e2v technologies

BY1144L
RF Power Triode

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

ABRIDGED DATA

Vapour cooled transmitting triode with integral filament leads. The grid terminal is suitable for cathode drive operation.

Anode dissipation	125	kW max
Anode voltage	14	kV max
Frequency for full ratings	27	MHz max
Output power (class C telegraphy)	200	kW

GENERAL

Electrical

Filament (two sections)		
(see note 1)	thoriated tungsten	
Filament voltage per section (see note 2)	9.6	V
Filament current per section	290	A
Surge filament current per section		
(peak) (see note 3)	700	A max
Filament cold resistance per section	4.0	mΩ
Peak usable cathode current	175	A
Perveance	6.0	$mA/V^{3/2}$
Amplification factor		
(V_a = 9.0 kV, I_a = 5.0 A)	34	
Mutual conductance		
(V_a = 9.0 kV, I_a = 5.0 A)	85	mA/V
Inter-electrode capacitances (average):		
grid to anode	108	pF
grid to filament	259	pF
anode to filament	3.5	pF

Mechanical

Overall dimensions	see outline
Net weight	57 kg approx
Mounting position	vertical, filament end up

Accessories

Boiler unit, separate condenser	BY4060
Sealing ring (supplied with tube)	MA260
Thermal fuse (2 supplied with tube)	MA85D
Replacement spring finger (8 per set)	MA1191A
Holding strip (8 per set)	MA1192A

COOLING

Anode

The BY1144L anode is vapour cooled in boiler unit BY4060. The steam generated at the anode is lead away by suitable insulated tubing for condensation at some convenient point external to the boiler unit.

Two thermal fuses (part number MA85D) are provided with each BY1144L to give protection against anode overheating; only one fuse at a time need be used. Alternative positions for mounting the thermal fuse are provided by four threaded holes equally spaced round the top surface of the anode ring. Replacement fuses can be supplied to order.

Filament and grid seals

The temperature of the filament and grid seals must not exceed 140 °C. A flow of air of 1.7 m^3/min directed into the filament header via a 50 mm maximum diameter nozzle before and during the application of any voltages is usually adequate for limiting the temperature of these seals.

Anode seal and bulb

The anode seal and bulb temperatures must not exceed 180 °C.

INSTALLATION

The BY1144L should be lifted by means of four lifting hooks hooked under the anode corona ring (see outline drawing and also page 6 for details of a suitable lifting hook), the hooks being connected by cables to a suitable spreader plate and lifting tackle.

RF POWER AMPLIFIER AND OSCILLATOR
(Class C Telegraphy, key-down conditions, one tube)

MAXIMUM RATINGS (Absolute values)

Anode voltage (see note 4)	14	kV
Anode current	18	A
Anode dissipation (see note 5)	125	kW
Grid dissipation	2.75	kW
Operating frequency (for full ratings)	27	MHz

TYPICAL OPERATING CONDITIONS
(For amplifier)

Anode voltage	14	kV
Grid voltage	−765	V
Peak RF grid drive voltage	1305	V
Anode current	17.5	A
Grid current (approx)	3.1	A
Anode dissipation	45	kW
Grid dissipation (approx)	1.7	kW
Driving power (approx)	4.0	kW
Output power	200	kW
Efficiency	81	%

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RANGE OF CHARACTERISTICS FOR EQUIPMENT DESIGN

	Min	Max	
Filament current per section at filament voltage 9.6 V	263	311	A
Filament current difference between sections	–	15	A
Amplification factor (V_a = 9.0 kV, I_a = 5.0 A)	31	39	
Mutual conductance (V_a = 9.0 kV, I_a = 5.0 A)	78	102	mA/V
Grid voltage (negative value) (V_a = 10 kV, I_a = 0.1 A)	–	370	V
Grid voltage (V_a = 9.0 kV, I_a = 5.0 A)	145	222	V
Anode current (V_a = 1.5 kV, V_g = +400 V)	48	72	A
Grid current (V_a = 1.5 kV, V_g = +400 V)	10	16	A
Anode current (V_a = 4.0 kV, V_g = +400 V)	66	98	A
Grid current (V_a = 4.0 kV, V_g = +400 V)	2.0	10	A
Anode current (V_a = 10 kV, V_g = +400 V)	90	138	A
Grid current (V_a = 10 kV, V_g = +400 V)	0	6.0	A

NOTES

1. The filament comprises two separate sections and these should be operated in phase quadrature. Each section is connected across diametrically opposite filament pins.
2. The tube must be operated at the stated filament voltage. Fluctuation in filament voltage must not exceed ±5%.
3. The filament current must not exceed 700 A per section, even momentarily, at any time.
4. The maximum anode voltage for class C anode modulated operation (100% modulation) is 12 kV.
5. The maximum anode dissipation for class C anode modulated operation is 83 kW. This value corresponds to 125 kW at 100% sine wave modulation.

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.

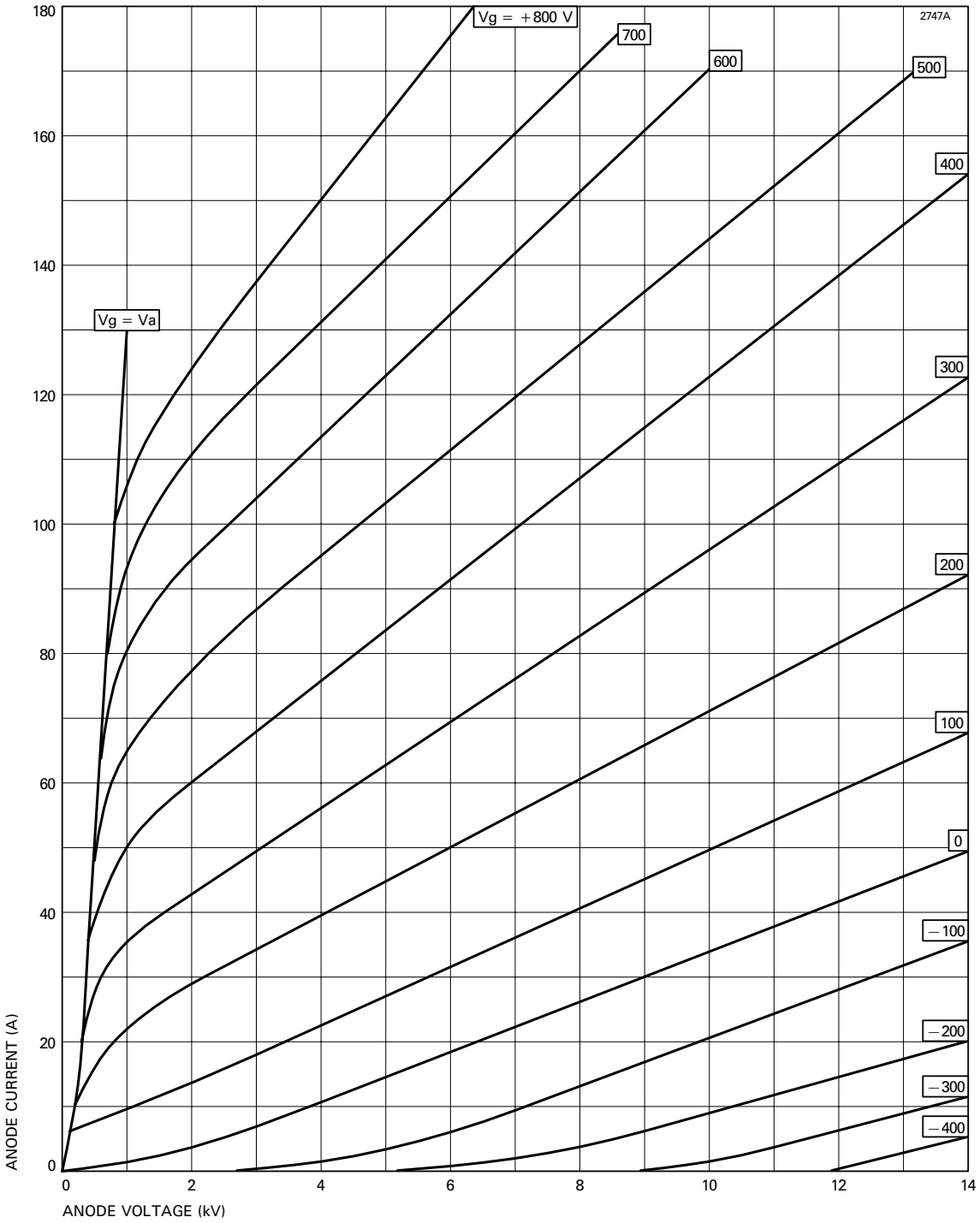
Implosion

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 envelope.

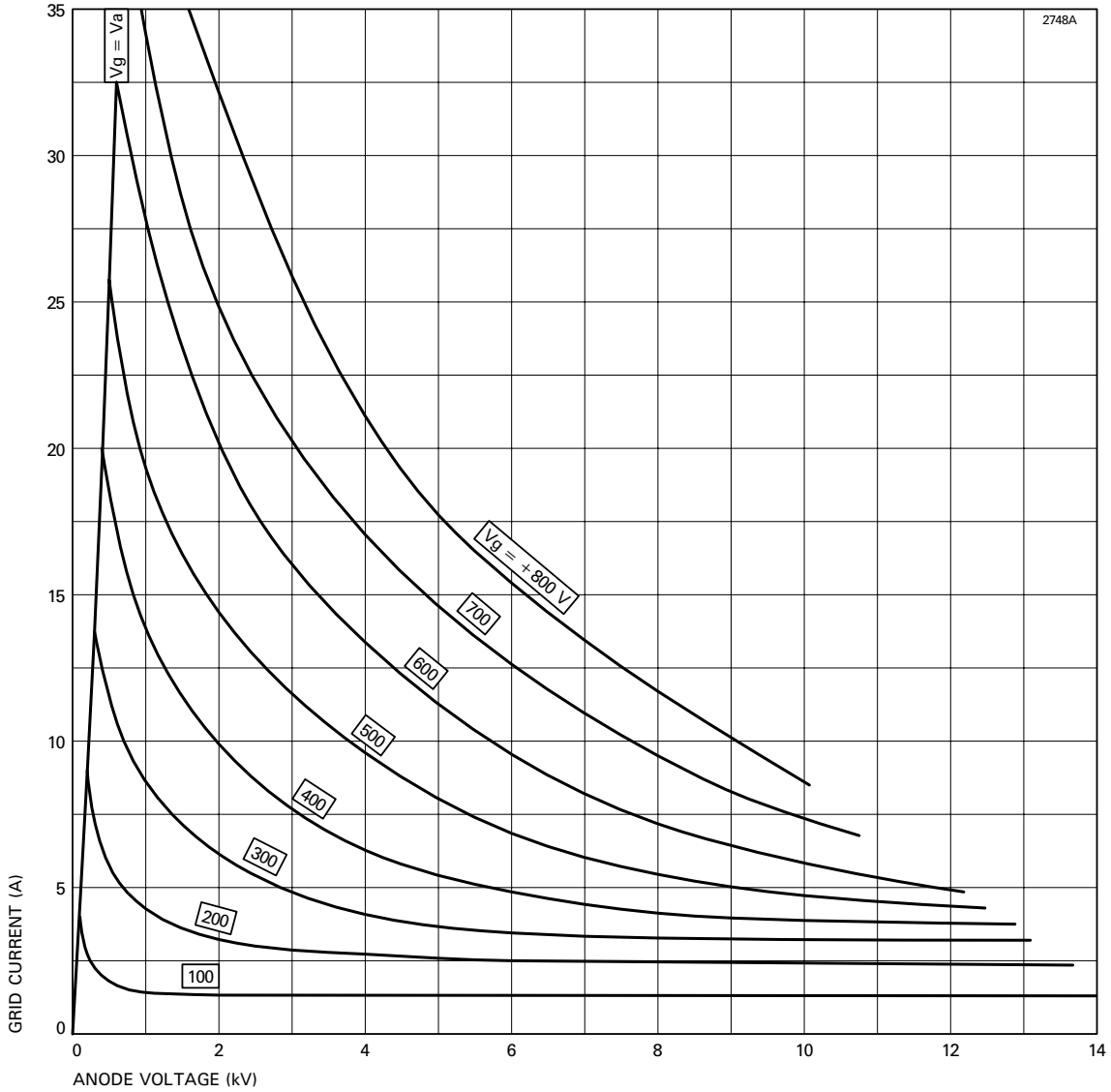
References

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 high power tubes.

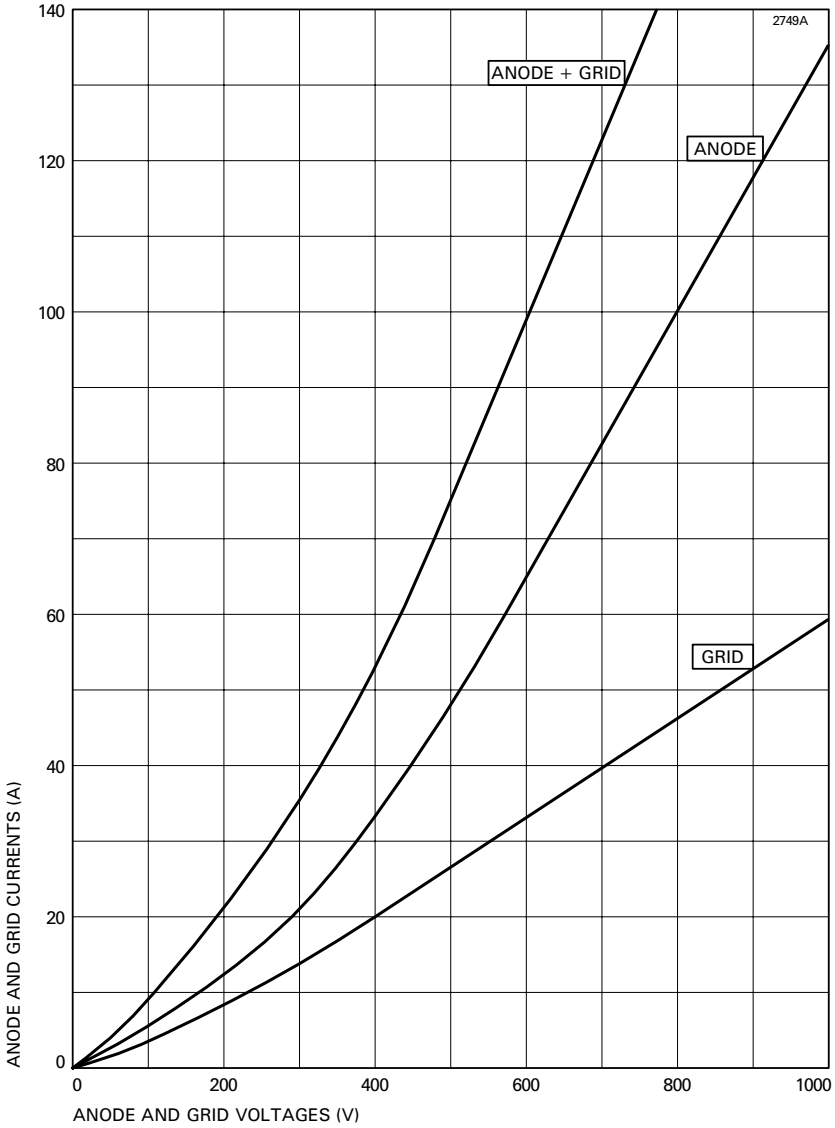
TYPICAL ANODE CHARACTERISTICS



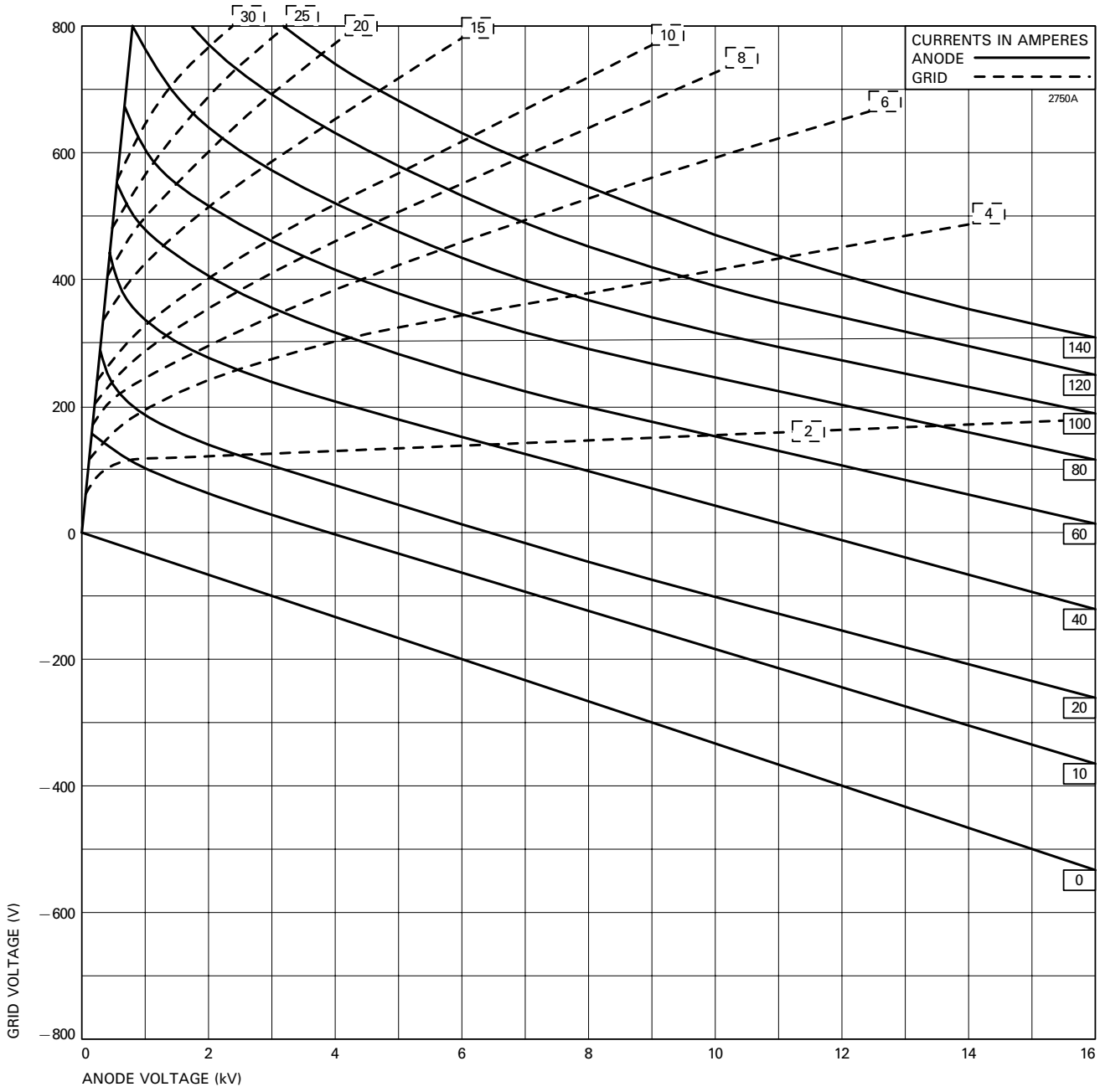
TYPICAL GRID CHARACTERISTICS



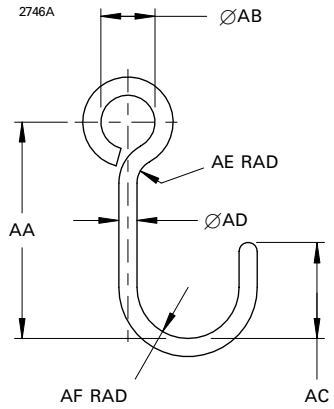
TYPICAL STRAPPED CHARACTERISTICS



TYPICAL CONSTANT CURRENT CHARACTERISTICS

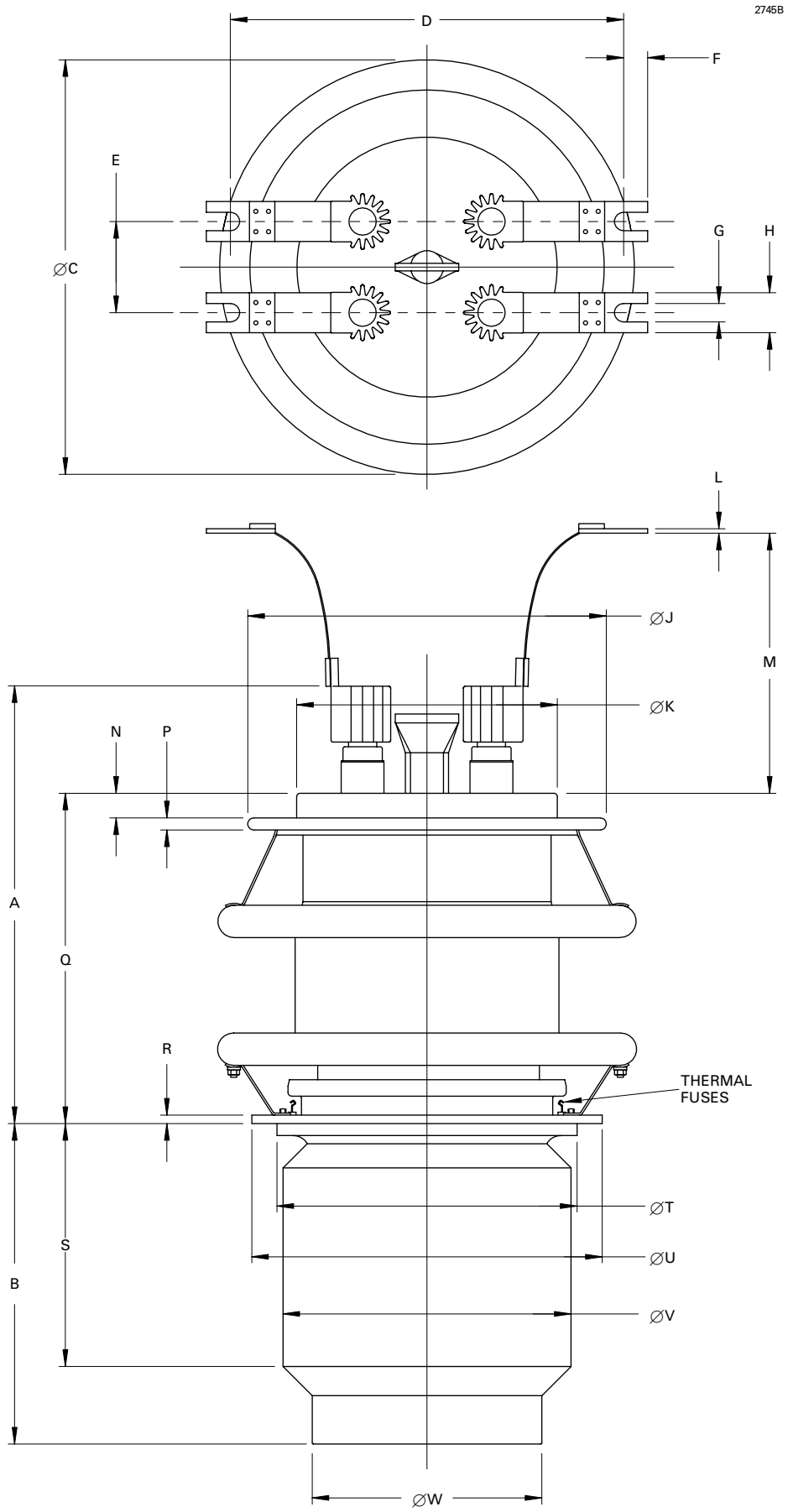


LIFTING HOOK



Ref	Millimetres
AA	57.2
AB	14.3
AC	25.4
AD	4.8
AE	6.4
AF	13.5

OUTLINE (All dimensions without limits are nominal)



Ref	Millimetres
A	350.5 max
B	258.7 max
C	331.8 max
D	309.9
E	71.8
F	19.0
G	14.5
H	31.5
J	282.6 ± 1.6
K	205.4 ± 0.8
L	3.15
M	138.0
N	19.0 min
P	9.5 ± 0.8
Q	259.50 ± 6.4
R	6.35 ± 0.80
S	197.6 max
T	236.5 ± 0.4
U	276.2 ± 0.8
V	228.6 max
W	181.0 ± 1.6