

MIL-E-1/1386E(EC)
 20 July 1976
~~SUPERSEDING~~
 MIL-E-1/1386D(NAVY)
 30 July 1970

MILITARY SPECIFICATION SHEET

ELECTRON TUBE, CATHODE RAY

TYPE 4QP2

This specification is approved for use by Naval Electronic Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

The complete requirements for procuring the electron tube described herein shall consist of this document and the latest issue of Specification MIL-E-1.

DESCRIPTION: Flat face, rectangular, electrostatic deflection and focus, post accelerator.

DIMENSIONS AND PIN CONNECTIONS: See figure 1.

ABSOLUTE RATINGS:

Parameter:	Ef	Ec1	Eb1	Eb2	Eb3	ed	Rg
Unit:	V	Vdc	Vdc	Vdc	Vdc	v	Meg
Maximum:	6.9	0	160	650	3,400	200	1.5
Minimum:	5.7	-200	---	---	---	---	---

TEST CONDITIONS: 6.3 Adjust Focus 575 3,000 --- ---

(Cathode reference)
(Notes 1 and 2)

TEST CONDITIONS: 6.3 Adjust Focus --- --- --- ---

(Oscilloscope use) (Ground reference)
(Notes 1 and 2)

ABSOLUTE RATINGS:

Parameter:	Zd	Ehk	Eb3/Eb2	Ek	Egeom	Esd	East	Escn
Unit:	Meg (Note 2)	Vdc	Ratio	Vdc	Vdc	Vdc	Vdc	Vdc
Maximum:	1.0	+180	5.2	---	---	---	---	---
Minimum:	---	-180	---	---	---	---	---	---

TEST CONDITIONS: --- --- --- --- --- --- --- ---

(Cathode reference)
(Notes 1 and 2)

TEST CONDITIONS: --- --- --- -575 Adjust Adjust Adjust 2,425

(Oscilloscope use) (Ground reference)
(Notes 1 and 2)

GENERAL:

Qualification - Required

ⓔ denotes changes

4QP2

METHOD	REQUIREMENT OR TEST	NOTES	CONDITIONS	SYMBOL	LIMITS		UNIT
					MINIMUM	MAXIMUM	
(E)	<u>Qualification inspection</u>						
1027	Temperature cycling	-		---	5	---	Cycles
1141	Pressure (implosion)	-		---	---	---	---
1002	Barometric pressure, reduced	-		---	---	---	---
1026	Low-temperature operation	-		---	-55	---	°C
5111	Vibration	-		---	---	1	mm
5216	Cathode illumination	-		---	---	---	---
1331	Direct-interelectrode capacitance	-	Cathode to all Grid No. 1 to all D1 to D2 D3 to D4 D1 to all D2 to all D3 to all D4 to all	Ck Cg1 C1D2 C3D4 CD1 CD2 CD3 CD4	---	5.3 6.8 2.8 1.0 6.3 6.7 3.8 3.8	pF pF pF pF pF pF pF pF
5101	Neck and bulb alignment (electrostatic types)	-		---	---	---	---
5101	Face tilt	-		---	---	0.080	Inch
5248	Deflection-factor uniformity	8	1D2 3D4	DFU DFU	---	3 3	% %
5256	Magnetization	-		---	---	---	---
---	Shock	9		---	---	---	---
	<u>Quality conformance inspection, part I</u>	12					
5201	Electrode current (anode No. 3)	3		---	---	15	µA
5201	Voltage breakdown	-		---	---	---	---
5201	Voltage breakdown (electrostatic types)	-		---	---	---	---
5206	Gas "cross"	13	Ib3 = 15 µA	---	---	---	---
5101	Angle between traces	-		---	89	91	Degrees
5106	Screen and faceplate blemishes	-		---	---	---	---
5223	Modulation	-	Ib3 = 10 µA	ΔEc1	---	30	Vdc
5226	Line width "A" (electrostatic deflection)	4	Ib3 = 10 µA	---	---	0.75	mm
5226	Line width "B" (electrostatic deflection)	-	Ib3 = 10 µA	---	---	0.80	mm
5231	Spot position (electrostatic deflection)	-	1D2 3D4	---	---	6 8	mm mm
5231	Spot displacement (leakage)	-		---	---	10	mm
5241	Grid cutoff voltage	-		Ec1	-40	-20	Vdc
5246	Focusing voltage at cutoff	-		Eb1	---	180	Vdc
5248	Deflection factor	-	1D2 3D4	DF DF	22.5 13.5	27.5 16.5	Vdc/in. Vdc/in.

METHOD	REQUIREMENT OR TEST	NOTES	CONDITIONS	SYMBOL	LIMITS		UNIT
					MINIMUM	MAXIMUM	
	<u>Quality conformance inspection, part 1</u> -Continued						
5251	Grid No. 1 leakage current	-		---	---	3	μ Adc
5251	Anode No. 1 leakage current	-		---	---	5	μ Adc
5251	Anode No. 2 leakage current	-		---	---	5	μ Adc
---	Geometry adjust	6,10		---	520	595	Vdc
---	Deflection plate shield	7,10	3D4	---	520	595	Vdc
---	Astigmatism adjust	10		---	520	595	Vdc
---	Useful scan	-	1D2 3D4	---	---	2.50 2.25	Inch Inch
---	Pattern distortion	5		---	---	---	---
	<u>Quality conformance inspection, part 2</u>						
1301	Heater current	-	Ec1 = 2 Vdc	If	540	660	mA
5201	Electrode current (anode No. 1)	-		---	-15	+10	μ Adc
5201	Electrode current (cathode)	-	Ib3 = 15 μ A	Ik	---	0.500	mAdc
5101	Base alinement (electrostatic types)	-	+1D2, pin No. 4	---	---	---	---
5101	Side terminal alinement (electrostatic types)	-	+1D2	---	---	---	---
5101	Side terminal and base alinement	-	Pin No. 4	---	---	---	---
1026	High-temperature operation	11		---	---	+70	$^{\circ}$ C
5101	Neck and base alinement (electrostatic types)	-		---	---	---	---
5216	Stray light emission (conventional types)	-	Eb2 = 600 Vdc; Eb3 = 3,400 Vdc	---	---	---	---
5221	Screen	-		---	360	---	cb
5246	Focusing voltage, zero-bias	-		Eb1	40	---	Vdc
5251	Heater-cathode leakage current	-		Ihk	---	10	μ Adc
1101	Secureness of base, cap, or insert	-		---	---	---	---
Ⓔ 1105	Permanence of marking	-		---	---	---	---
	<u>Quality conformance inspection, part 3</u>						
---	Life test	-	Group C; Ib3 = 10 μ Adc; Eb2 = 575 Vdc; Eb3 = 3,000 Vdc	t	500	---	hrs

METHOD	REQUIREMENT OR TEST	NOTES	CONDITIONS	SYMBOL	LIMITS		UNIT
					MINIMUM	MAXIMUM	
---	<u>Quality conformance inspection, part 3</u> -Continued						
---	Life-test end points:						
5226	Line width "A"	-	Ib3 = 10 μ A	---	---	0.75	mm
5226	Line width "B"	-	Ib3 = 10 μ A	---	---	0.80	mm
5223	Modulation	-	Ib3 = 10 μ A	ΔE_c1	---	30	Vdc

NOTES:

- All readings of beam current (Ib3) shall be in addition to the reading obtained for method 5201, anode No. 3 current. For oscilloscope use, the mean potentials of 1D2 and 3D4 with respect to ground shall be zero.
- It is recommended that the deflecting electrode circuit resistance be approximately equal. Higher resistance values up to 5.0 megohms may be used for low-beam current operation.
- With the beam cutoff, the post-accelerator anode (A3) shall draw 15 μ Adc maximum.
- Spot adjusted for least astigmatism.
- With a 2.5- by 2-inch rectangular raster centered on the face of the tube, the raster edge shall not deviate from straight parallel lines by more than 0.040 inch on the left and right edges nor by more than 0.015 inch at the top and bottom.
- The post-accelerator spiral band lower end and the geometry adjust are connected internally. By adjusting the potential on this electrode combination, pin cushion and barrel distortions are minimized.
- Normally operated at accelerator potential, linearity improvements can be obtained in the vertical trace by proper adjustment of deflection plate shield voltage.
- For the 1D2 direction: Divide the axis into five successive 1/2-inch intervals symmetrically located with respect to the geometric center of the tube face. The percentage difference (DFU) between deflection factors of the center interval and any other interval shall not exceed the limit specified.
- The shock testing machine shall be as shown on Drawing 10-T-2145 (See MIL-T-945). The tube may be clamped as in the vibration test, or mounted directly on the shock machine. With test potentials applied, display a circle or raster. Using a hammer-drop height of 6 inches, apply three blows each in directions 1D2, 3D4, and base-to-face. Momentary failure of operation during shock is permissible provided normal operation is resumed after each blow. After shock test, the tube shall meet the initial requirements for light output, deflection factor, spot position, and grid cutoff voltage. In addition, there shall be no evidence of damage to the internal structure.
- Range for oscilloscope use: -55 to +20 Vdc.
- Following temperature stabilization, the tube shall meet requirements under pattern distortion, line-width, and anode No. 3 current; all voltages and settings being those obtained at room temperature with 25 K resistors in series with geometry, shield and astigmatism adjust electrodes.
- The AQL for the combined defectives for quality conformance inspection, part 1 shall be 1.0, inspection level II.
- This test to be performed at the conclusion of the holding period.

User activities:
Navy - AS, OS, MC, CG

Preparing activity:
Navy - EC

Agent:
DSA - ES

(Project 5960-N097)

Ltr	Dimensions in inches with metric equivalents (mm) in parentheses	
	Minimum	Maximum
Quality conformance inspection, part 2		
A	13.312 (338.12)	13.688 (347.68)
B	- - -	3.765 (95.63)
C	1.969 (50.01)	2.031 (51.59)
D	2.250 (57.15)	- - -
E	10.000 (254.00)	10.250 (260.35)
H	1.250 (31.75)	1.500 (38.10)
J	3.219 (81.76)	3.281 (83.34)
K	2.719 (69.06)	2.781 (70.64)
L	- - -	.500 (12.70) Rad.
P	2.719 (69.06)	2.781 (70.64)
Reference dimensions (see note c)		
F	8.500 (215.90)	
G	3.125 (79.38)	
M	.625 (15.88)	
R	5.500 (139.70) Rad.	
S	3.000 (76.20) Rad.	

NOTES:

- a. +1D2 towards pin No. 4.
- b. +3D4 towards pin No. 1.
- c. These dimensions are for information only and are not required for inspection purposes.

FIGURE 1. Outline drawing of electron tube type 4QP2 - Continued.

FOLD

DEPARTMENT OF THE NAVY
NAVAL ELECTRONIC SYSTEMS COMMAND
WASHINGTON, D.C. 20360

POSTAGE AND FEES PAID
NAVY DEPARTMENT
DDO 316

OFFICAL BUSINESS

COMMANDER
NAVAL ELECTRONIC SYSTEMS COMMAND
DEFENSE STANDARDIZATION PROGRAM BRANCH
DEPARTMENT OF THE NAVY
WASHINGTON, D. C. 20360

FOLD

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSALOMB Approval
No. 22-R255

INSTRUCTIONS: The purpose of this form is to solicit beneficial comments which will help achieve procurement of suitable products at reasonable cost and minimum delay, or will otherwise enhance use of the document. DoD contractors, government activities, or manufacturers/vendors who are prospective suppliers of the product are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.

DOCUMENT IDENTIFIER AND TITLE

NAME OF ORGANIZATION AND ADDRESS

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

 DIRECT GOVERNMENT CONTRACT SUBCONTRACT**1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?****A. GIVE PARAGRAPH NUMBER AND WORDING.****B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES****2. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID****3. IS THE DOCUMENT RESTRICTIVE?** YES NO (If "Yes", in what way?)**4. REMARKS**

SUBMITTED BY (Printed or typed name and address - Optional)

TELEPHONE NO.

DATE

DD FORM 1426
1 JAN 72

REPLACES EDITION OF 1 JAN 66 WHICH MAY BE USED

S/N 0102-014-1802