VALVE ELECTRONIC

SERVICES VALVE TEST LABORATORY

CV 3518

Specification AD/CV.3518 incorporating MIL-E-1/136D.

Issue No. 2 dated 4.8.61.

To be read in conjunction with K.1006.

SECURITY	
SPECN.	VALVE
Unclassified	Unclassified

TYPE OF VALVE	Hydrogen thyratron modulator, with hydrogen reservoir.
CATHODE	Unipotential, tied to mid-point of heater.
ENVELOPE	Glass
PROTOTYPE	5948

RATINGS			NOTE
Heater voltage nominal	(V)	6.3	
Heater current nominal	(A)	29	
Max. peak anode voltage	(kV)	25	A
Max. peak inverse anode voltage	(kV)	25	A
Max. peak inverse grid voltage	(V)	650	
Min. trigger voltage	(V)	700	A
Max. peak anode current	(A)	1000	
Max. mean anode current	(A)	1.0	
Max. rate of rise anode current	(A/μS)	5000	
Max. value of product (peak anode volts) x (peak anode current) x prf	(V.A.pps)	9×10^6	
Min. cathode heating time	(mins)	15	
Max. ambient temperature	(°C)	75	
Range of reservoir voltage	(V)	2.5 - 5.5	
Max. reservoir current	(A)	7	

MARKING

See K1001/4.

Additional marking 5948.

BASE

Special - see drawing on page 5.

CONNECTIONS

See diagram on page 5.

TOP CAP

See drawing on page 5.

Similar to BSS.448 ref. CT3.

DIMENSIONS

See drawing on page 5.

MOUNTING POSITION

Vertical, base down.

NOTES

A. For further details see notes 1, 2 and 3 of MIL-E-1/136D.

MIL-E-1/136D
26 December 1956
SUPERSEDING
MIL-E-1/136C
11 March 1955

CV 3518

INDIVIDUAL MILITARY SPECIFICATION SHEET

ELECTRON TUBE, THYRATRON, WITH HYDROGEN RESERVOIR

JAN-5948

This specification sheet forms a part of the latest issue of Military Specification MIL-E-1.

Ratings: Absolute	Ef Vac	epy kv	epx kv	Ebb kVdc	egy v	egx v	Ec Vdc	ib a	Ib Adc	prr pps	Pb ---	dik dt a/us	tk sec	Reservoir, Ef Vac	TA °C	Alt ft	Cooling
Maximum:	6.3 ± 7.5%	25.0 Note 1	25.0 Note 2	---	---	650	---	1000	1.0	---	9.0×10^9	5000	---	5.5 Note 4	475	10000	Note 5
Minimum:	---	10.0	5% epy	5.0	Note 3	---	---	---	---	---	---	---	900	2.5	-90	---	---
Test Cond.:	6.3	25.0	---	---	550	---	0	---	---	360	---	---	900	Note 6	---	---	---

**Cathode: Unipotential, tied to midpoint of heater

**Base: Per Outline; see Fig. 2. Metal shell base with mounting flange and low-loss Phenolic wafer insert; flange shall be secured to base with rivets or equivalent.

**Leads: Per Outline. Flexible leads 5-1/2 ± 1/2 long from bottom of base insert to center of lead lug hole.

The Grid lead shall be provided with Insulation Sleeving H-A-1 of the MIL-I-3190, and all other leads with H-A-1 or H-B-1.

All feed-through fittings equipped with set screws or equivalent, to secure leads. Lug shall be permanently identified with symbols: G, Grid; K, Cathode; H, Heater; R, Reservoir; H.R, Heater and Reservoir leads, internally connected. The common Heater-Reservoir leads shall be permanently identified with the symbol H-R. See Figure 3.

The leads shall have the following colors: Grid, green; Heater, yellow; Cathode, black; Reservoirs, red; Heater, yellow with black sleeve (internally connected to Reservoirs); Reservoirs, red with yellow sleeve (internally connected to one end of the Heater).

Identification should also be stamped on insert at feed-through points.

*Height: 15-1/4 in. min, 16-1/4 in. max

*Diameter: 5-1/8 in. maximum

**Cap: Per Outline

Mounting Position: Vertical only, base down

**Envelope: Per Outline

The following tests shall be performed:

For miscellaneous requirements, see Paragraph 3.3, Inspection Instructions for Electron Tubes.

Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Sym.	LIMITS Min.	LAL	Bogie	UAL	Max.	ALD	Units
	Qualification Approval Tests											
3.1	Qualification Approval:	Required for JAN Marking	---	---								
---	Cathode:	Unipotential, tied to midpoint of heater	---	---								
3.4.3	Base Connections:		---	---								
---	Operation (3):	TA=75°C; t=5.0hr; Notes 7, 8	---	---								
	Measurements Acceptance Tests, Part 1: Note 9											
4.5	Holding Period:	t=96 hours	---	---	---	---	---	---	---	---	---	---
4.10.8	Cathode Heater Current:		0.65	II	If:	25.0	---	---	---	33.0	---	Aac
4.10.8	Reservoir Heater Current:	Eres=4.5Vac	0.65	II	Ires:	3.0	---	---	---	6.0	---	Aac
---	†Instantaneous Starting:	epy=18kv(min); Notes 7, 10	0.65	II	---	---	---	---	---	---	---	

Z.21795

CV 3518

Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Sym.	LIMITS Min.	LAL	Bogie	UAL	Max.	ALD	Units
	Measurements Acceptance Tests, Part 1: Note 9 (Contd)											
4.10.17.2	DC Anode Voltage:	Notes 7, 11	0.65	II	Ebb;	---	---	---	---	4000	---	Vdc
---	†Operation (1):	epy=27.5kv; Notes 7, 8	0.65	II	egy:	---	---	---	---	550	---	v
---	Reservoir Voltage (1):	Operation (1); Note 12	0.65	II	Eres:	2.5	---	---	---	5.5	---	Vac
---	Operation (2):	epy=15kv; prr=1500pps; Notes 8, 13	0.65	II	egy:	---	---	---	---	550	---	v
---	Reservoir Voltage (2):	Operation (2)	0.65	II	Eres:	2.5	---	---	---	5.5	---	Vac
---	Emission:	ik=1500a; tp=5.0us ±10%; ppr=60pps±10% tr=0.5us max; Note 14	0.65	II	egk:	---	---	---	---	400	---	v
	Measurements Acceptance Tests, Part 2											
---	Anode Delay Time:	Operation (1); t=120; Note 15	6.5	II	tad:	---	---	---	---	1.0	---	us
---	Anode Delay Time Drift:	Anode Delay Time; Note 16	6.5	II	Δtad:	---	---	---	---	0.25	---	us
	Time Jitter:	Operation (1) except epy=8kv; Note 17	6.5	II	tj:	---	---	---	---	0.01	---	us

Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Allowable Defectives per Characteristic 1st Sample	Combined Samples	Sym.	LIMITS Min.	Max.	Units
	Acceptance Life Tests									
4.11	Life Test (1):	Group C; Notes 7, 18	---	---	---	---	t:	500	---	hrs
4.11	Life Test (2):	Group C; Operation (2); Notes 18, 19	---	---	---	---	t:	500	---	hrs
4.11.4	Life Tests (1) and (2) End Points:	Operation (1) except Note 8	---	---	---	---	egy:	---	650	v
		DC Anode Voltage	---	---	---	---	Ebb:	---	4500	Vdc
		Time Jitter	---	---	---	---	tj:	---	0.02	us
	Packaging Requirements									
4.9.18.1.6	Container Drop:	(i) Package Group 4; Container Size H								

Note 1 : Instantaneous starting is not recommended. When it is absolutely necessary, however, the maximum permissible epy is 18.0kv and shall not be attained in less than 0.04 seconds.

Note 2 : In pulsed operation, the peak inverse voltage, exclusive of a spike of .05us maximum duration, shall not exceed 5.0kv during the first 25us following the anode pulse.

Note 3 : The Driver pulse, measured at tube socket with thyratron grid disconnected: 700 volts minimum, 1000 volts maximum; tr=0.35us maximum; grid pulse duration 2.0us minimum. Impedance of drive circuit 50 to 200 ohms.

Note 4 : The optimum reservoir voltage for operation in accordance with Operation (1) conditions is inscribed on the base of the tube and must be held to within ±5%. Applications involving other operating conditions will necessitate the redetermination of the optimum reservoir voltage.

Note 5 : Cooling of the anode lead is permissible, but there shall be no air blast directly on the bulb.

Note 6 : Adjust reservoir voltage to value indicated on tube within ±5%

Note 7 : The tube shall be tested in the test circuit shown in Fig. 1. Tests performed at repetition rates less than the resonant rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen under resonant charging conditions so that: epy=25 kv; ib=1000a minimum; $\frac{(dik)}{dt}$ = 5000a/us minimum; tp=2.5±0.25us; prr=500pps minimum.

Warning: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltage and repetition rates for each test are specified in the conventional manner under the particular conditions or under the general test conditions, as the case may be.

Grid pulse as measured at tube socket with thyratron grid disconnected shall have the following conditions: tr=.35us minimum; tp=2.0us maximum. The internal impedance of driver shall be 250 ohms minimum.

The tube shall operate continuously for 30 minutes without evidence of arcback.

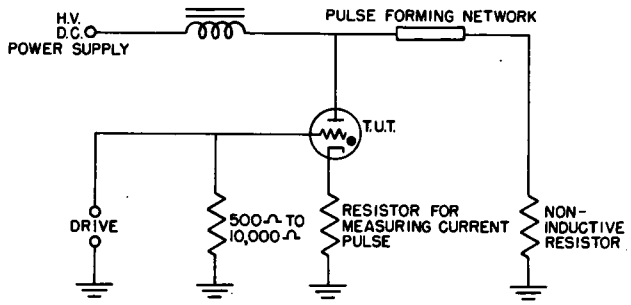


Fig. 1

Note 8 : There shall be no evidence of anode heating during this test.

Note 9 : The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding Mechanical, shall be one percent. A tube having one or more defects shall be counted as one defective. MIL-STD-105, Inspection Level II, shall apply.

Note 10: This test shall be the first test performed after the holding period. The tube shall operate satisfactorily on push-button starting within 3 attempts when the anode voltage (epy) is applied to the tube under test in such a manner as to rise from 0 to 18kv minimum within 0.03 seconds. (The filter in the rectifier shall be designed so that the epy reaches at least 9kv within 0.015 seconds.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 nor more than 30 seconds. Any tube failing to start within three attempts will be considered a failure.

Note 11: This test shall be conducted within 60 seconds of the Operation (1) test.

Note 12: The optimum reservoir voltage determined by the manufacturer under these conditions shall be inscribed permanently on the base of each tube.

Note 13: The anode circuit constants shall be so chosen that the epy=15kv; ib=500a minimum and rate of rise of current pulse $\frac{(dik)}{dt}$ = 5000a/us minimum, tp=1.3us±10% minimum, prr=1500pps minimum, epx=5.0kv. Grid pulse same as Note 7. Reservoir voltage shall be adjusted to optimum value for these test conditions. The tube shall operate continuously for 20 minutes without evidence of arcback or anode heating.

Note 14: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode not more than 2.5us after the beginning of the current pulse. The average voltage shall not increase after the voltage measurement point. Plate Floating. As an alternate the test may be conducted by connecting the grid to the plate through a one-ohm resistance, applying the positive pulse and reading epk. The limit for this reading will be the same as that for egk in Emission test.

Note 15: Anode delay time (tad): The time interval between the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

Note 16: During interval between 2 minutes and 7 minutes of the Anode Delay Time test, the change in Anode Delay Time (Δtad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.

Note 17: The tube shall be tested by applying a peak forward anode voltage not to exceed that specified in the test conditions for the Time Jitter test immediately after the cathode warm-up period (tk). The variation in firing time (tj) should be measured at 50% of the pulse amplitude and shall not be greater than the amount specified after 60 seconds of operation.

Note 18: During every 96-hour period, the life test shall be shut off for 30 minutes minimum.

Note 19: The reservoir voltage shall be adjusted to the value determined under Operation (2).

Note 20: Referenced specification shall be of the issue in effect on the date of invitation for bids.

CV 3518

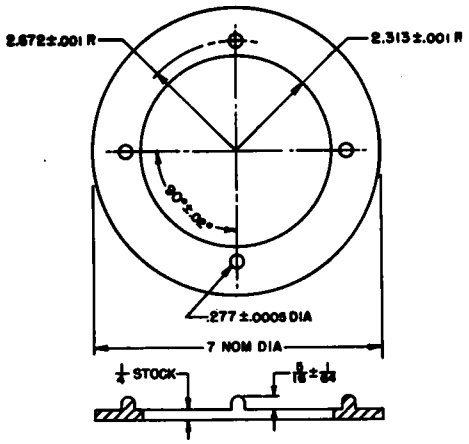
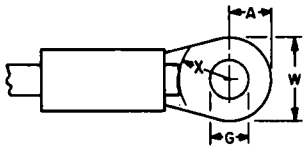


Fig. 2: Base Gage



PRESSURE TYPE LUGS (WITH INSULATING SLEEVES)

LEADS	LUG DESIGNATION	G(inches)	W(inches)	A(inches)	X(inches)
GRID	#10	0.187 to 0.207	0.395 Max.	0.200 Max.	0.275 Min.
RESERVOIR	#10	.187 to .207	.395 Max.	.200 Max.	.275 Min.
CATHODE	1/4"	.260 to .313	.605 Max.	.305 Max.	.380 Min.
HEATER	1/4"	.260 to .313	.605 Max.	.305 Max.	.380 Min.

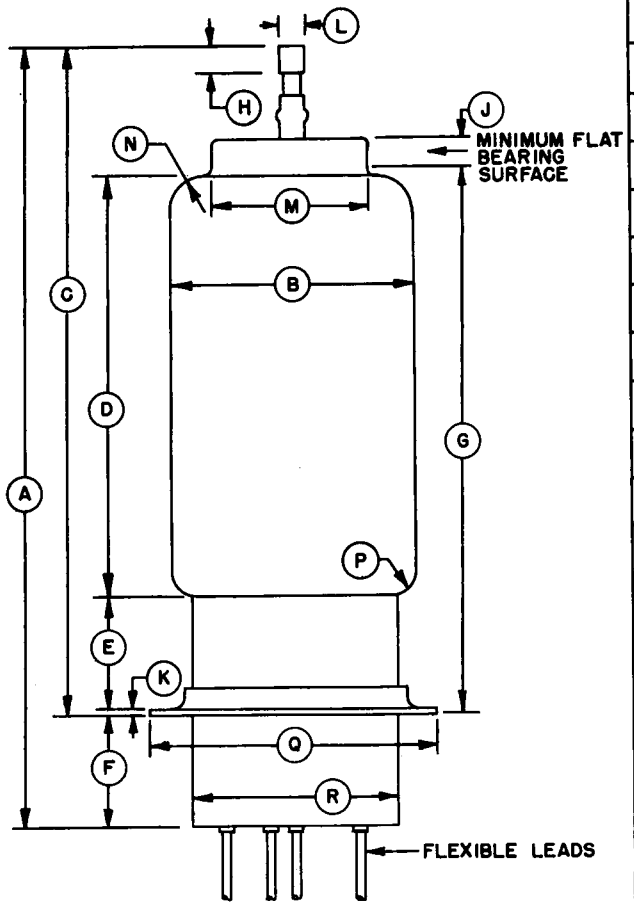
NOTE: There shall be no obstruction within the distance "X" from the center of the lug screw hole.

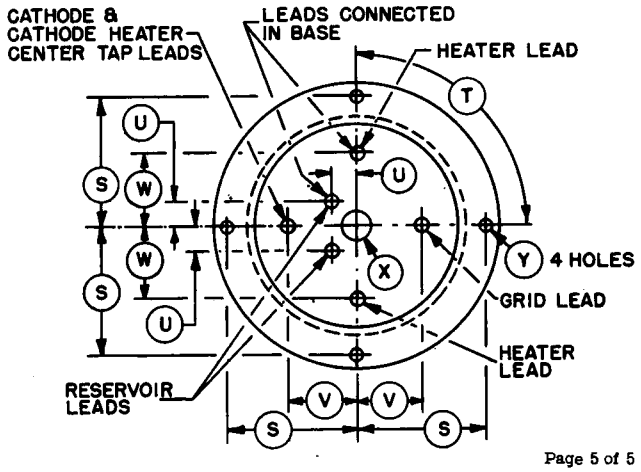
Fig. 3

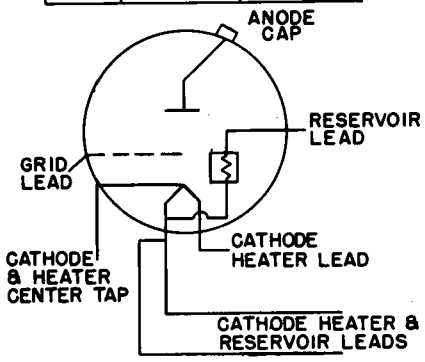
CV 3518

MIL-E-1/136D

REF	DIMENSIONS	
	MIN	MAX
*A	15 1/4	16 1/4
*B	4 7/8 DIA	5 1/8 DIA
*C	13 1/8	13 7/8
**D	7 3/4	8 3/4
**E	2 3/16	2 5/16
*F	2 3/16	2 5/16
**G	10 1/4	11 1/4
**H	.500	
**J	3/4	
**K	3/32 STOCK	
**L	.559 DIA	.573 DIA
*M	3 3/8 DIA	3 5/8 DIA
**N		3/4 R
**P		1/2 R
**Q	5 15/16 DIA	6 1/16 DIA
*R	4 7/16 DIA	4 9/16 DIA
*S	2.662	2.682
**T	89.6°	90.4°
**U	1/2	
**V	1 3/8	
**W	1 1/2	
**X	1/2 NOM DIA (OPTIONAL)	
*Y	.309 DIA	.315 DIA







TAN-5948