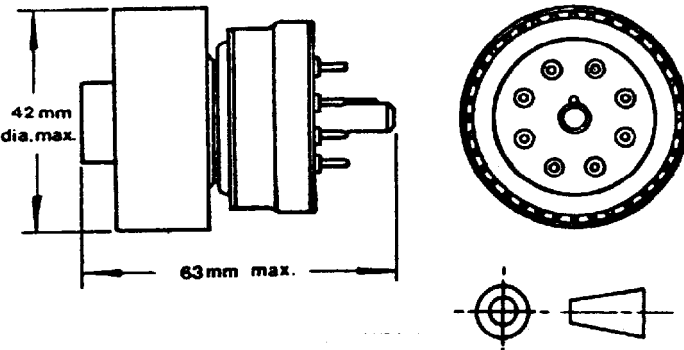


BRITISH STANDARDS INSTITUTION 2, PARK STREET LONDON W1A 2BS	BS CECC 45 003-002 BS CECC 45 003-003
Specification available from : AS SHOWN IN PD 9002, CECC 00 200 AND STC DEFENCE SYSTEMS, ELECTRON TUBES DIVISION, BRIXHAM ROAD, PAIGNTON, DEVON TQ4 7BE.	ISSUE 3 JANUARY 1987  PAGE 1 OF 27 PAGES
ELECTRONIC COMPONENTS OF ASSESSED QUALITY DETAIL SPECIFICATION IN ACCORDANCE WITH BS CECC 45 000 : 1977	MANUFACTURER'S TYPE NUMBER 002 TYPE - 4CX250B 003 TYPE - 4CX250BM SEE PD 9002 AND CECC 00 200
Outline and dimensions THIRD ANGLE PROJECTION DIMENSIONS AND BASE CONNECTIONS SEE APPENDIX A  Marking information SEE 2.2	For ordering information see 2.3 UHF POWER TETRODE 250 W, 500 MHz FORCED AIR COOLED INTEGRAL FINNED EXTERNAL ANODE CERAMIC ENVELOPE B8F BASE FULL ASSESSMENT

1. RATINGS (NOT FOR INSPECTION PURPOSES)

Ratings are limiting values, and absolute, in accordance with IEC 134.

1.1 ELECTRICAL	MINIMUM	MAXIMUM	UNIT
Heater voltage: Up to 300 MHz 301 to 400 MHz 401 to 500 MHz	5.7 5.5 5.4	6.3 6.0 5.8	V V V
Operating frequency at full input	-	500	MHz
Frequency capability at 70 % (Class C) conversion efficiency	-	300	MHz
Anode dissipation	-	250	W
Anode current	-	250	mA
Anode voltage	-	2000	V
Screen grid voltage	-	400	V
Screen grid dissipation	-	12	W
Grid negative voltage	-	-250	V
Grid dissipation	-	2	W

/PHYSICAL

Refer to Qualified Products List PD 9002 and/or CECC 00 200 for details of manufacturers approved to this specification.

Documents

Document Sharing Hub

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1.2 PHYSICAL

	MINIMUM	NOMINAL	MAXIMUM	UNIT
Dimensioned drawing	See Appendix A			
Mass	-	140	-	g
Mounting position	-	ANY	-	
Air coolant flow at sea level	0.11	-	-	m ³ /min
Air coolant flow at 3000 m	0.17	-	-	m ³ /min
Coolant pressure drop at 0.11 m ³ /min	-	90	-	N/m ²
Air pressure (reduced)	68.9	-	-	kN/m ²
Seal and anode core temperatures	-	-	250	°C
Shock:				
Peak acceleration (operating)	-	-	245	m/s ²
Duration	-	-	5	ms
Peak acceleration (non-operating)	-	-	735	m/s ²
Duration	-	-	5	ms
Vibration:				
Acceleration (non-operating)	-	-	19.6	m/s ²
Frequency range	55	-	500	Hz

2. Supplementary Information

2.1 Related Documents

CECC 00 006	Basic Specification: Environmental test procedures.
CECC 00 007	Basic Specification: Sampling plans and procedures for inspection by attributes.
CECC 00 100	Basic Rules.
CECC 00 107	RP7: Quality assessment procedures.
CECC 00 200	Qualified Products List.
CECC 45 000	Generic Specification: Space-charge Controlled Tubes.
IEC 68	Basic environmental testing procedures (see CECC 00 006).
IEC 134	Rating systems for electronic tubes and valves and analogous semiconductor devices.
IEC 151	Measurement of the electrical properties of electronic tubes and valves.
-0	Precautions relating to methods of measurement of electronic tubes and valves.
-1	Measurement of electrode current.
-2	Measurement of heater or filament current.
-11	Methods of measurement of radio-frequency output power.
-12	Methods of measuring electrode resistance, transconductance, amplification factor, conversion resistance and conversion transconductance.
-13	Methods of measurement of emission current from hot cathodes for high-vacuum electronic tubes and valves.
-15	Methods of measurement of spurious and unwanted electrode currents.
IEC 235	Measurement of the electrical properties of microwave tubes.
-1	Terminology.
-2	General measurements.
-3	Disc seal tubes.

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IEC 410 Sampling plans and procedures for inspection by attributes
(see CECC 00 007).

PD 9002 Qualified Products List for electronic components of
assessed quality.

Drawing List The air system socket and test cavity drawing list is shown
in FIGURE 7.1 and DL BS 9011 F001 and F002.

2.2 Marking

The following shall be marked on the tube in the following order of
precedence as space permits. All this information shall appear on the
primary pack:

- a) Type designation.
- b) BS CECC 45 003-002 or BS CECC 45 003-003
- c) Date code and factory identification code.
- d) Manufacturer's name or trademark.
- e) NATO Stock Number.
- f) Mark of conformity unless a certificate of conformity is used.

2.3 Ordering

Orders for tubes shall contain the following minimum information:

- a) The number, issue and date of detail specification.
- b) The type designation number.
- c) NATO Stock Number.
- d) The quantity required.

2.4 Certified Test Records

Not Applicable.

2.5 Structural Similarity

Not Applicable.

3. Delayed Delivery

Each tube held for a period exceeding 12 months following quality
conformance inspection shall be re-examined before delivery by the
following tests:

1. Negative control grid current
2. Pulse emission

4. DATA (not for inspection
purposes)

4.1 General and Mechanical

Dimensioned drawing

Mass

Mounting position

Air coolant flow at sea level

Air coolant flow at 3000 m

Coolant pressure drop at
0.11 m³/min

Air pressure (reduced)

Seal and anode core temperatures

Shock:

Peak acceleration (operating)

Duration

Peak acceleration (non-operating)

Duration

Vibration: (non-operating)

Acceleration

Frequency range

4.2 Electrical Characteristics

(Nominal values)

Capacitance: Input

Output

Anode - Grid 1

Inner u at $V_a = 1000$ V;

$$V_{g2} = 300 \text{ V}, I_a = 150 \text{ mA}$$

Mutal conductance at $V_a = 500 \text{ V}$

$$V_{g2} = 250 \text{ V}, I_a = 200 \text{ mA}$$

Characteristic Curves

SYMBOL	LIMITS			UNIT	NOTE
	MIN	NOM	MAX		
	See Appendix A				
	-	140	-	g	1
	-	ANY	-	-	
	0.11	-	-	m ³ /min	
	0.17	-	-	m ³ /min	
	-	90	-	N/m ²	
	68.9			kN/m ²	2
	-	-	250	°C	
	-	-	245	m/s ²	
	-	-	5	ms	
	-	-	735	m/s ²	
	-	-	5	ms	
	-	-	19.6	m/s ²	
	55	-	500	Hz	
Cin	-	15.7	-	pF	
Cout	-	4.5	-	pF	
Ca-G1	-	0.035	-	pF	
ug1-g2	-	5	-	-	
gm	-	12	-	mA/V	
	See Appendix B				

4.3 Electrical Limiting Values

Absolute maximum rating
system in accordance with
IEC 134

Minimum heater warm-up time
Maximum heater surge current
Limiting value of heater current
for nominal value of heater
voltage
Maximum control grid current
with 50 ohm resistor
Maximum control grid external
resistance
Maximum peak voltage heater to
cathode $\pm$ ve

Heater voltage:

Up to 300 MHz
301 - 400 MHz
401 - 500 MHz

Operating frequency at full input
Frequency capability at 70 %
(Class C) conversion efficiency
Maximum anode voltage d.c.
Maximum screen voltage d.c.
Maximum negative control grid
voltage: d.c. at 500 MHz
up to 300 MHz

Maximum mean anode current
Maximum mean cathode current
Maximum peak cathode current
Maximum mean screen grid current
Maximum anode power dissipation
Maximum total control grid
power dissipation
Maximum mean control grid
current
Maximum screen grid power
dissipation

SYMBOL	LIMITS			UNIT	NOTE
	MIN	NOM	MAX		
					3
	30	-	-	s	
	-	-	14.0	A	
	-	-	2.9	A	
	-	-	170	mA	
	-	-	25	k Ω	
	-	-	150	V	
	5.7	-	6.3	V	
	5.5	-	6.0	V	
	5.4	-	5.8	V	
	-	-	500	MHz	
	-	-	300	MHz	
	-	-	2000	kV	
	-	-	400	V	
	-	-	100	V	
	-	-	250	V	
	-	-	250	mA	
	-	-	350	mA	
	-	-	40	A	
	-	-	100	mA	
	-	-	250	W	
	-	-	2	W	
	-	-	70	mA	
	-	-	12	W	

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5. Operating Conditions

1. At class AB1 up to 30 MHz:

$V_a = 1600 \text{ V}$, $V_{g2} = 400 \text{ V}$, $I_a = 100 \text{ mA}$, H.F. drive $I_{g1} = 10 \text{ uA max.}$

2. At class C up to 500 MHz:

$V_a = 2 \text{ kV}$, $V_{g2} = 250 - 300 \text{ V}$, $V_{g1} = -90 \text{ V}$, $I_a = 250 \text{ mA max.}$,
 $I_{g1} = 25 \text{ mA max.}$, $I_{g2} = 30 \text{ mA max.}$, $P_i = 40 \text{ W max.}$

3. Nominal heater voltage:

Up to 300 MHz.....	6.00 V
301 to 400 MHz.....	5.75 V
401 to 500 MHz.....	5.60 V

6. Inspection Requirements

Qualification Approval Procedure

The procedure used is PROCEDURE 2. The use of quality conformance inspection whereby three consecutive lots are subjected to lot-by-lot inspection and one lot (drawn from the three) subjected to periodic inspection.

General Test Conditions (unless otherwise specified) NOTE 3

$V_h = 6.0 \text{ V}$
 $V_a = 1000 \text{ V}$
 $I_a = 150 \text{ mA}$
 $V_{g2} = 300 \text{ V}$
 $V_{g1} = \text{Adjust voltage}$

Cooling conditions see Note 1

Cathode heating time - 2 minutes minimum

GROUP A: LOT BY LOT INSPECTION

Examination or Test	D ND	Ref.in CECC 45 000	Conditions of Test	Symbol	Limits		Unit	IL	AQL %
					Min	Max			
Sub-group: A4 and A5 not applicable									
Sub-group A0 Holding period (72 hours minimum) Post holding tests: Visual examination Negative control grid current Warm-up short circuit	ND		Note 4						
	ND	4.3		-	-	-	-	100%	-
	ND	4.5.2	$V_a = 2 \text{ kV}$ $I_a = 125 \text{ mA}$	$-I_{g1}$	-	15	μA	100%	-
	ND	App. C C1	Except $V_{g1} = -200 \text{ V}$ $V_k = V_{g2} = 0 \text{ V}$ $V_h = 6.3 \text{ V}; t = 120 \text{ s}$	R_{g1-k}	20	-	$\text{M}\Omega$	100%	-
	ND	App. C C1	$V_{g1} = -200 \text{ V}$ $V_k = V_{g2} = 0 \text{ V}$ $V_h = 6.3 \text{ V for } 180 \text{ s}$ $V_h = 0 \text{ for } 180 \text{ s}$ total $t = 360 \text{ s}$ Note 5	R_{g1-k}	20	-	$\text{M}\Omega$	100%	-
Screen grid current (003 - Type 4CX250BM only)	ND	4.5.5		I_{g2}	-7.0	0.0	mA	100%	-

Examination or Test	D	Ref.in CECC 45 000	Conditions of Test	Symbol	Limits		Unit	IL	AQL %
					Min	Max			
<u>Sub-group A1</u>									
Heater current	ND	4.5.1	$V_h = 6.0$ V only	I_h	2.0	2.9	A	II	1%
Anode current	ND	4.5.4	$V_{g1} = -38.0$ V	I_a	95	205	mA	II	1%
Screen grid current (002 - Type 4CX250B only)	ND	4.5.5		I_{g2}	-7.0	3.0	mA	II	1%
Pulse emission (long pulse method)	ND	App. C C2	$V_h = 5.4 : I_k(pk) = 1.5$ A $V_{g1} = -100$ V $V_a = V_{g2} = 250$ V Pulse - square wave $4.5 + 0.5$ ms duration, prf = $11.0 + 1.0$ p.p.s.	I_k	-	200	mA	II	1%
<u>Sub-group A2</u>									
Pulse emission	ND	4.5.7	$V_h = 6.0$ V pulse amplitude = 40 A prf = 50 p.p.s., duration = 2 us	$V_k(pk)$	-	850	V	II	2.5%
R.F. power output	ND	4.5.15	$f = 470$ MHz minimum $I_a = 250$ mA maximum $V_h = 5.5$ V, $V_a = 2$ kV $P_1 = 40$ W max, $V_{g1} = -90$ V $V_{g2} = 250 - 300$ V, $I_{g1} = 25$ mA max $I_{g2} = 30$ mA max Note 6	P_{out}	225	-	W	II	2.5%

Examination or Test	D ND	Ref. in CECC 45 000	Conditions of Test	Symbol	Limits		Unit	IL	AQL %
					Min	Max			
<u>Sub-group A3</u>									
Dimension for interchangeability	ND	4.4	In accordance with Group A dimensions specified in Appendix A		-	-	-	I	2.5%
Insulation of electrodes (leakage current)	ND	4.5.13	Test voltage = 500 V Series resistance = 2.5 MΩ	Ig1g2 Ig1k Ig2k Ig2a	-	50 50 50 50	uA uA uA uA	I	4%
Heater cathode leakage	ND	App. C C3	V _h = 6.0 V V _{hk} = +150 V V _{hk} = -150 V	+Ihk -Ihk	-	150 150	uA uA	I	4%
Current division	ND	App. C C4	V _a = V _{g2} = 250 V, V _h = 6.0 V V _{g1} = -100 V Adjust V _{gk} for I _a = 1.0 A R _{g1} = 23 k Pulse - squarewave 4.5 ± 0.5 ms prf = 11.0 ± 1.0 p.p.s.	Vgk Ig1 Ig2	8 - -	18 200 260	V mA mA	I	4%