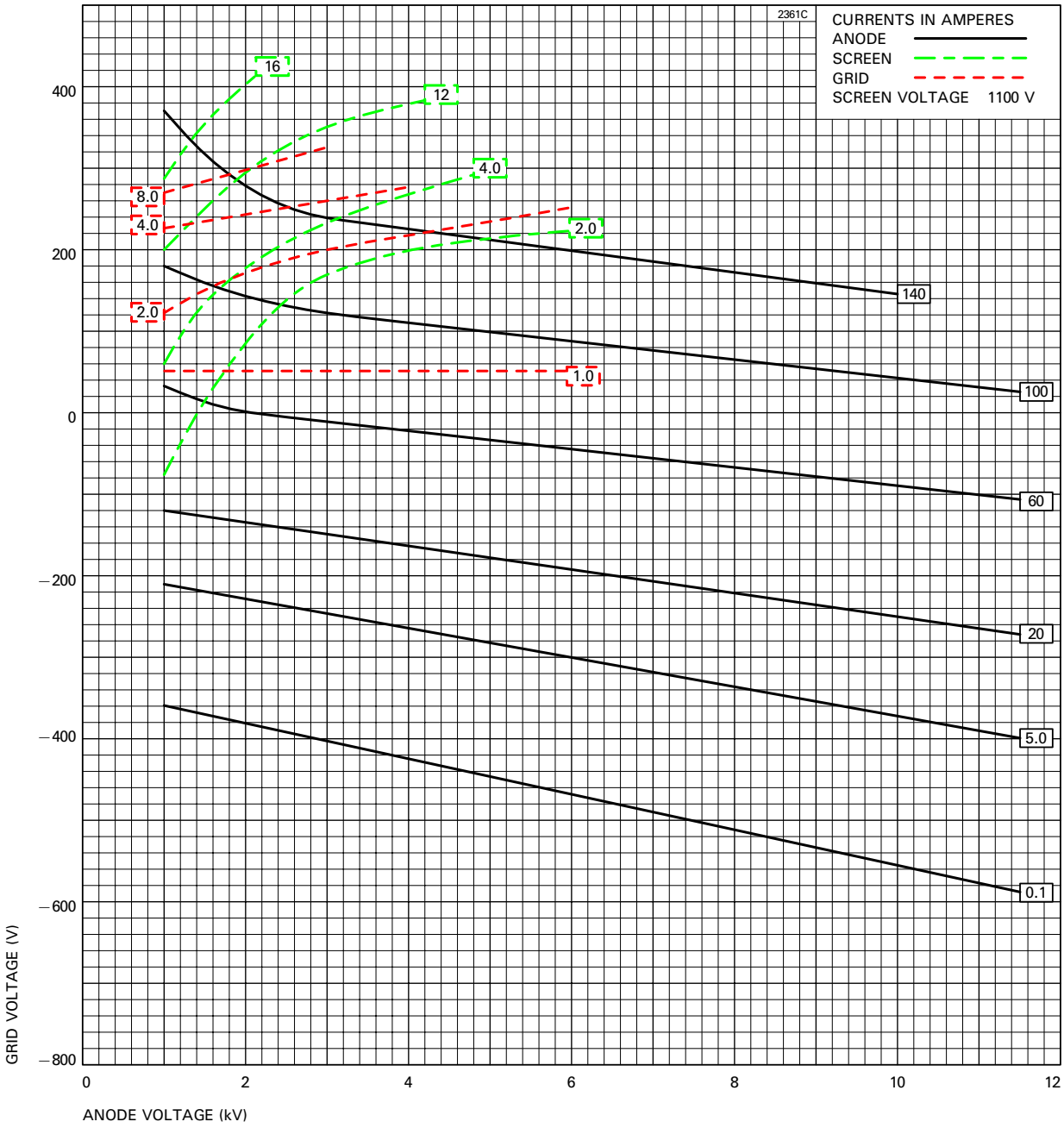
TYPICAL GRID CURRENT CHARACTERISTICS



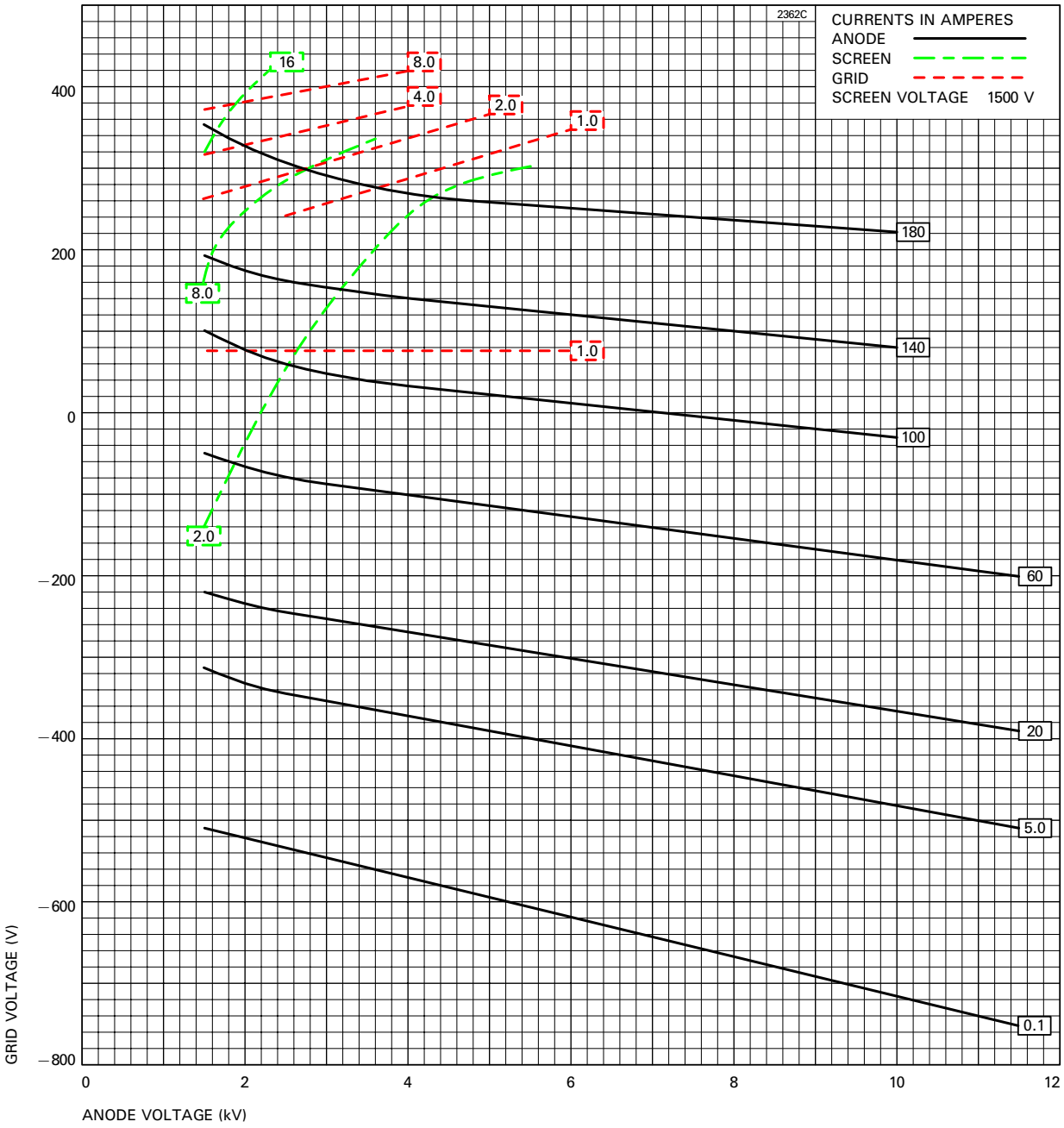
TYPICAL CONSTANT CURRENT CHARACTERISTICS



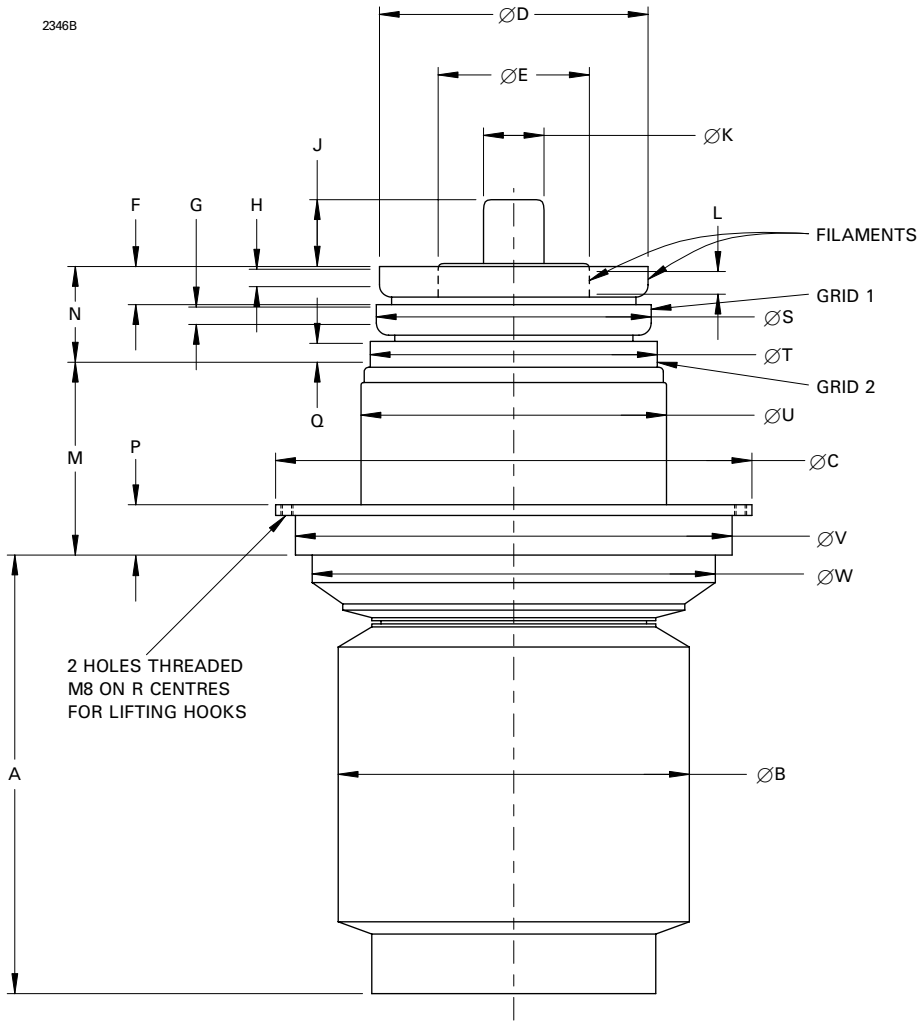
TYPICAL CONSTANT CURRENT CHARACTERISTICS



TYPICAL CONSTANT CURRENT CHARACTERISTICS

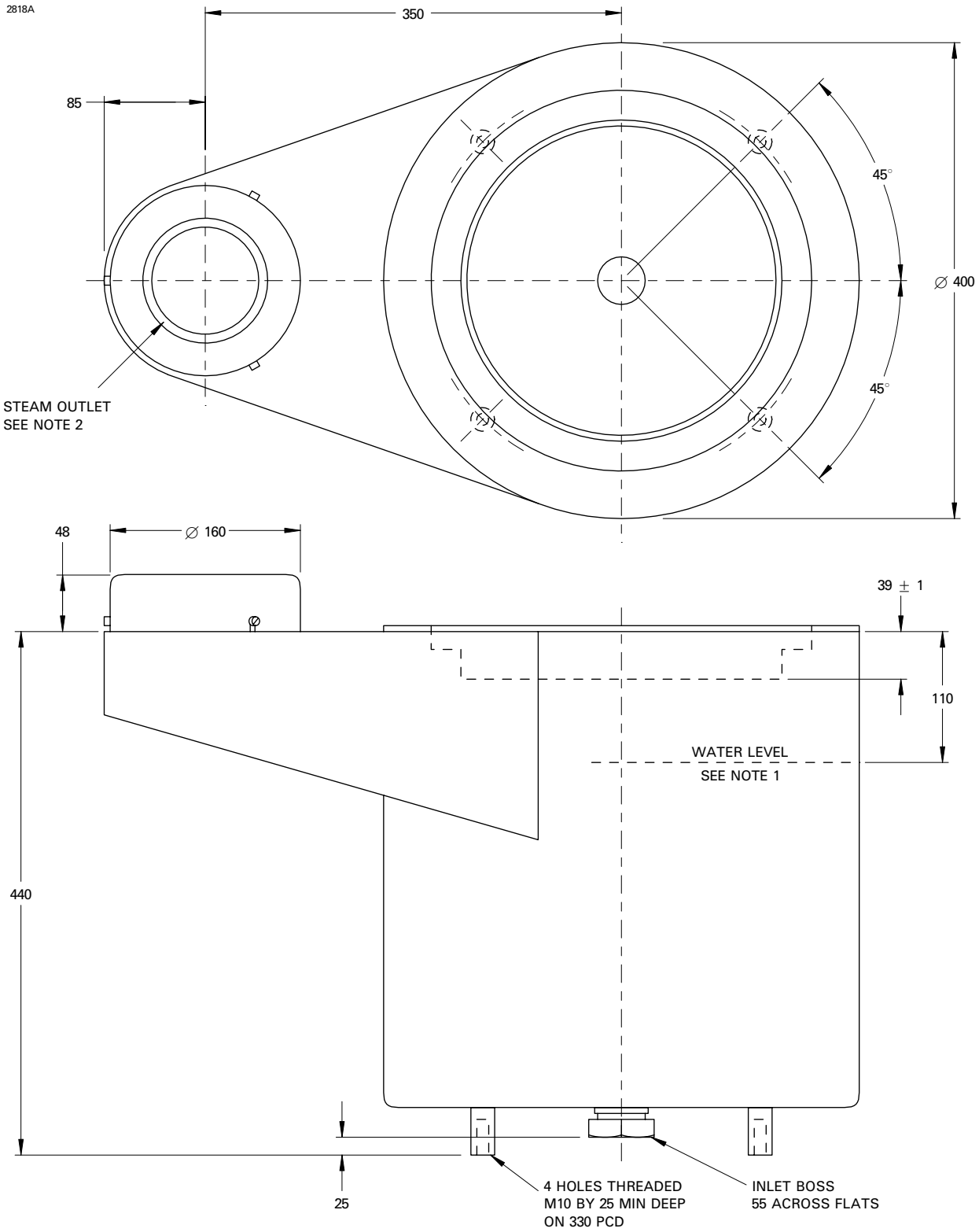


OUTLINE (All dimensions without limits are nominal)



Ref	Millimetres
A	289.0 ± 5.0
B	231.0 max
C	315.0
D	178.0 ± 0.5
E	96.0 ± 0.5
F	24.2 ± 0.5
G	15.0
H	15.0
J	42.5 +0.0 −2.0
K	40.0
L	15.0
M	125.3 ± 2.0
N	67.5 +1.0 −2.0
P	34.0 +0.5 −0.0
Q	15.0 +2.0 −3.5
R	300.0
S	185.0 ± 0.5
T	193.2 ± 0.5
U	208.0 max
V	290.0
W	270.0

OUTLINE OF BOILER UNIT CY4120 (All dimensions without limits are nominal)

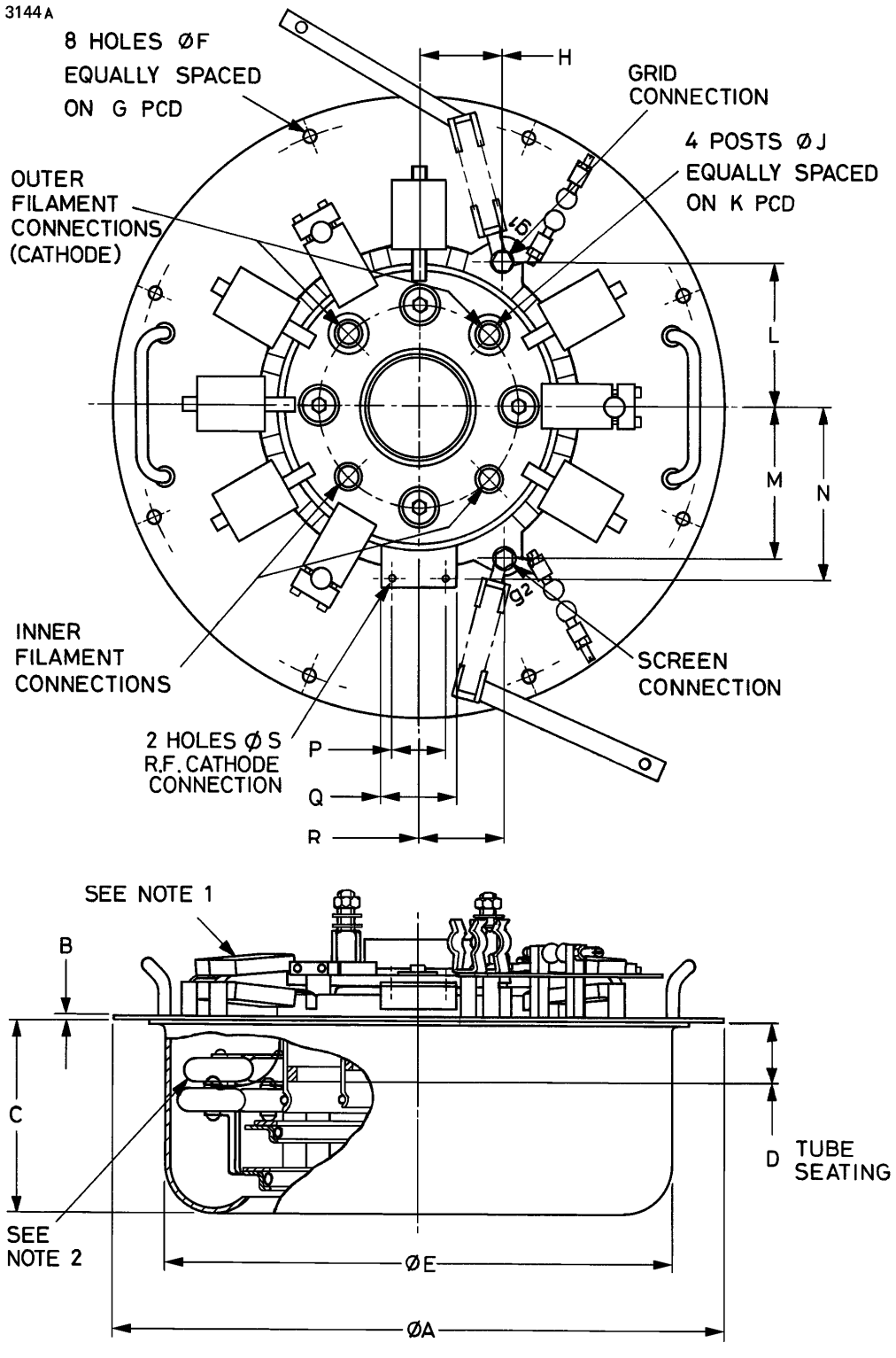


Outline Notes

1. This is the nominal water level for setting-up. The level must not fall below 160 mm under maximum anode dissipation. The CY4120 can be supplied with a water level indicator if required.
2. The following fittings are recommended for the steam outlet; they are not supplied with the boiler:
   (a) Steam outlet pipe (special)*
   (b) One backing flange CF4*
   (c) One PTFE bellows FB4*
   (d) One rubber insert CNR4*
   (e) Six bolts NB4*.

* Available from Q.V.F. Limited, Duke Street, Fenton, Stoke-on-Trent, Staffordshire.

OUTLINE OF SOCKET MA226A (All dimensions without limits are nominal)



Ref	Millimetres
A	400.0
B	3.0
C	123.0
D	38.0
E	330.0
F	9.0
G	375.0
H	54.0
J	15.0 ± 0.1
K	130.0
L	93.5
M	98.0
N	111.0
P	34.0
Q	50.0
R	56.5
S	4.5

Outline Notes

1. Filament bypass capacitors (not supplied with MA226A).
2. Screen decoupling capacitors (not supplied with MA226A).

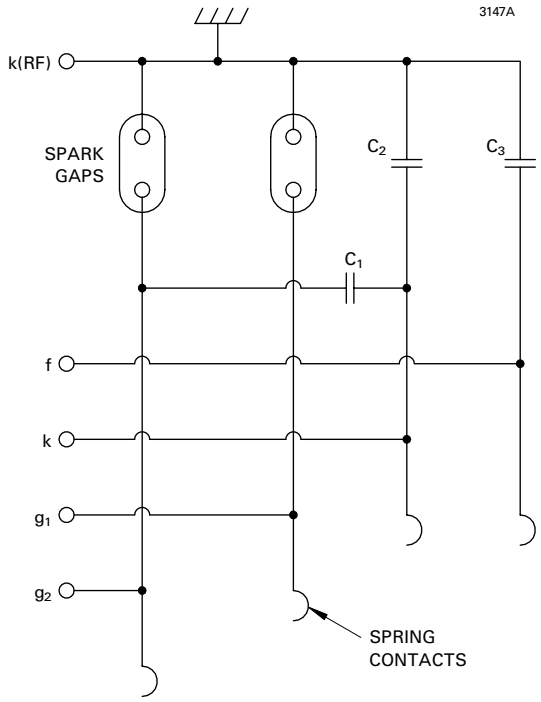
SOCKET MA226A

The MA226A provides connections to the filament and grids of the CY1172; it incorporates protective spark gaps for grid and screen and provision for filament bypass and screen decoupling capacitors (not supplied), as shown below. The outer shell of the socket forms a corona ring, to give flashover protection to the tube envelope.

C_1 10 ceramic capacitors, 6800 pF 3500 V working

C_2 6 mica capacitors, 470 000 pF 500 V working

C_3 6 mica capacitors, 470 000 pF 500 V working.



HEALTH AND SAFETY HAZARDS

E2V Technologies electronic devices are safe to handle and operate, provided that the precautions stated are observed. E2V Technologies does not accept responsibility for damage or injury resulting from the use of 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 energy 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. A properly designed equipment cabinet with good RF electrical connection between panels will normally provide sufficient protection.

X-Ray Radiation

This device, when operating at voltages above 5 kV, produces progressively more dangerous X-rays as the voltage is increased; the radiation varies greatly during life. The device envelope provides only limited protection and further shielding may be required. A metal equipment cabinet with overlapping joints will usually provide sufficient shielding, but if there is any doubt an expert in this field should perform an X-ray survey of the equipment.

Implosion

This tube stores potential energy by virtue of its vacuum. The energy level is low, but there is some hazard from flying fragments if the tube is dropped or subjected to violent impact. The tube must be stored and transported in its approved pack. During installation or replacement the tube must not be scratched or damaged in any way likely to reduce the strength of the ceramic envelope.

References

1. BS 3192. Specification for safety requirements for radio (including television) transmitting apparatus.
2. TEPAC Publication no. 181. Recommended practice for measurement of X-radiation from power tubes.

