VALVE ELECTRONIC **CV4516**

MINISTRY OF AVIATION - D.L.R.D.(T) /R.R.E.

Specification MOA/CV4516

Issue 2 dated 9th April, 1962.

To be read in conjunction with K1001, excluding 5.2., 5.8., BS448 and BS1409

SECURITY

Specification	Valve
Unclassified	Unclassified

TYPE OF VALVE - Reliable Subminiature Gasfilled Voltage Reference Diode with Flying Leads.

CATHODE - Cold

ENVELOPE - Glass

PROTOTYPE - VX8253C, VX9174

MARKING

See K1001/4

BASE

See drawing on page 6

CONNECTIONS

See drawing on page 6

DIMENSIONS

See drawing on page 6

RATINGS (Note A)

(All limiting values are absolute)

			Note
Min. Supply Voltage, Va(b)	(V)	125	B
Max. Cathode Current, Ik	(mA)	5.0	C
Min. Cathode Current, Ik	(mA)	0.5	C
Max. Vibration			
(i) 100 Hours duration Max	(g)	5	D
(ii) 10 Minutes duration Max	(g)	20	D
Max. Shock (short duration)	(g)	500	
Max. Operating Bulb Temperature	(°C)	85	E
Max. Operating Ambient Temperature Range	(°C)	-60/+70	E
Max. Storage Ambient Temperature Range	(°C)	-60/+70	F

Dimensions (mm)	Min.	Max.
A. Seated Height	25.8	28.8
B. Overall Length	-	34.9
C. Diameter	9.3	10.16
D. Lead Length (Note H)	38.1	-

CHARACTERISTICS AND TYPICAL OPERATING CONDITIONS

(At 25±5°C unless otherwise stated)

(Measured with Va(b) = 125V, Ra = 27k ohms)

Nom. Maintaining Voltage, Vm		(V)	84.5	
Optimum Cathode Current, Ik		(mA)	1.5	C
Incremental Resistance	Max.	(Ω)	1200	
	Typical	(Ω)	850	
Temperature Coefficient of Maintaining Voltage				
Tbulb = -60 to +25°C	Max.	(mV/°C)	-10	G
	Typical	(mV/°C)	-5	
Tbulb = +25 to +85°C	Max.	(mV/°C)	-7	
	Typical	(mV/°C)	-3	
Typical Drift in Maintaining Voltage				
0-200 Hours		(V)	+0.2	
200-1000 Hours		(V)	+0.1	
1000-3000 Hours		(V)	±0.05	

MOUNTING POSITION

Any

QUALIFICATION APPROVAL

See K1001/15

Minimum quantity for submission 175

See Note J

APPLICATIONS DATA

Issue 1. See section following page 6

NOTES

See page 2.

NOTES

A. Caution to Electronic Equipment Design Engineers: Special attention should be given to the temperature of valves operated in Guided Weapons and Aircraft. Reliability will be seriously impaired if the maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the valve and will be reduced appreciably if absolute maximum ratings are exceeded.

B. This value, which holds over life, is the minimum required for the valve to ignite either in total darkness or in normal ambient light.

C. For Voltage Reference applications the recommended operating current is between 1.2 and 2mA.

D. The ratings quoted for continuous and short term random vibration, are based on the assumption that the vibration frequency components are varying continuously in a random manner over the band 10-1000 c/s.

E. For greater reliability the operating bulb temperature should be maintained as constant as possible and the higher temperatures should be avoided.

F. In order that the valve shall retain its Maintaining Voltage during prolonged storage, the Maximum Ambient Storage Temperature should not exceed 70°C. The Applications Data include curves showing the effect of high storage temperatures.

G. The bulb temperature is defined as that temperature indicated by a thermometer immersed in a well stirred bath of fluid containing the valve.

H. Direct soldered connections to the leads must be at least 5mm from the seal and any bending of the leads must be at least 1.5mm from the seal.

J. When submitting samples for Qualification Approval, the manufacturer must have drawn the samples from a lot which has met the requirements of the specification. The manufacturer shall supply the Acceptance Test results for that particular lot. The valves submitted shall have been subjected to all the tests in Groups A to D inclusive and be accompanied by detailed results and measurements found on these tests. Sufficient measurements shall be provided on each test to enable the Approving Authority to verify that the quality level is acceptable. Where destructive tests are involved, readings on other samples from the lot should be supplied.

TESTS

CV4516

TO BE PERFORMED IN ADDITION TO THOSE APPLICABLE IN K1001

TESTS IN ANY ONE GROUP (EXCEPT GROUP A) SHALL BE PERFORMED IN THE SPECIFIED ORDER

TEST CONDITIONS - UNLESS OTHERWISE SPECIFIED

Va (b) (V)	Ra (Ω)	Tamb (°C)
125 Note: 1	27000 ± 1%	15 to 30

K1001	TEST	TEST CONDITIONS	AQL %	INSP. LEVEL	SYMBOL	LIMITS MIN.	LAL	BOGEY	UAL	MAX	ALD	UNITS
AIX/2.1	GROUP A	Note: 2										
	Visual Inspection	Notes: 3 & 4		100%								
5.14	Inoperatives			100%								
5G.13	Leakage Current	Va-k = 50V		100%	Ik	-	-	-	-	1	-	μA
5G.1.1	Striking Time (1)	Note: 5		100%	t	-	-	-	-	500	-	ms
	Vibration Noise (1)	Acceleration = 15g Peak Min. Frequency = 50 c/s Notes: 4 & 6		100%	Vout	-	-	-	-	25	-	mV pk-pk
AIX/2.2		Note 7										
AIX/2.3												
	GROUP B											
5G.1.1	Striking Time (2)	Note: 5	0.4	II	t	-	-	-	-	500	-	ms
5G.2				V2	t	-	-	-	10	-	-	ms
5G.3	Maintaining Voltage (1)		0.4	II	Vm	83.7	-	84.5	-	85.3	-	V
				V2	Vm		84.1	-	84.9	-	0.60	V
5G.3	Maintaining Voltage (2)	Ik = 5mA	0.4	II	Vm	-	-	-	-	89.5	-	V
				V2	Vm	-	-	-	88.6	-	0.90	V
5G.4	Regulation (1)	Ik changed from 1 to 2mA Ra = 5kΩ Min.	0.4	II	ΔVm	-	-	-	-	1.2	-	V
				V2	ΔVm	-	-	-	0.90	-	0.30	V
5G.7	Voltage Jumps (1)	Ik varied from 1.2 to 5mA. Notes: 8 & 9	0.4	II		-	-	-	-	8	-	mV peak
	GROUP C											
5G.7	Voltage Jumps (2)	Ik varied from 0.5 to 5mA Notes: 8 & 9	2.5	I		-	-	-	-	50	-	mV peak
5G.4	Regulation (2)	Ik changed from 0.5 to 5mA.	1.0	I	ΔVm	-	-	-	-	5.0	-	V
	GROUP D											
5G.6	Oscillation (Q/A Only)	Ik varied from 1.2 to 5mA Ra = 5000Ω Notes 8 & 10				-	-	-	-	2	-	mV pk-pk
5G.10	Temperature Coefficient (1)	Tbulb = +25°C & +85°C Note: 11	2.5	Code G		0	-	-	-	-7	-	mV/°C
5G.10	Temperature Coefficient (2) (Q/A Only)	Tbulb = -60 to +25°C Note: 11				0	-	-	-	-10	-	mV/°C
	Operation at Reduced Temperature (Q/A Only)	Tbulb = -60°C Notes: 11 & 12										
	Performance Tests											
5G.1.1	Striking Time (1)	Note 5			t	-	-	-	-	500	-	ms
5G.3	Maintaining Voltage (1)				Vm	83.7	-	-	-	86.1	-	V
5G.4	Regulation (1)	As in Group B			ΔVm	-	-	-	-	1.3	-	V

K1001	TEST	TEST CONDITIONS	AQL %	INSP LEVEL	SYMBOL	LIMITS MIN	LAL	BOGEY	UAL	MAX	ALD	UNITS
	GROUP D cont.											
	Operation at Elevated Temperature (Q/A Only)	Tbulb = +85°C Notes: 11 & 12										
	Performance Tests											
5C.1.1	Striking Time (1)	Note: 5			t	-	-	-	-	500	-	ms
5C.3	Maintaining Voltage (1)				Vm	83.3	-	-	-	85.3	-	V
5C.4	Regulation (1)	As in Group B			ΔVm	-	-	-	-	1.0	-	V
	GROUP E											
AIX/ 2.4.2.3	Lead Fragility	No Voltages	1.5	Code H								
AIX/ 2.4.2.1	Glass Strain	No Voltages Note: 13	2.5	Code G								
	Vibration Noise (2)	As in Group A Note: 6		Code K	Vout	-	-	-	10	-	-	mV pk-pk
	Vibration Fatigue	Acceleration = 5g Peak Min. Time = 200 Hours Note: 14.		Code K								
	Vibration Noise (3)	Acceleration = 20g Peak Min. Frequency:										
		(1) 60 - 120 c/s			Vout	-	-	-		-	-	mV(pk-pk)
		(2) 120 - 250 c/s			Vout	-	-	-		-	-	mV(pk-pk)
		(3) 250 - 500 c/s			Vout	-	-	-		-	-	mV(pk-pk)
		(4) 500 - 1000 c/s			Vout	-	-	-		-	-	mV(pk-pk)
		(5) 1000 - 2000 c/s Note: 15			Vout	-	-	-		-	-	mV(pk-pk)
	Post Vibration Noise (3) Tests	Combined AQL Note: 16	2.5									
5C.1.1.	Striking Time (1)	Note: 5	0.4		t	-	-	-	-	500	-	ms
5C.3	Change in Maintaining Voltage (1)		1.0		ΔVm	-	-	-	-	1.0	-	V
5C.4	Regulation (1)	As in Group B	1.5		ΔVm	-	-	-	-	1.2	-	V
	Vibration Noise (1)	As in Group A. Note: 6	0.4		Vout	-	-	-	-	50	-	mV pk-pk
	Catastrophics	Note: 17	0.4									
AIX/ 2.4.2. 4.3.	Shock (Q/A Only)	Hammer Angle = 30° No Voltages										
	Post Shock Tests	As for Post Vibration Noise (3) Tests										
	GROUP F											
AIX/ 2.4.3.	Life											
AVI/5.1	Stability Life											
5C.3	Change in Maintaining Voltage (1)		1.0	I	ΔVm	-	-	-	-	0.2	-	V

K1001	TEST	TEST CONDITIONS	AQL %	INSP. LEVEL	SYMBOL	LIMITS						UNITS
						MIN.	LAL	BOGEY	UAL	MAX	ALD	
	GROUP F cont.											
AVI/5.3	Intermittent Life											
	Test Point 200 Hours	Combined AQL Note: = 16	2.5	Code G								
5.14	Inoperatives											
5G.1.1.	Striking Time (1)	Note: 5			t	-	-	-	-	500	-	ms
5G.3	Change in Maintaining Voltage (1)				Δ Vm	-	-	-	-	0.4	-	V
5G.4	Regulation (1)	As in Group B			Δ Vm	-	-	-	-	1.2		V
	Test Point 1000 Hours	Combined AQL Note: 16	4.0	Code G								
5.14	Inoperatives											
5G.1.1.	Striking Time (1)	Note: 5			t	-	-	-	-	500	-	ms
5G.3	Change in Maintaining Voltage (1)				Δ Vm	-	-	-	-	0.5	-	V
5G.4	Regulation (1)	As in Group B			Δ Vm	-	-	-	-	1.2	-	V
	GROUP G											
AIX/2.5	Electrical Retest after 28 days holding period			100%								
5.14	Inoperatives		0.5									
5G.1.1 5G.2	Striking Time (2)	Note 5			t	-	-	-	-	500	-	ms
5G.3	Maintaining Voltage (1)				Vm	83.5	-	-	-	85.5	-	V
5G.4	Regulation (1)	As in Group B			Δ Vm	-	-	-	-	1.2	-	V

NOTES

1. This voltage is for a nominal current of 1.5mA and shall be suitably adjusted for other current conditions where specified

2. Tests in Group A may be performed in any order.

3. The valve shall be visually inspected for good workmanship using a visual aid having a X10 magnification. Particular attention shall be paid to the following:-
   Structure quality, quality of welds, quality of sputtering, quality of lead tinning, external dimensions and shape, freedom from harmful loose particles.

4. This test may be done alternatively in Group C.

5. A direct voltage of 125 volts shall be applied between the anode and cathode in such a manner that this value is never exceeded. The tube shall ignite within 500 ms of the application of voltage. For Striking Time (1), the test shall be carried out in normal ambient lighting, whilst for Striking Time (2) the test shall be conducted with the valve in total darkness, after it has been held non-conducting for a minimum of 24 hours and in total darkness for at least 1 hour immediately prior to the test.

6. The valve shall be mounted so that the direction of vibration is perpendicular to its axis. The test shall be of sufficient duration to obtain a steady reading of noise output.

7. At this stage the lot shall be formed. It shall be an identifiable lot not exceeding 3200 valves, manufactured in a period not exceeding 20 consecutive working days. Normal sampling (single) shall apply.

8. The measuring equipment is to have a substantially linear frequency response over the range 20 to 50,000 c/s.

9. A calibrated indicator as specified in Note 8 is to be connected between Anode and Cathode. The Anode current is to be varied through the full-rated current range in 10 ± 2 seconds. Where an indicator with persistence of less than 1 second is used, this test shall be performed at least 3 times, but if an indicator with persistence of 1 second or more is used, one sweep is sufficient.

10. Any oscillation which persists over a current range of less than 0.2mA shall be considered to be a voltage jump.

11. The bulb temperature is defined as that temperature indicated by a thermometer immersed in a well stirred bath of fluid in which the valve is operating.

NOTES contd.

12. The valve shall be immersed in a bath of fluid maintained at a temperature such that the bulb temperature stabilises at the specified figure. The performance tests shall be made whilst the bulb is at the specified temperature and between 10 and 15 minutes after immersion.

13. This is a destructive test and valves used for this test will not be accepted for delivery.

14. The valves shall be randomly mounted on the vibrator mount in such a manner that each valve experiences an acceleration of at least 5g peak. The frequency of vibration shall be swept continuously over the range 60-500 c/s at a rate of change of frequency not greater than 1 octave per minute.

15. This test is to be applied to the total sample previously subjected to the Vibration Fatigue test. Each valve shall be mounted so that the direction of vibration is perpendicular to the axis of the valve and shall be vibrated over the frequency range 60 to 2000 c/s, swept once only at a rate of change of frequency not greater than 2 octaves per minute. The voltages to be recorded shall be the values of noise output at the maximum resonance in each of the specified frequency bands, as measured in terms of peak to peak voltage using an approved equipment. **See pages 7 and 8 of CV4504**

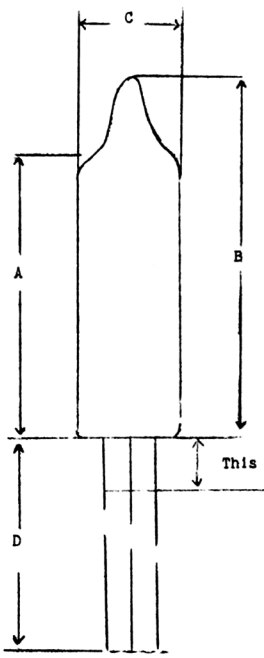
16. In the event of a valve being defective in more than one characteristic, the defect occurring first in the list of tests at that particular test point shall constitute the failure.

17. A valve shall be deemed to be catastrophic if it is either an inoperative as defined in K1001 section 5.14., or has one or both of the following defects:

    (a) Maintaining Voltage (1) outside the limits ± 10% of the bogey given in Group B.

    (b) Vibration Noise output, as measured in Group A, greater than 250mV pk-pk.

Outline

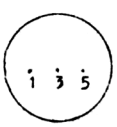


Connections

Lead	Electrode
1	Cathode k
2	Lead omitted
3	Anode a
4	Lead omitted
5	Cathode k

Leads to be of tinned flexible wire 0.45 mm nominal diameter and spaced 2.44 mm nominal between centres. Maximum untinned length 4 mm.

Base



APPLICATIONS DATA

FOR

VALVE TYPE

CV4516

This information is intended for the guidance of users and does not form part of the procurement specification

ISSUE 1 APRIL 1962

ISSUED BY:-

MINISTRY OF AVIATION T.L.5. (B)

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LONDON. W.C.1.

AMENDMENTS

No:	Date	Page

CV4516

CONTENTS

STATISTICAL ASPECTS OF CV4500 SPECIFICATIONS

These test specifications have been drawn up on a statistical basis involving the following considerations:-

1. The use of 100% testing on its own does not, with presently known methods, and with reasonable economy, result in 100% perfect items reaching the customer, because reliability cannot be tested into a product.

2. To control the average and spread of the characteristics of a batch of valves is a better guarantee that the product is under control, than to accept all of a product solely on the basis that the characteristics lie within certain limits. In general it is true to say that a valve which is just inside a limit is neither better nor more reliable than one which is just outside that limit.

3. It may be demonstrated that the main characteristics of valves fairly closely follow normal or log-normal Gaussian distributions.

The inspection of these valves when submitted for acceptance is therefore carried out in two complementary stages.

Acceptance Sampling by Attributes.

Each Attribute sampling test in the specification has two conditions which define the inspection which must be made in order to ensure that the corresponding characteristic meets the required standard. The conditions are:-

(a) The Inspection Level, which defines, directly or indirectly, the size of the sample which must be taken.

(b) The Acceptance Quality Level (AQL), which defines, indirectly, the number of rejects which can be tolerated in the sample.

These conditions also define the Operating Characteristic of the sampling scheme (Page 5), which gives the relationship between the quality of the submitted lot and the probability of its acceptance. In general the levels are so calculated that if lots containing a percentage of rejects equal to the AQL were constantly submitted, then approximately 95% of the lots would be accepted.

It can be seen that the above scheme only defines the permissible percentage of valves outside the specified test limits, and not the distribution of the values of the characteristic within those limits. Theoretically therefore, it would be possible for all the values to lie just within a limit and the product would still be accepted.

To ensure that this situation does not occur on the major electrical characteristics, Variables sampling is introduced.

Acceptance Sampling by Variables

Each Variables sampling test in the specification has one condition which defines the inspection which must be made in order to ensure that the corresponding characteristic meets the required standard. This condition is the Inspection Level, which defines the size of the sample which must be taken.

The sample is divided into groups of five and the required characteristics are recorded. From these results the average value of each characteristic for the whole sample, and the average of the individual ranges for each group of five, are calculated. These values define the location and the dispersion of the characteristic distribution, respectively. The average must lie between the Lower Acceptance Limit (LAL) and the Upper Acceptance Limit (UAL), and the average range must not exceed the Acceptance Limit for Dispersion (ALD)

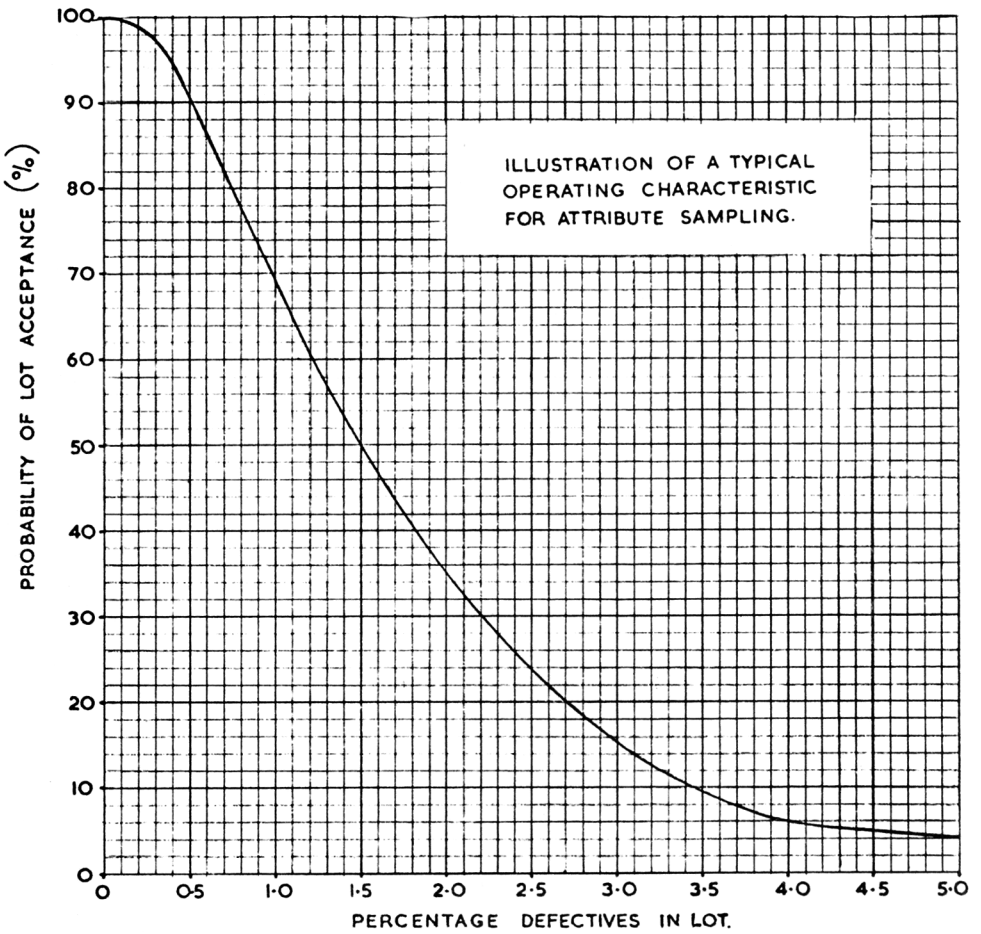
Illustrations of the limiting distributions for this valve, which would be just accepted by the above controls, are given on pages 6 and 7. These show normal curves with the maximum permissible spread allowed by the ALD, centred on the LAL and UAL, respectively, and the maximum spread distributions, centred on the bogey value.

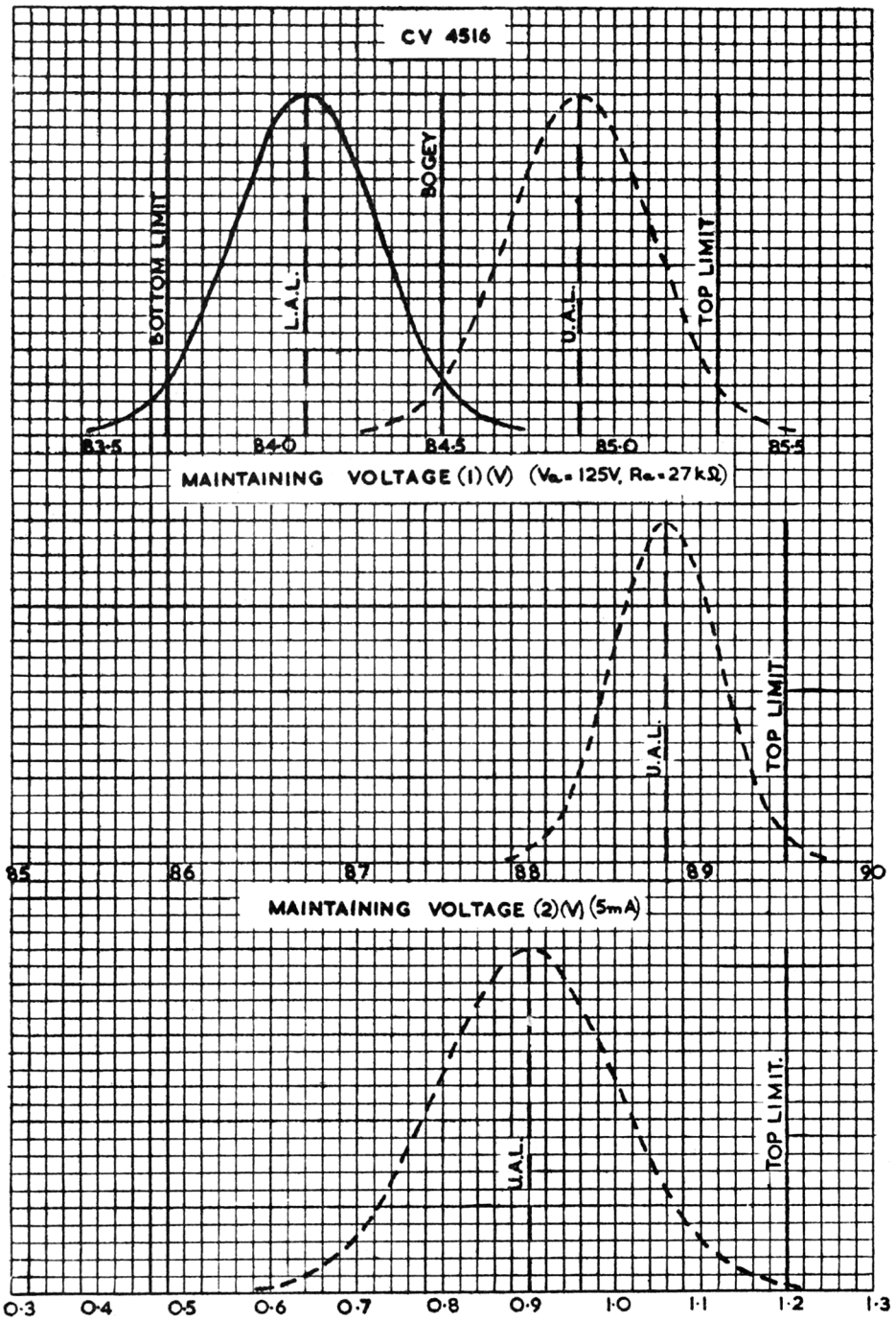
For further details of sampling inspection procedures for Attributes and Variables, reference should be made to K1001, Appendix XI, and MIL Standard 105A, Sampling Procedures and Tables for Inspection by Attributes.

Typical Operating Characteristic

The following curve gives a typical Operating Characteristic for:-

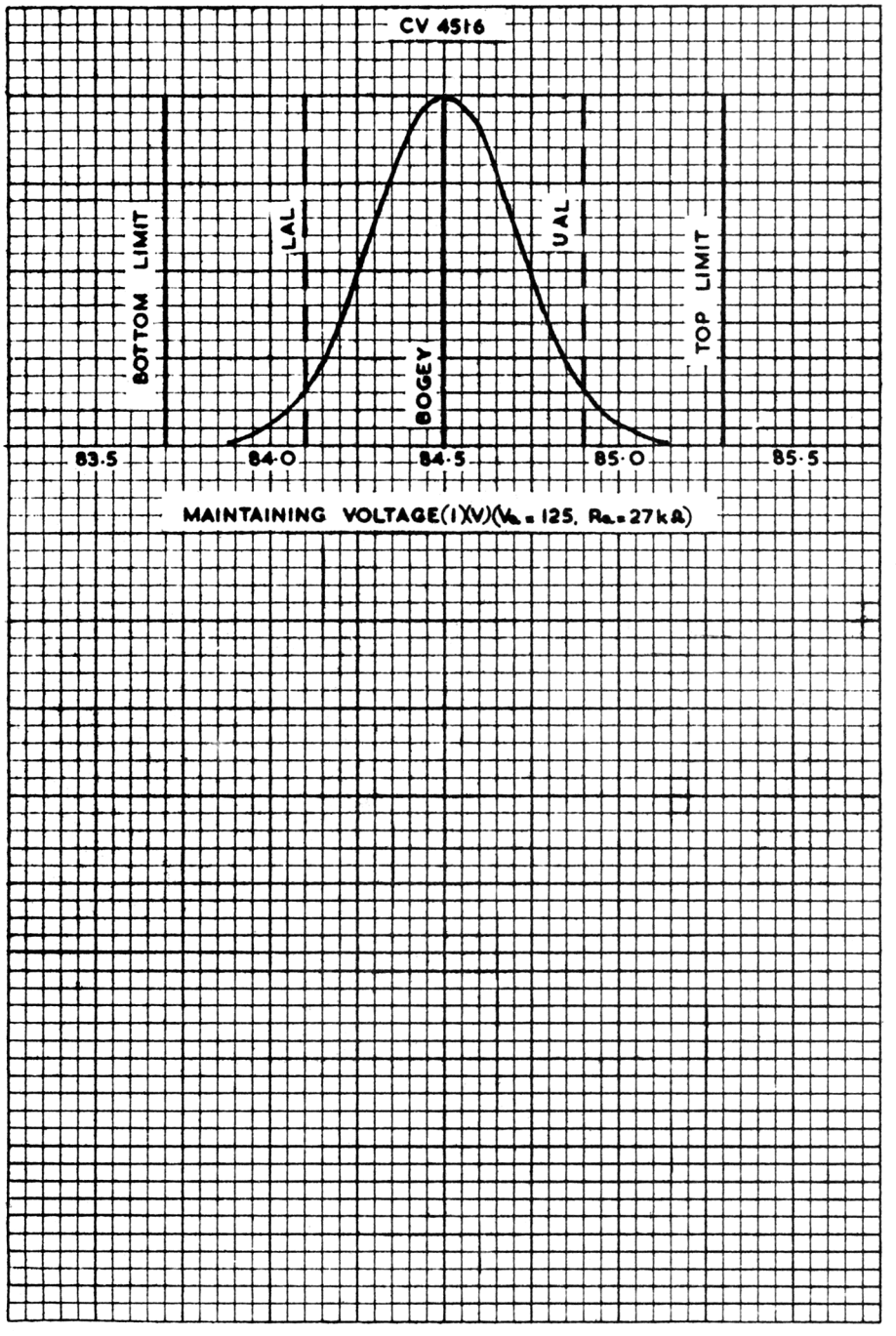
Lot Size of between 801 and 1300
Inspection Level II (Code Letter K, Sample size 110)
An AQL of 0.65% (Accept on 1, reject on 2)



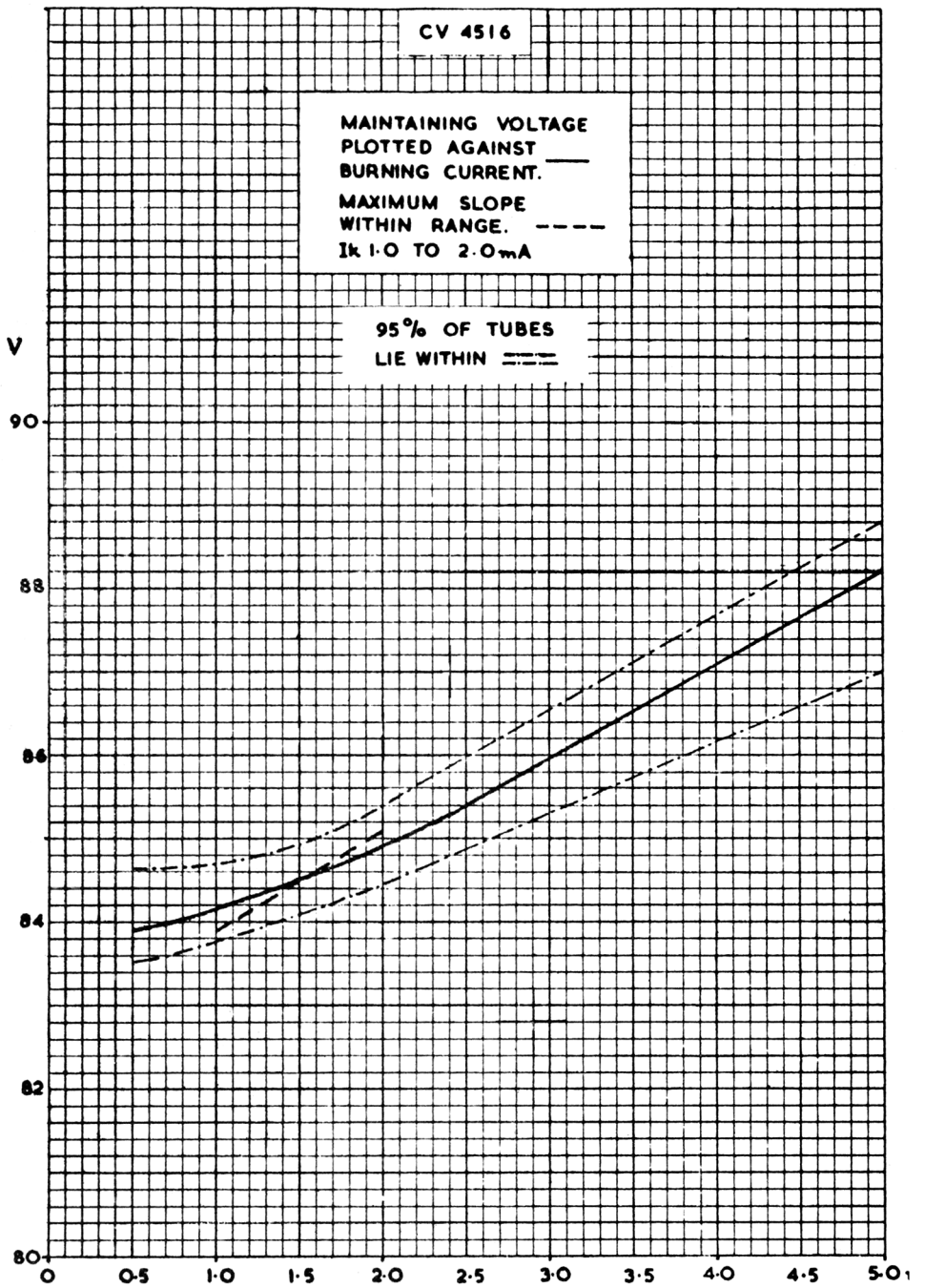


LIMITING DISTRIBUTIONS OF MAJOR CHARACTERISTICS

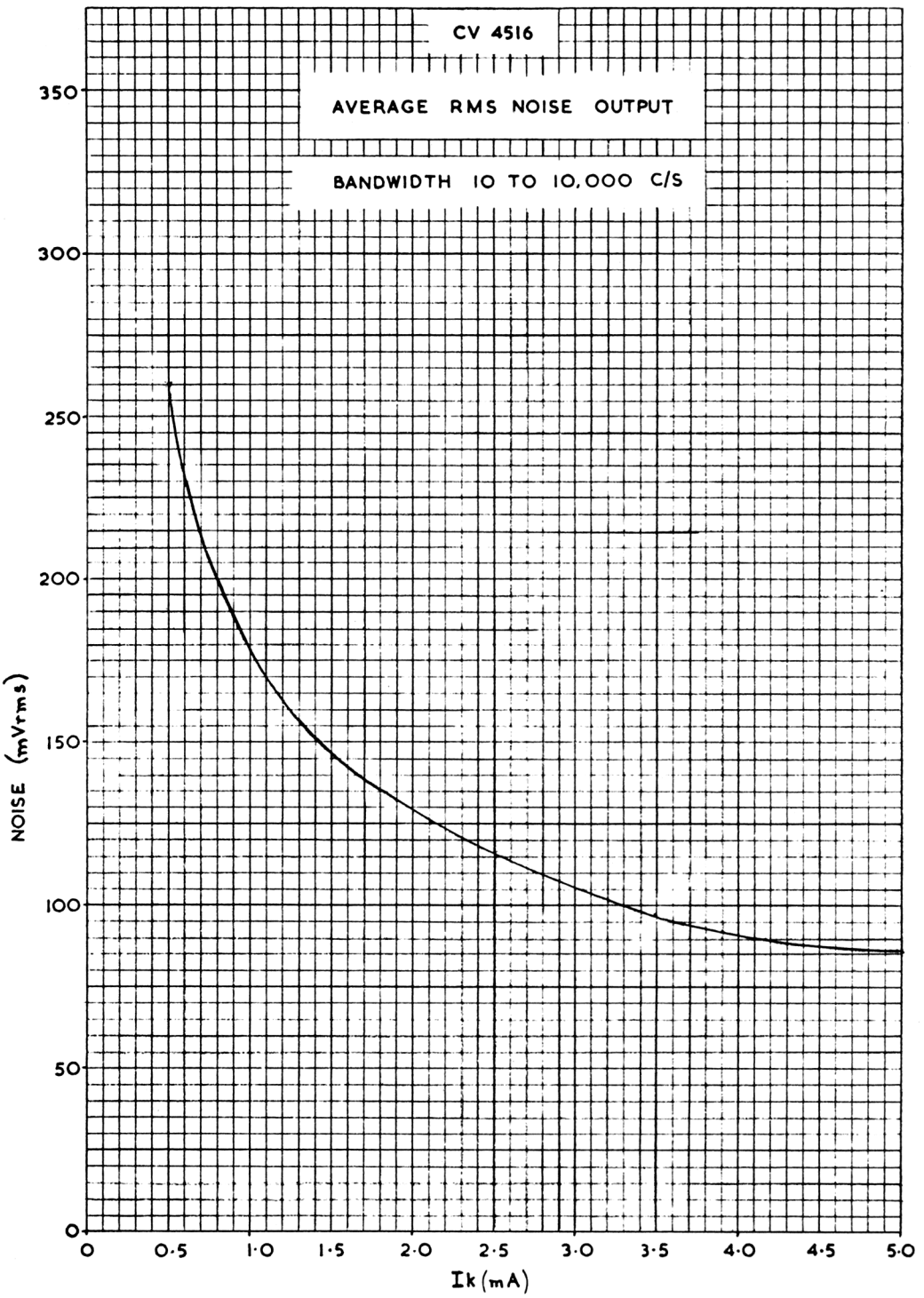
CV4516

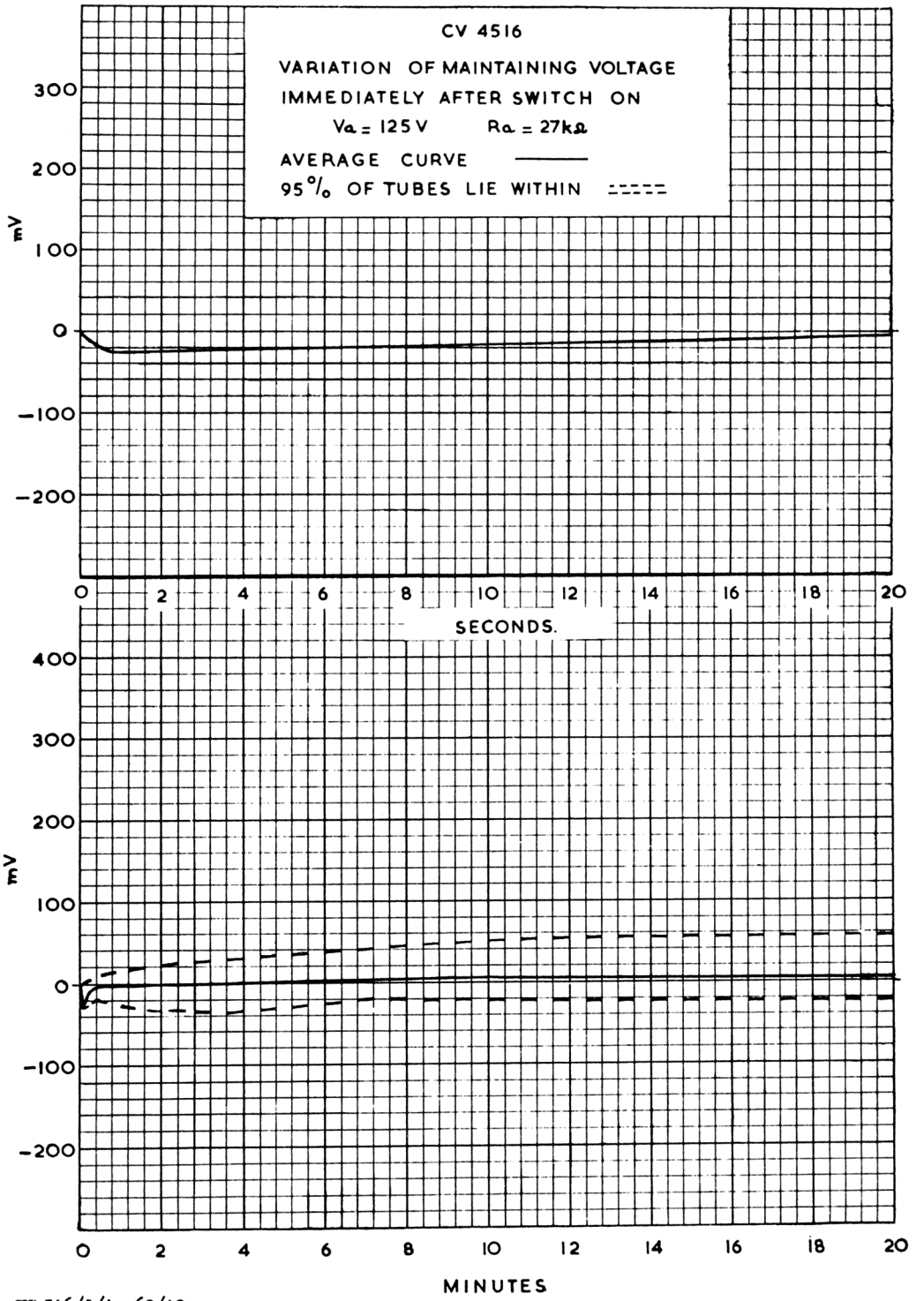


MAXIMUM RANGE DISTRIBUTION CENTRED ON BOGEY

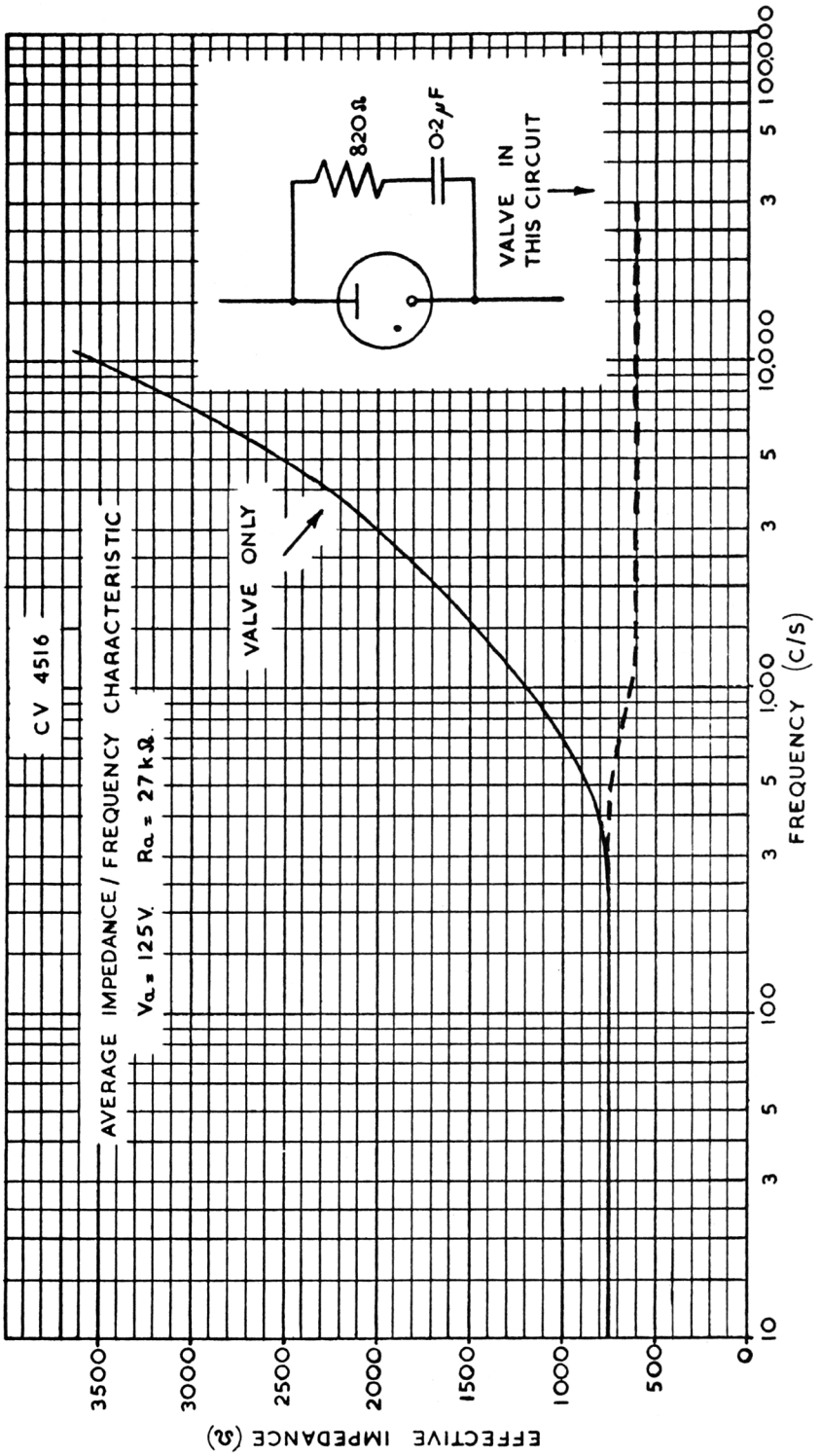

CV 4516
MAINTAINING VOLTAGE PLOTTED AGAINST BURNING CURRENT.
MAXIMUM SLOPE WITHIN RANGE. Ik 1·0 TO 2·0mA
95% OF TUBES LIE WITHIN
V
90
88
86
84
82
80
0
0·5
1·0
1·5
2·0
2·5
3·0
3·5
4·0
4·5
5·0

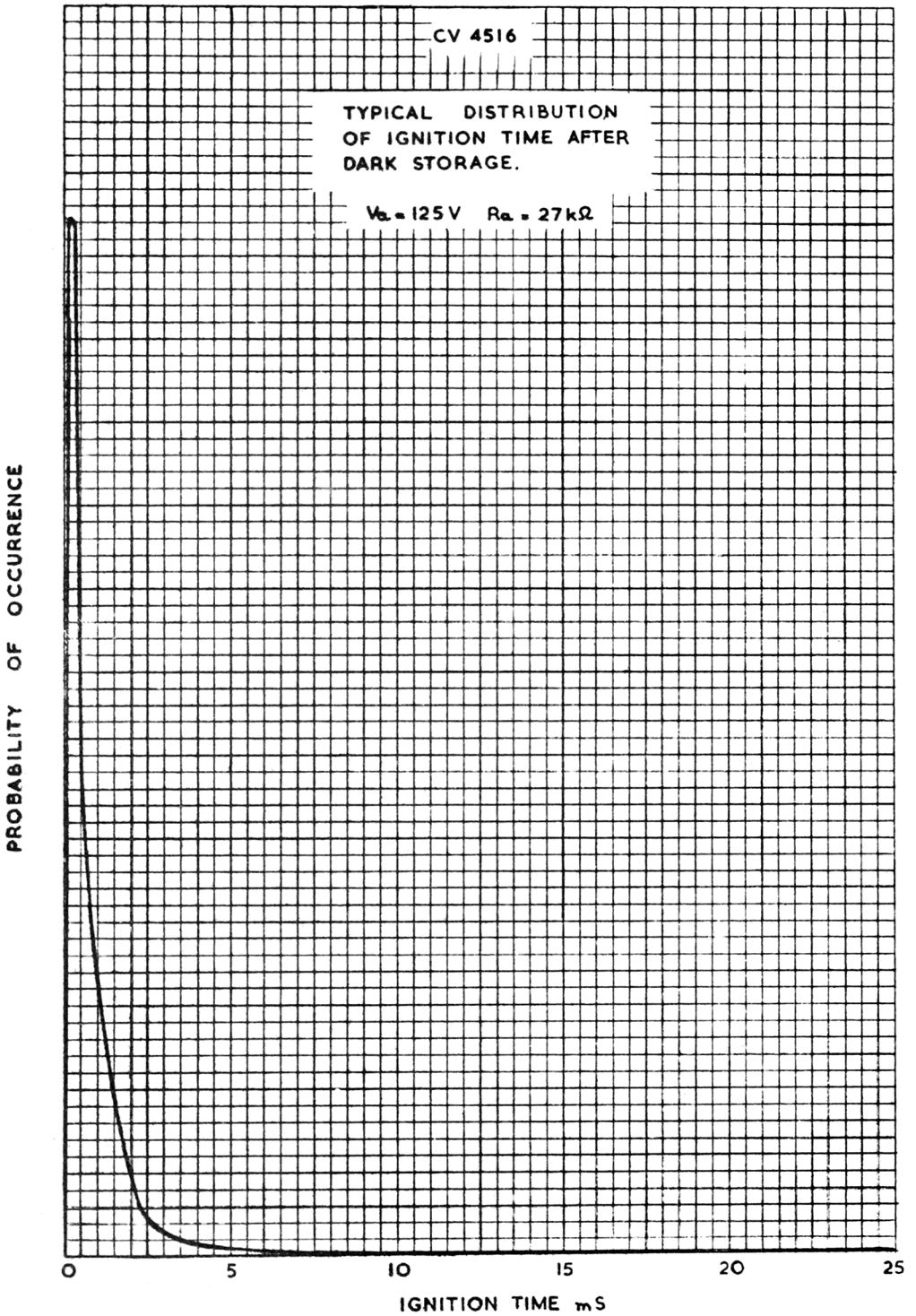
CV4516


CV 4516
AVERAGE RMS NOISE OUTPUT
BANDWIDTH 10 TO 10,000 C/S
NOISE (mVrms)
350
300
250
200
150
100
50
0
0
0·5
1·0
1·5
2·0
2·5
3·0
3·5
4·0
4·5
5·0
Ik (mA)

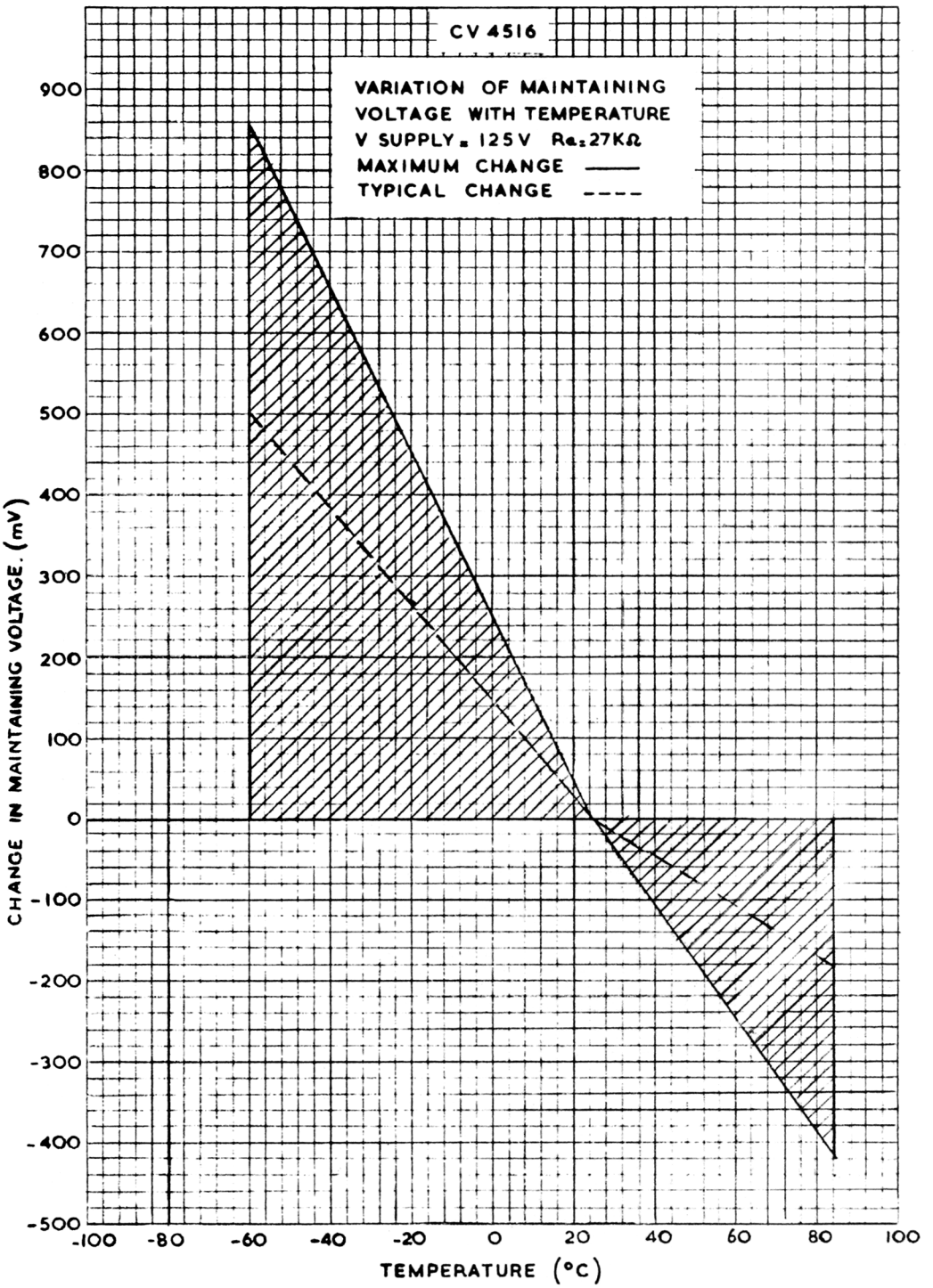

CV 4516
VARIATION OF MAINTAINING VOLTAGE
IMMEDIATELY AFTER SWITCH ON
Va = 125 V Ra = 27kΩ
AVERAGE CURVE
95% OF TUBES LIE WITHIN
mV
300
200
100
0
−100
−200
0 2 4 6 8 10 12 14 16 18 20
SECONDS.
mV
400
300
200
100
0
−100
−200
0 2 4 6 8 10 12 14 16 18 20
MINUTES

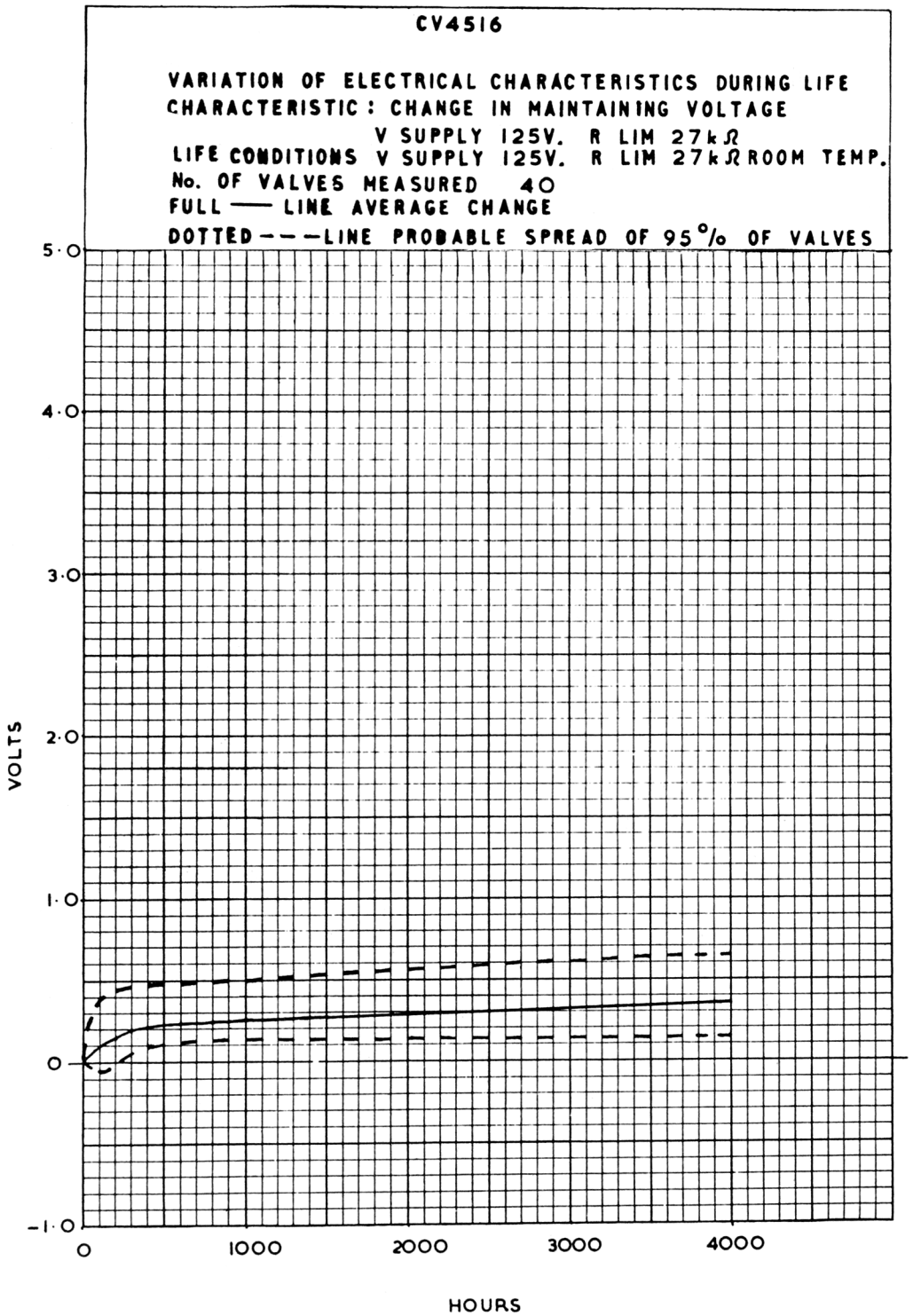
CV4516


CV 4516
AVERAGE IMPEDANCE / FREQUENCY CHARACTERISTIC
Va = 125V. Ra = 27kΩ.
VALVE ONLY
820Ω
0·2μF
VALVE IN THIS CIRCUIT
EFFECTIVE IMPEDANCE (Ω)
FREQUENCY (C/S)
0
500
1000
1500
2000
2500
3000
3500
10
100
1,000
10,000
100,000

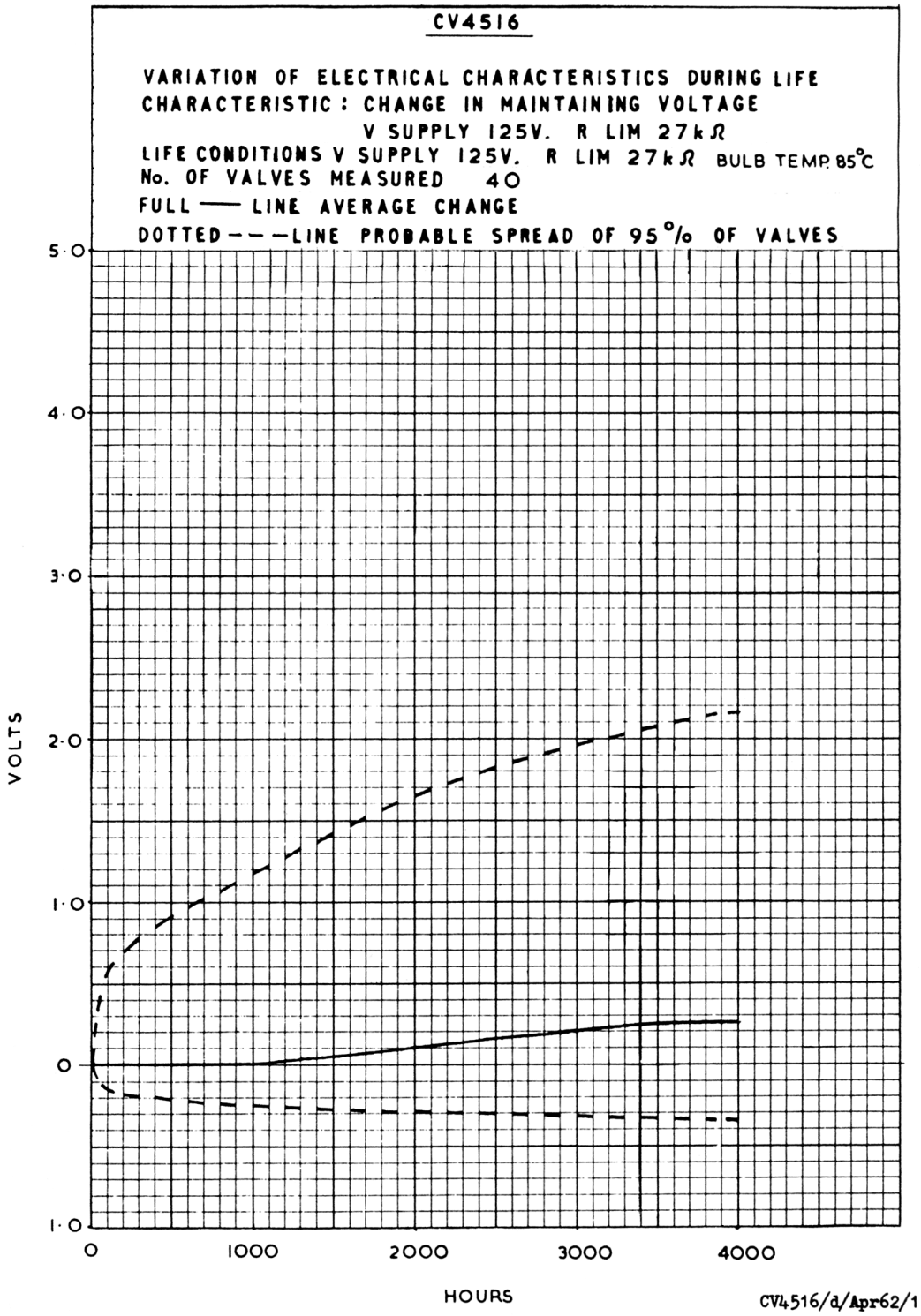

CV 4516
TYPICAL DISTRIBUTION OF IGNITION TIME AFTER DARK STORAGE.
Va = 125 V Ra = 27 kΩ
PROBABILITY OF OCCURRENCE
0
5
10
15
20
25
IGNITION TIME mS

CV4516


CV 4516
VARIATION OF MAINTAINING VOLTAGE WITH TEMPERATURE
V SUPPLY = 125V Ra = 27KΩ
MAXIMUM CHANGE ——
TYPICAL CHANGE - - - -
CHANGE IN MAINTAINING VOLTAGE. (mV)
900
800
700
600
500
400
300
200
100
0
-100
-200
-300
-400
-500
-100
-80
-60
-40
-20
0
20
40
60
80
100
TEMPERATURE (°C)

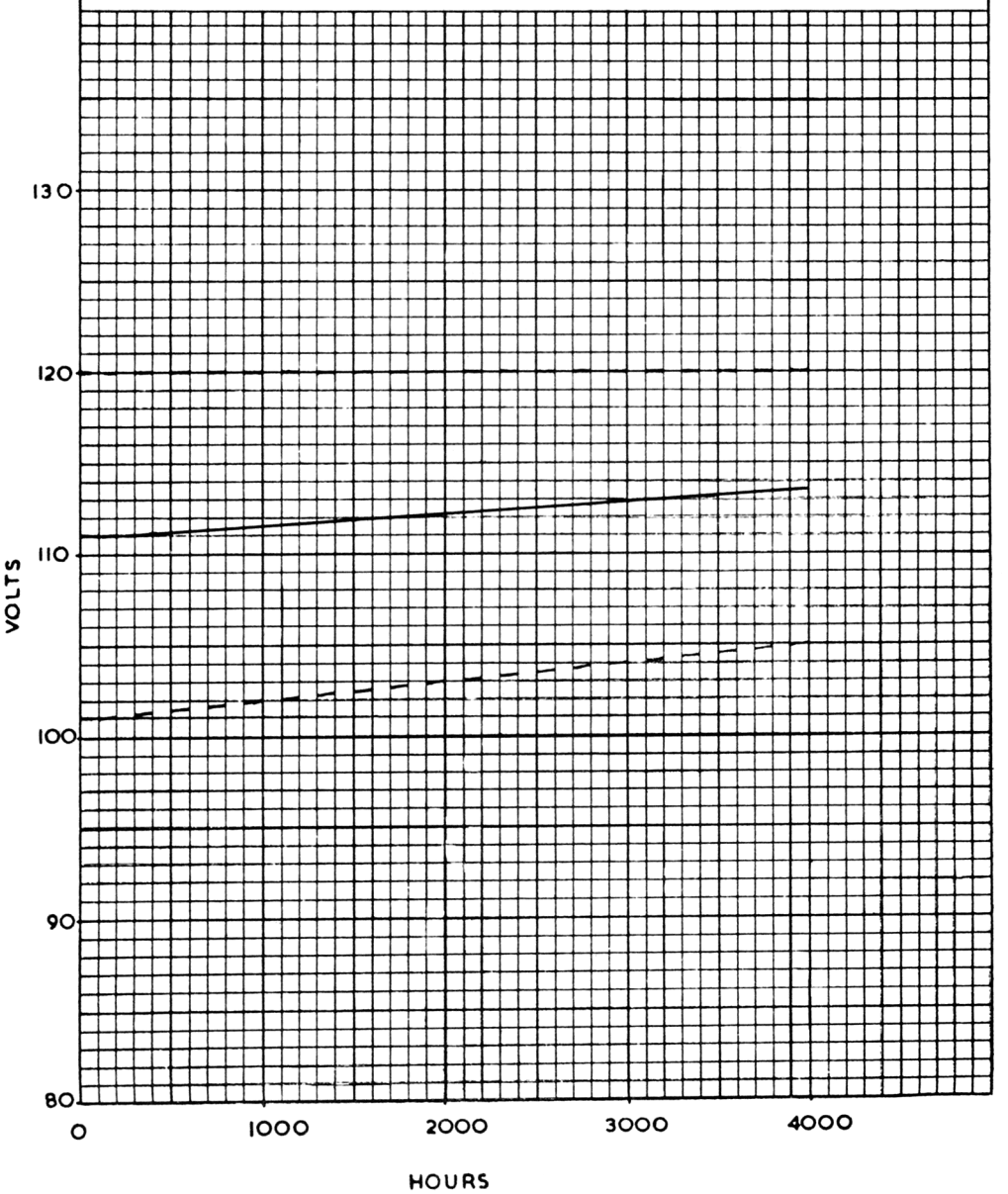

CV4516
VARIATION OF ELECTRICAL CHARACTERISTICS DURING LIFE
CHARACTERISTIC : CHANGE IN MAINTAINING VOLTAGE
V SUPPLY 125V. R LIM 27kΩ
LIFE CONDITIONS V SUPPLY 125V. R LIM 27kΩ ROOM TEMP.
No. OF VALVES MEASURED 40
FULL —— LINE AVERAGE CHANGE
DOTTED - - - LINE PROBABLE SPREAD OF 95% OF VALVES
5·0
4·0
3·0
2·0
1·0
0
-1·0
VOLTS
0
1000
2000
3000
4000
HOURS

CV4516


CV4516
VARIATION OF ELECTRICAL CHARACTERISTICS DURING LIFE
CHARACTERISTIC : CHANGE IN MAINTAINING VOLTAGE
V SUPPLY 125V. R LIM 27kΩ
LIFE CONDITIONS V SUPPLY 125V. R LIM 27kΩ BULB TEMP. 85°C
No. OF VALVES MEASURED 40
FULL —— LINE AVERAGE CHANGE
DOTTED - - - LINE PROBABLE SPREAD OF 95% OF VALVES
5·0
4·0
3·0
2·0
1·0
0
1·0
VOLTS
0
1000
2000
3000
4000
HOURS

CV 4516

VARIATION OF ELECTRICAL CHARACTERISTICS DURING LIFE
CHARACTERISTIC: IGNITION VOLTAGE (IN LIGHT) R LIM 27 kΩ
LIFE CONDITIONS: V SUPPLY 125V, R LIM. 27KΩ. ROOM TEMPERATURE.
No. OF VALVES MEASURED: 40
FULL LINE —— AVERAGE CHANGE
DOTTED LINE---PROBABLE SPREAD OF 95% OF VALVES.



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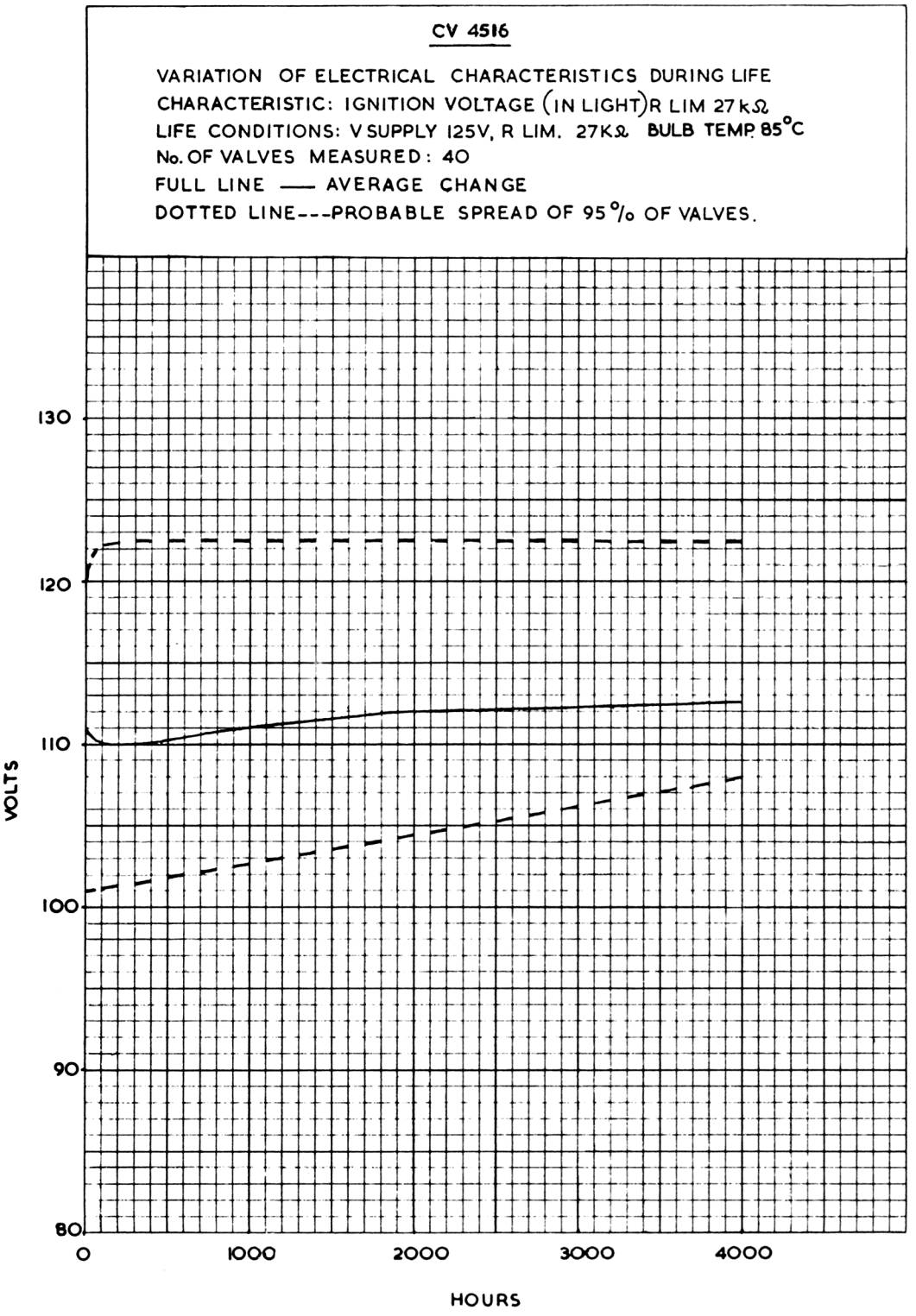
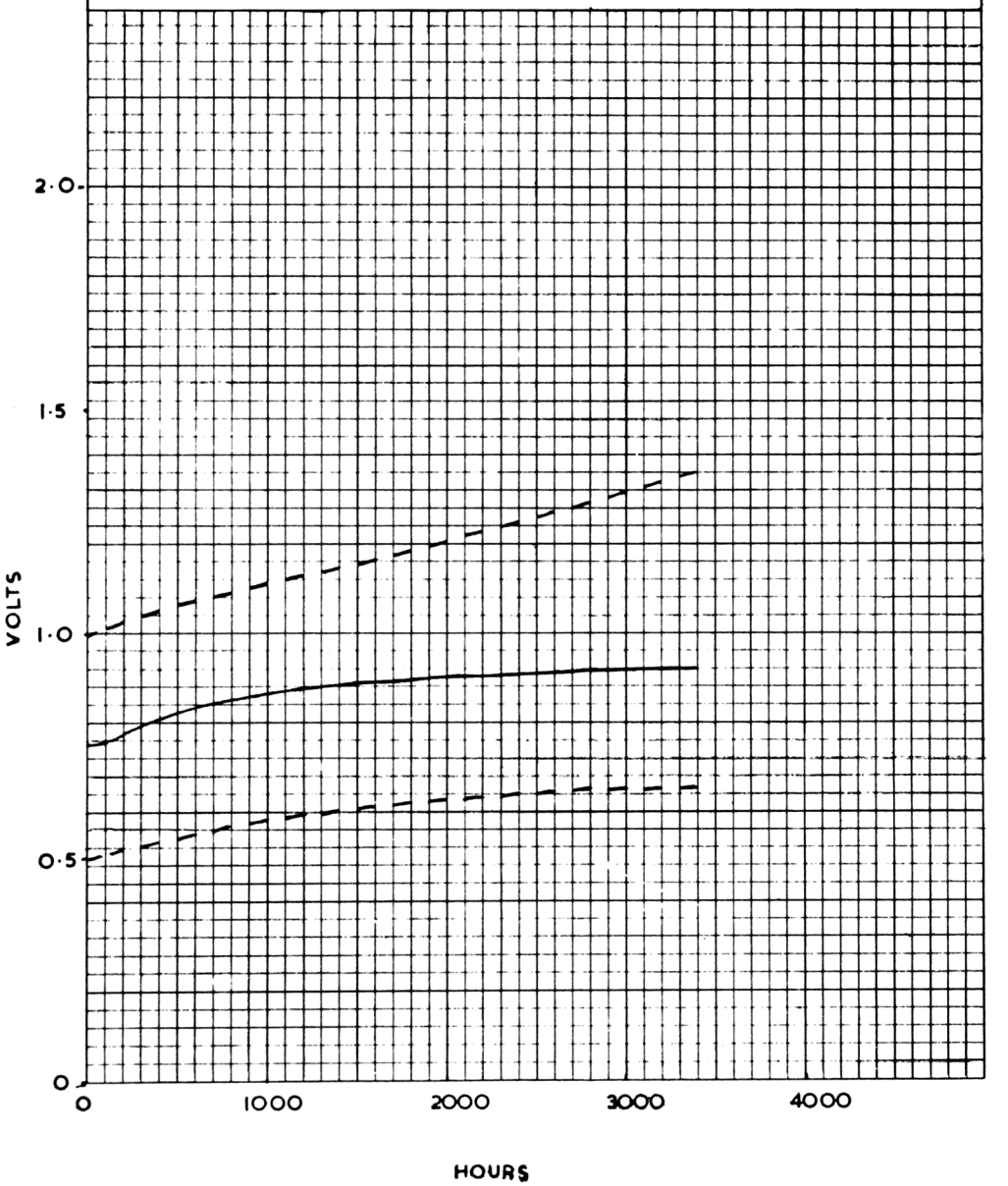

CV 4516
VARIATION OF ELECTRICAL CHARACTERISTICS DURING LIFE
CHARACTERISTIC: IGNITION VOLTAGE (IN LIGHT) R LIM 27 kΩ
LIFE CONDITIONS: V SUPPLY 125V, R LIM. 27KΩ BULB TEMP. 85°C
No. OF VALVES MEASURED: 40
FULL LINE —— AVERAGE CHANGE
DOTTED LINE---PROBABLE SPREAD OF 95% OF VALVES.
130
120
110
100
90
80
VOLTS
0
1000
2000
3000
4000
HOURS

CV 4516

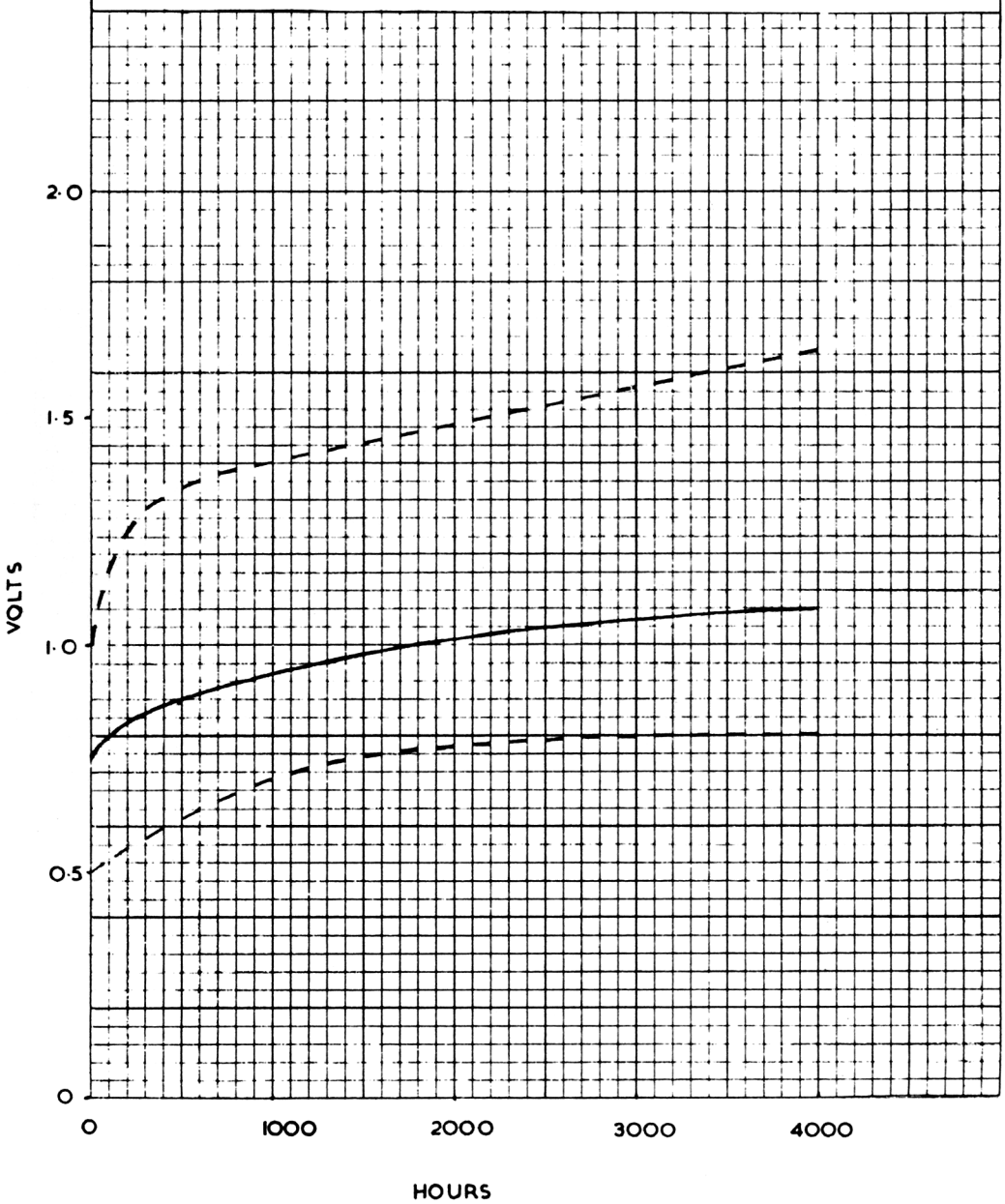
VARIATION OF ELECTRICAL CHARACTERISTICS DURING LIFE.
CHARACTERISTIC: REGULATION 1.0 TO 2.0mA.
LIFE CONDITIONS: V SUPPLY 125V, R LIM 27kΩ ROOM TEMPERATURE
No. OF VALVES MEASURED = 40.
FULL LINE —— AVERAGE CHANGE.
DOTTED LINE --- PROBABLE SPREAD OF 95% OF VALVES.

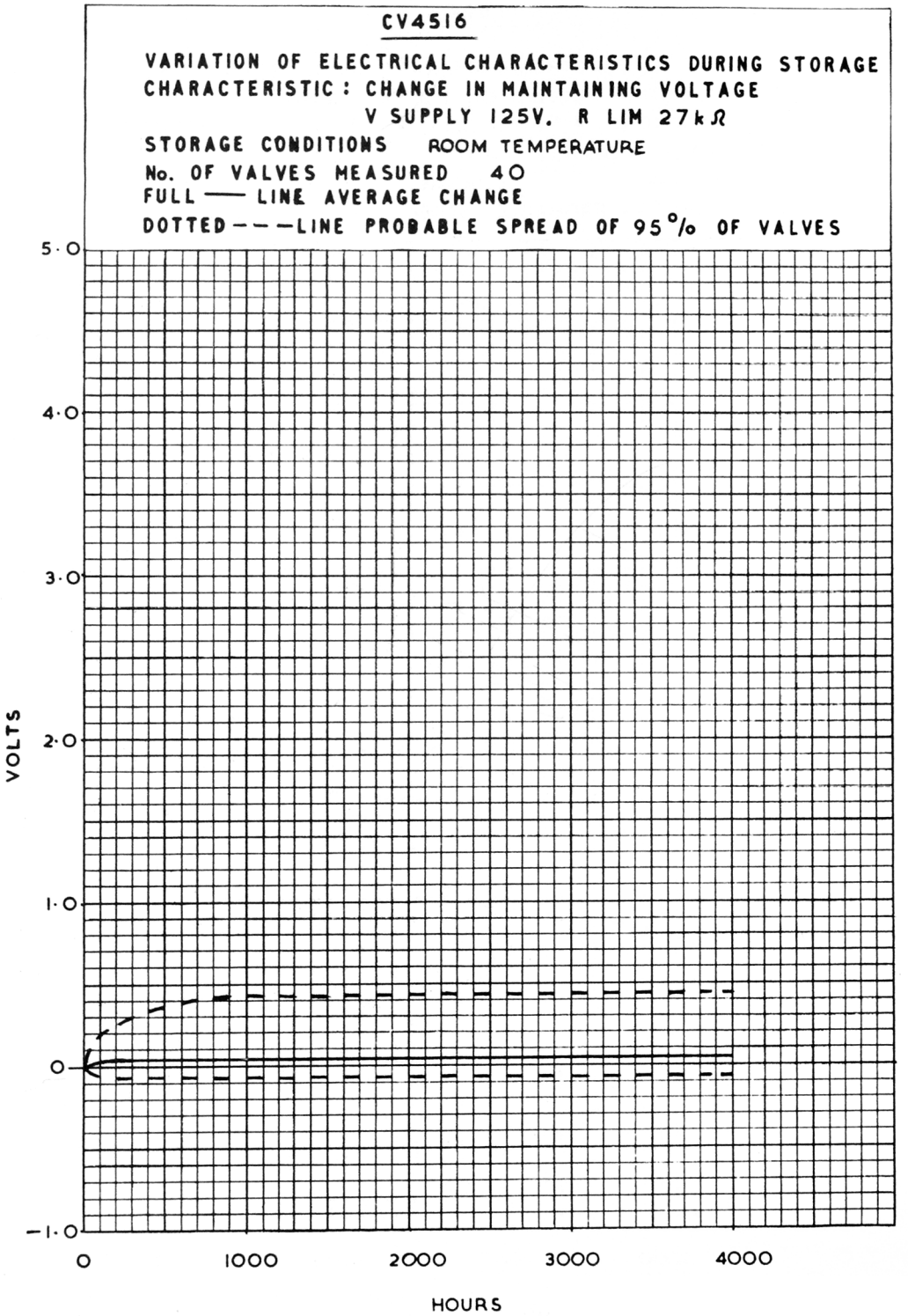


CV4516

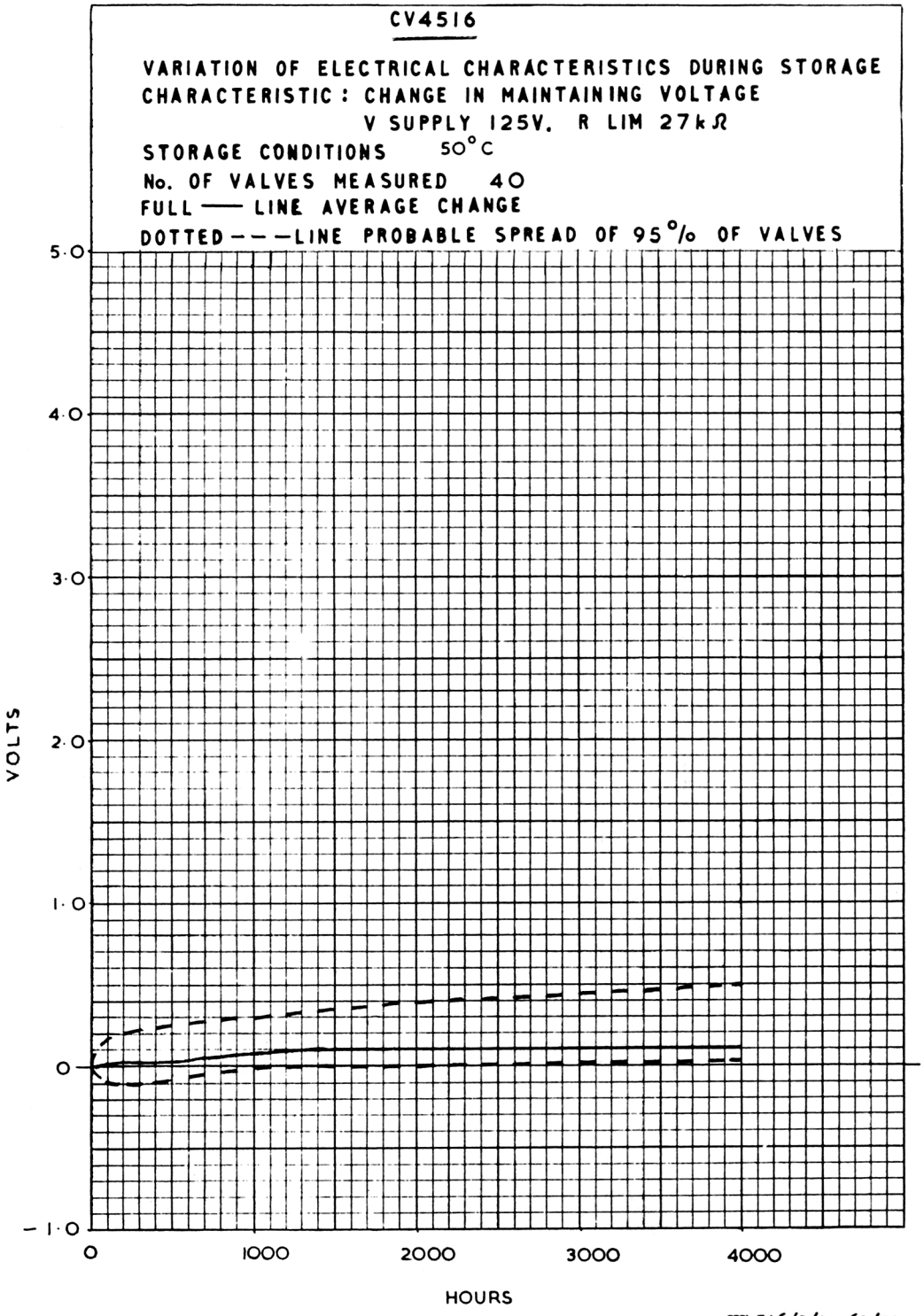
CV 4516

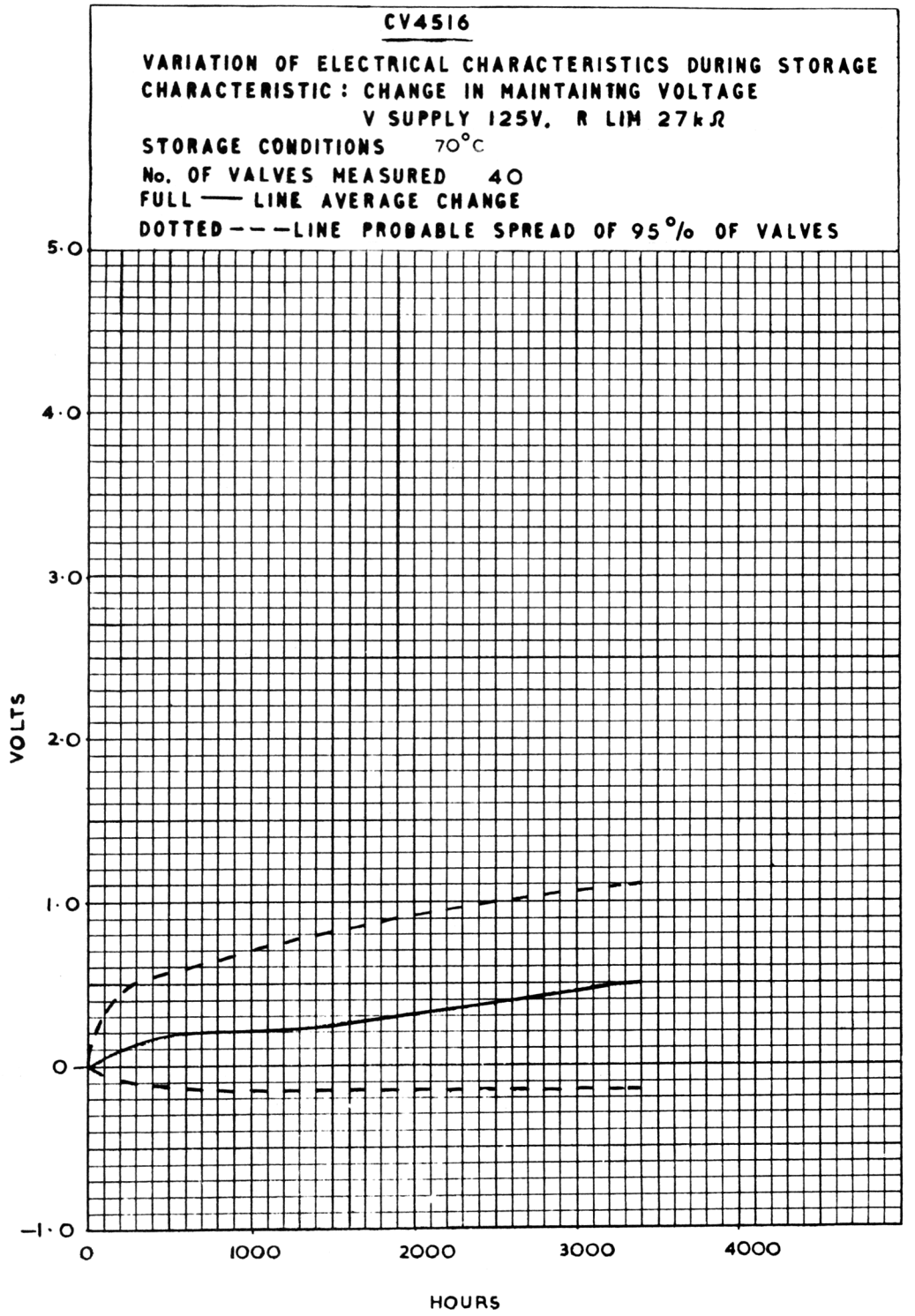
VARIATION OF ELECTRICAL CHARACTERISTICS DURING LIFE.
CHARACTERISTIC: REGULATION 1·0 TO 2·0mA.
LIFE CONDITIONS: V SUPPLY 125V, R LIM 27kΩ BULB TEMP. 85°C
No. OF VALVES MEASURED = 40.
FULL LINE —— AVERAGE CHANGE.
DOTTED LINE --- PROBABLE SPREAD OF 95% OF VALVES.



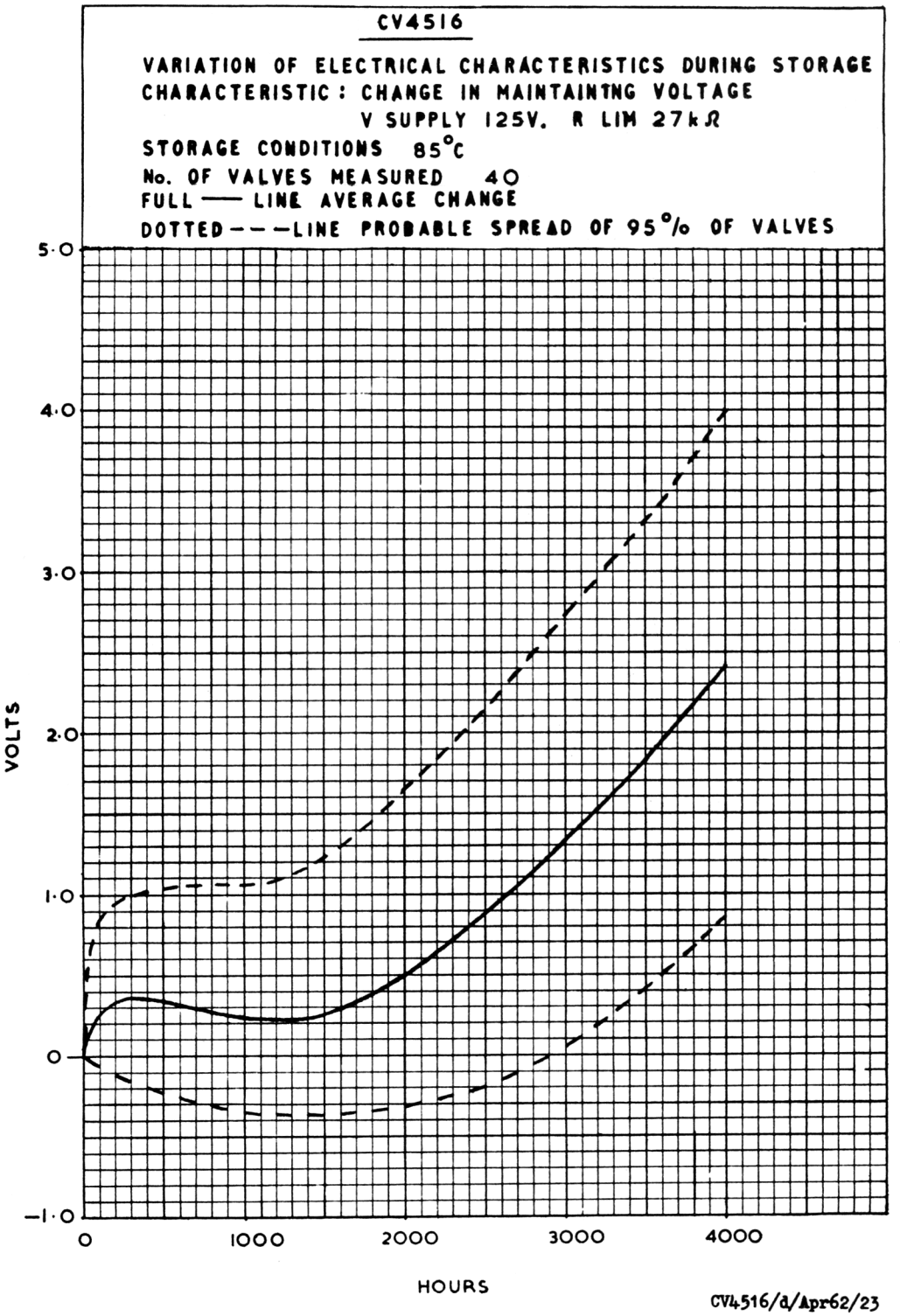

CV4516
VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE
CHARACTERISTIC : CHANGE IN MAINTAINING VOLTAGE
V SUPPLY 125V. R LIM 27kΩ
STORAGE CONDITIONS ROOM TEMPERATURE
No. OF VALVES MEASURED 40
FULL —— LINE AVERAGE CHANGE
DOTTED – – – LINE PROBABLE SPREAD OF 95% OF VALVES
5·0
4·0
3·0
2·0
1·0
0
−1·0
VOLTS
0
1000
2000
3000
4000
HOURS

CV4516


CV4516
VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE
CHARACTERISTIC : CHANGE IN MAINTAINING VOLTAGE
V SUPPLY 125V. R LIM 27kΩ
STORAGE CONDITIONS 50°C
No. OF VALVES MEASURED 40
FULL —— LINE AVERAGE CHANGE
DOTTED - - - LINE PROBABLE SPREAD OF 95% OF VALVES
5·0
4·0
3·0
2·0
1·0
0
−1·0
VOLTS
0
1000
2000
3000
4000
HOURS


CV4516
VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE
CHARACTERISTIC : CHANGE IN MAINTAINING VOLTAGE
V SUPPLY 125V. R LIM 27kΩ
STORAGE CONDITIONS 70°C
No. OF VALVES MEASURED 40
FULL —— LINE AVERAGE CHANGE
DOTTED - - - LINE PROBABLE SPREAD OF 95% OF VALVES
5·0
4·0
3·0
2·0
1·0
0
-1·0
VOLTS
0
1000
2000
3000
4000
HOURS

CV4516



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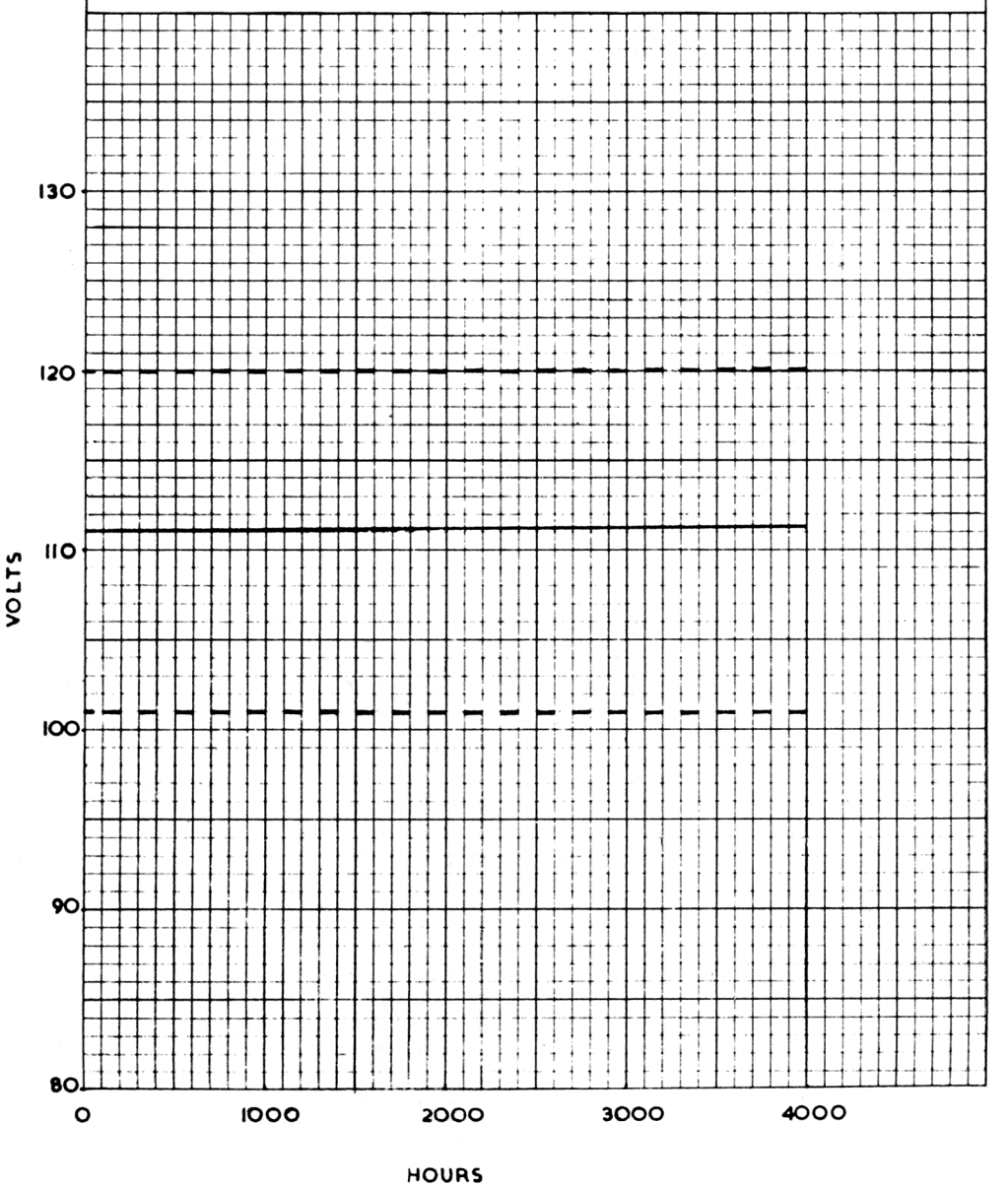
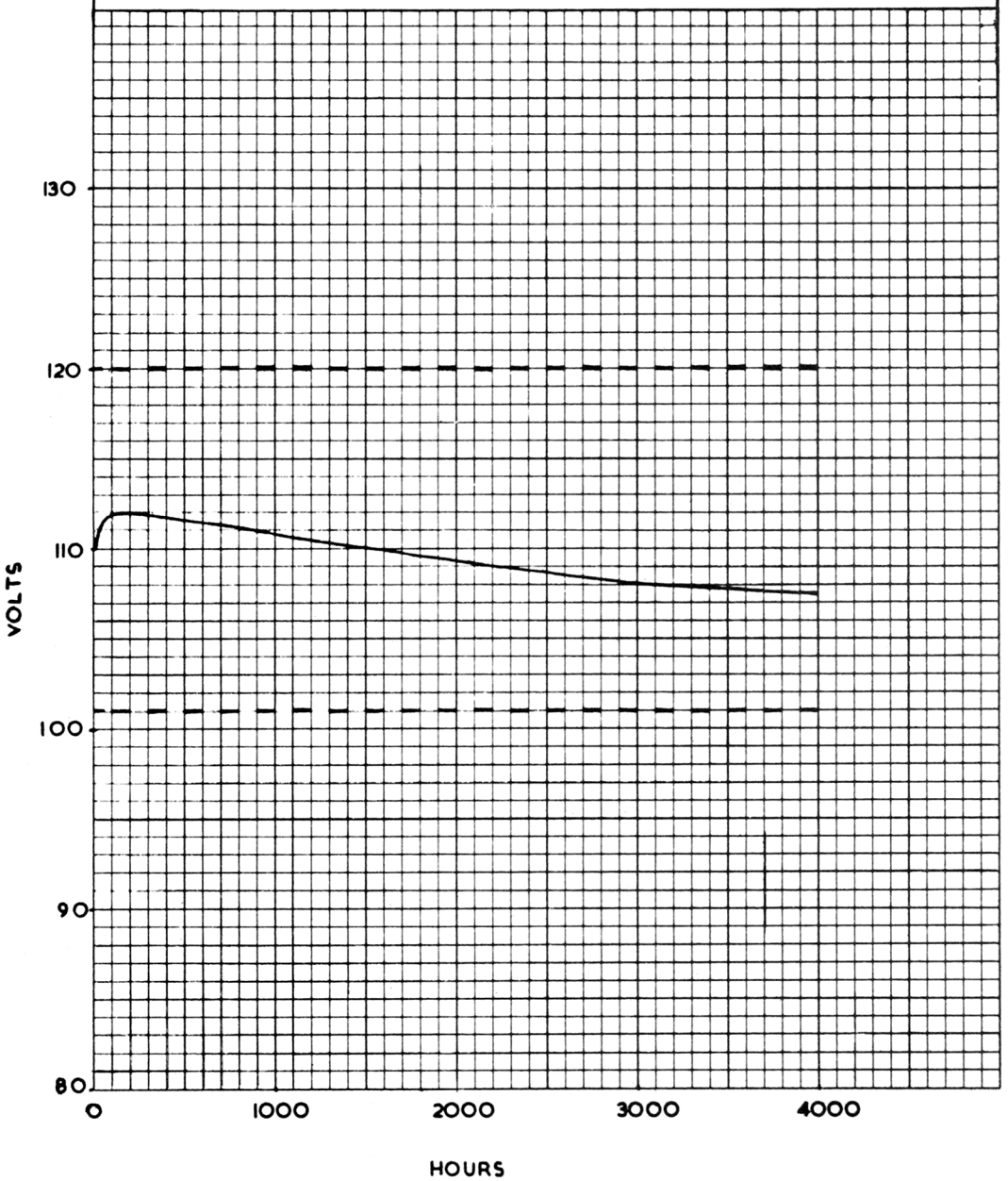
VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE
CHARACTERISTIC: IGNITION VOLTAGE (IN LIGHT) R LIM 27kΩ
STORAGE CONDITIONS: ROOM TEMPERATURE
No. OF VALVES MEASURED: 40.
FULL LINE —— AVERAGE CHANGE.
DOTTED LINE - - - PROBABLE SPREAD OF 95% OF VALVES.



CV4516

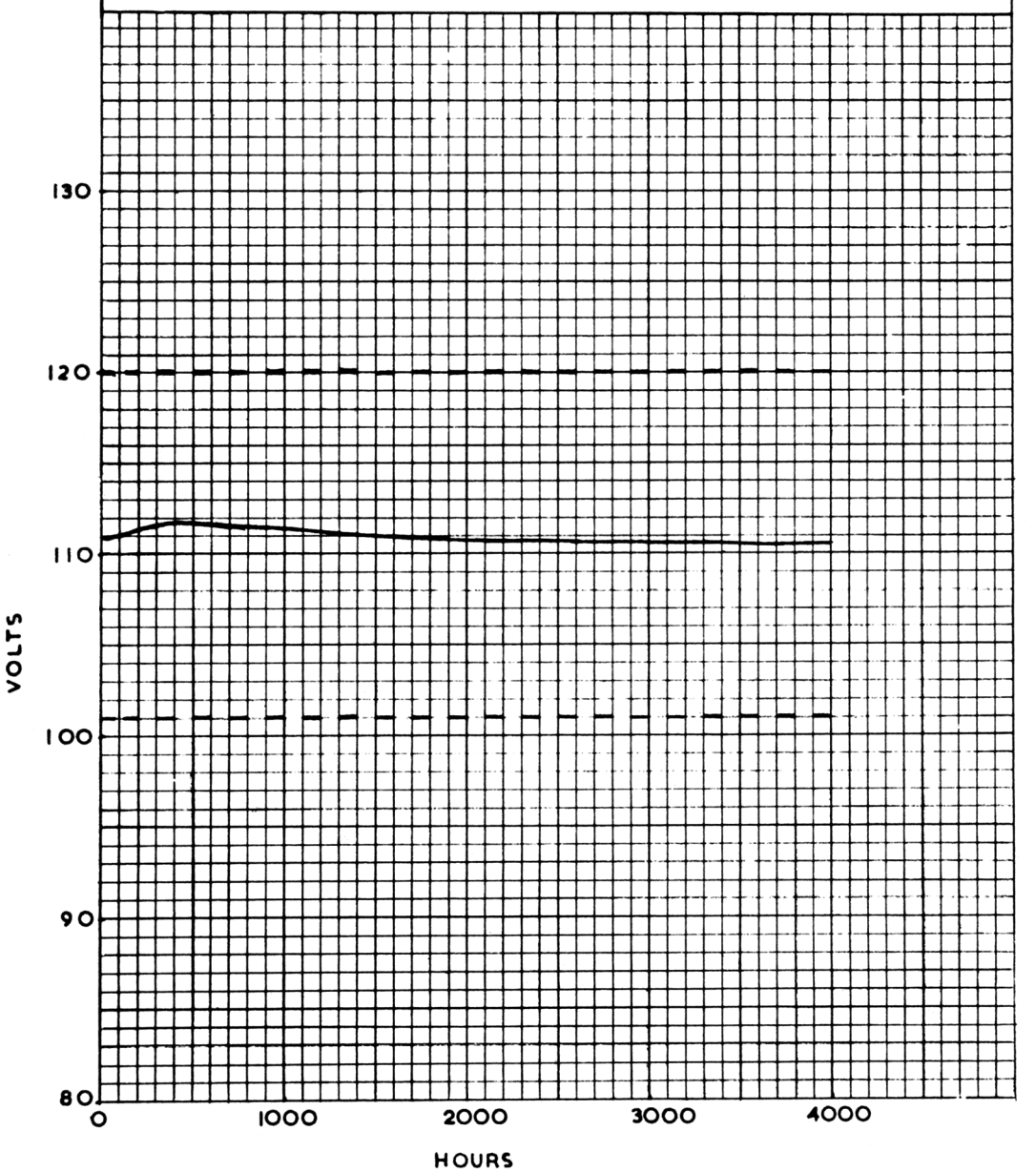
CV 4516

VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE
CHARACTERISTIC: IGNITION VOLTAGE (IN LIGHT) R LIM 27kΩ
STORAGE CONDITIONS: 50°C
No. OF VALVES MEASURED: 40.
FULL LINE —— AVERAGE CHANGE.
DOTTED LINE - - - PROBABLE SPREAD OF 95% OF VALVES.



CV 4516

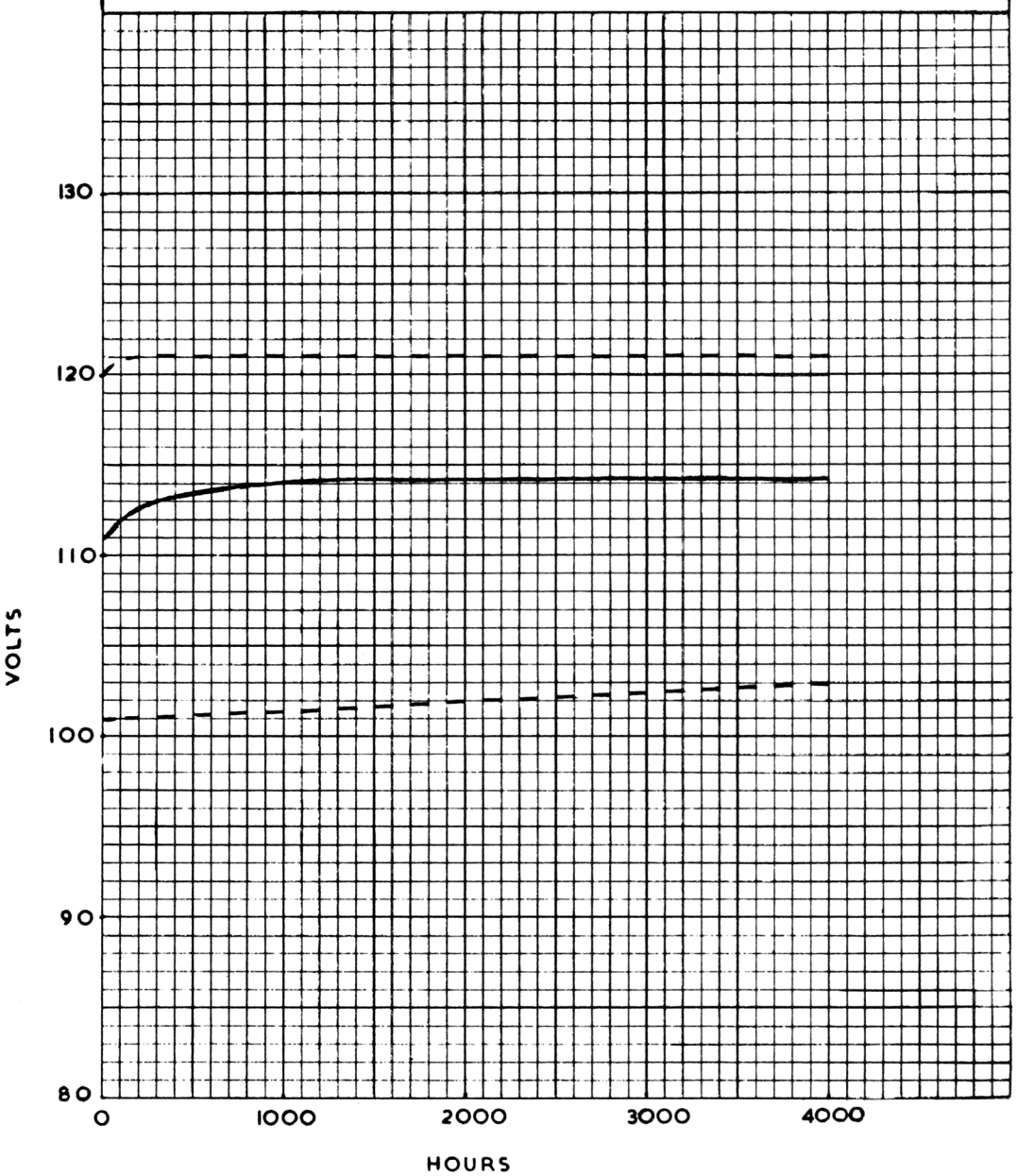
VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE
CHARACTERISTIC: IGNITION VOLTAGE (IN LIGHT) R LIM 27kΩ
STORAGE CONDITIONS: 70°C
No. OF VALVES MEASURED: 40.
FULL LINE —— AVERAGE CHANGE.
DOTTED LINE - - - PROBABLE SPREAD OF 95% OF VALVES.



CV4516

CV 4516

VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE
CHARACTERISTIC: IGNITION VOLTAGE (IN LIGHT) R LIM 27kΩ
STORAGE CONDITIONS: 85°C
No. OF VALVES MEASURED: 40.
FULL LINE —— AVERAGE CHANGE.
DOTTED LINE - - - PROBABLE SPREAD OF 95% OF VALVES.



CV4516

VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE

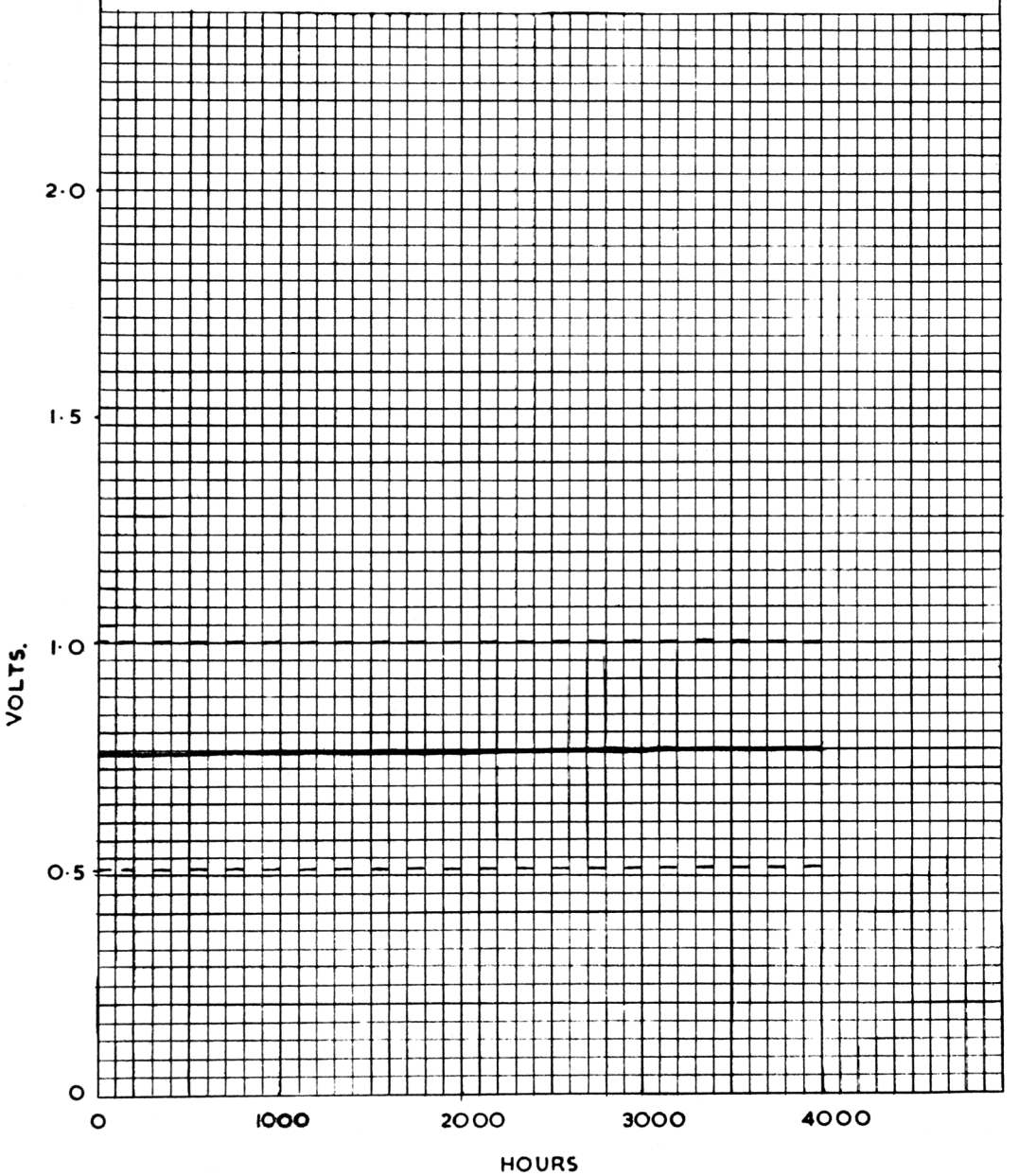
CHARACTERISTIC : REGULATION 1.0 TO 2.0 mA

STORAGE CONDITIONS : ROOM TEMPERATURE

No. OF VALVES MEASURED : 40

FULL —— LINE AVERAGE CHANGE

DOTTED - - - LINE PROBABLE SPREAD OF 95% OF VALVES



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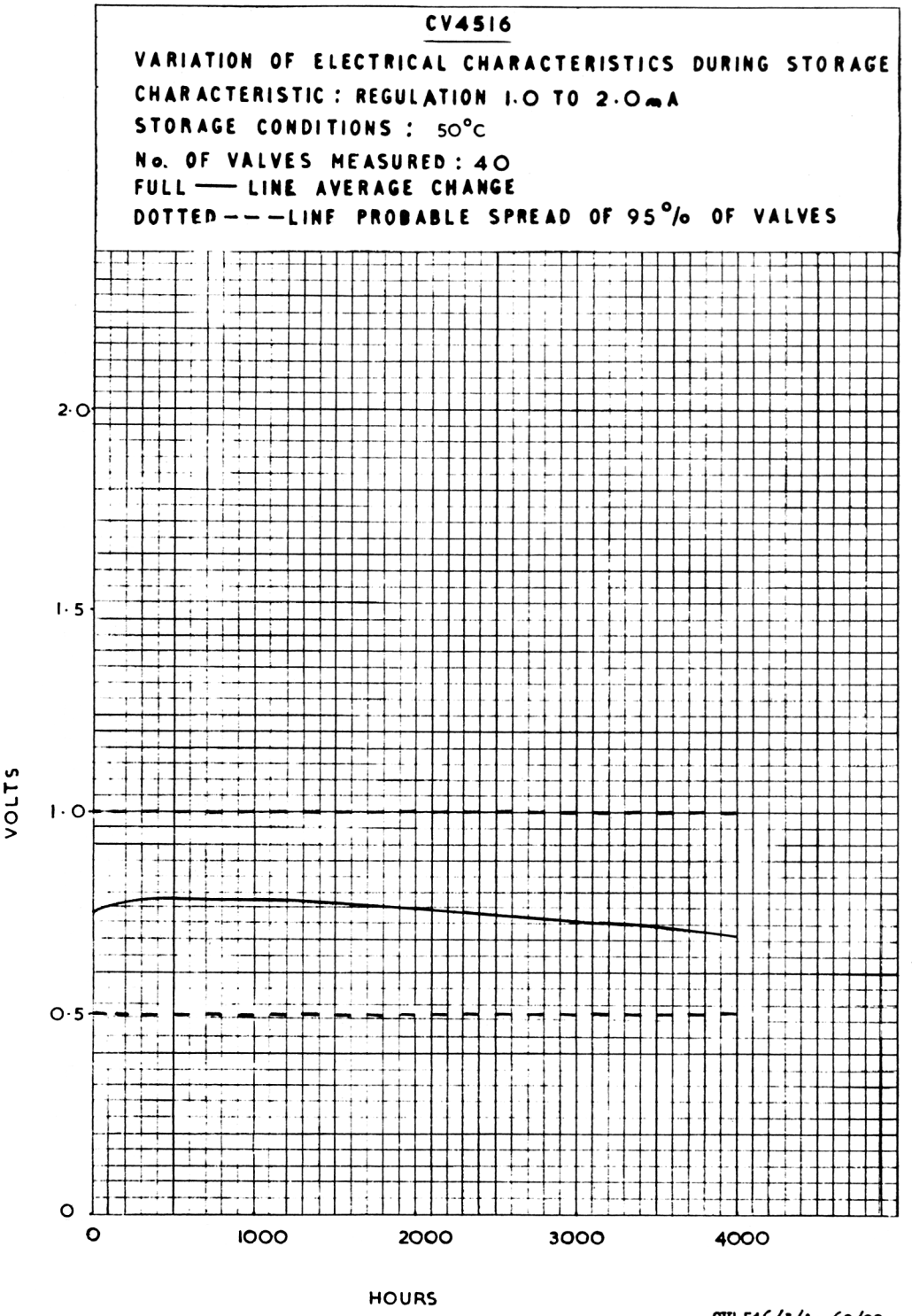
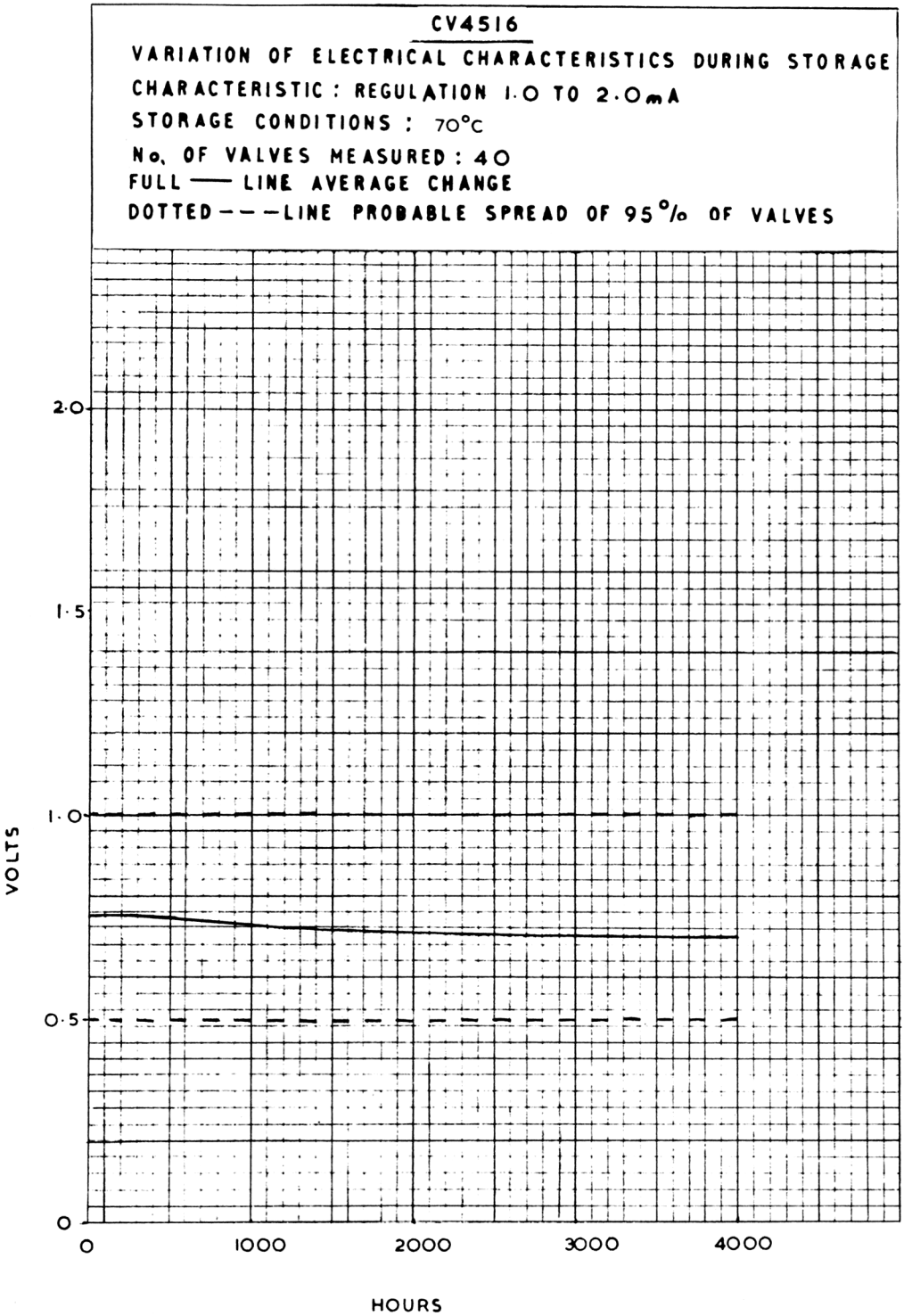
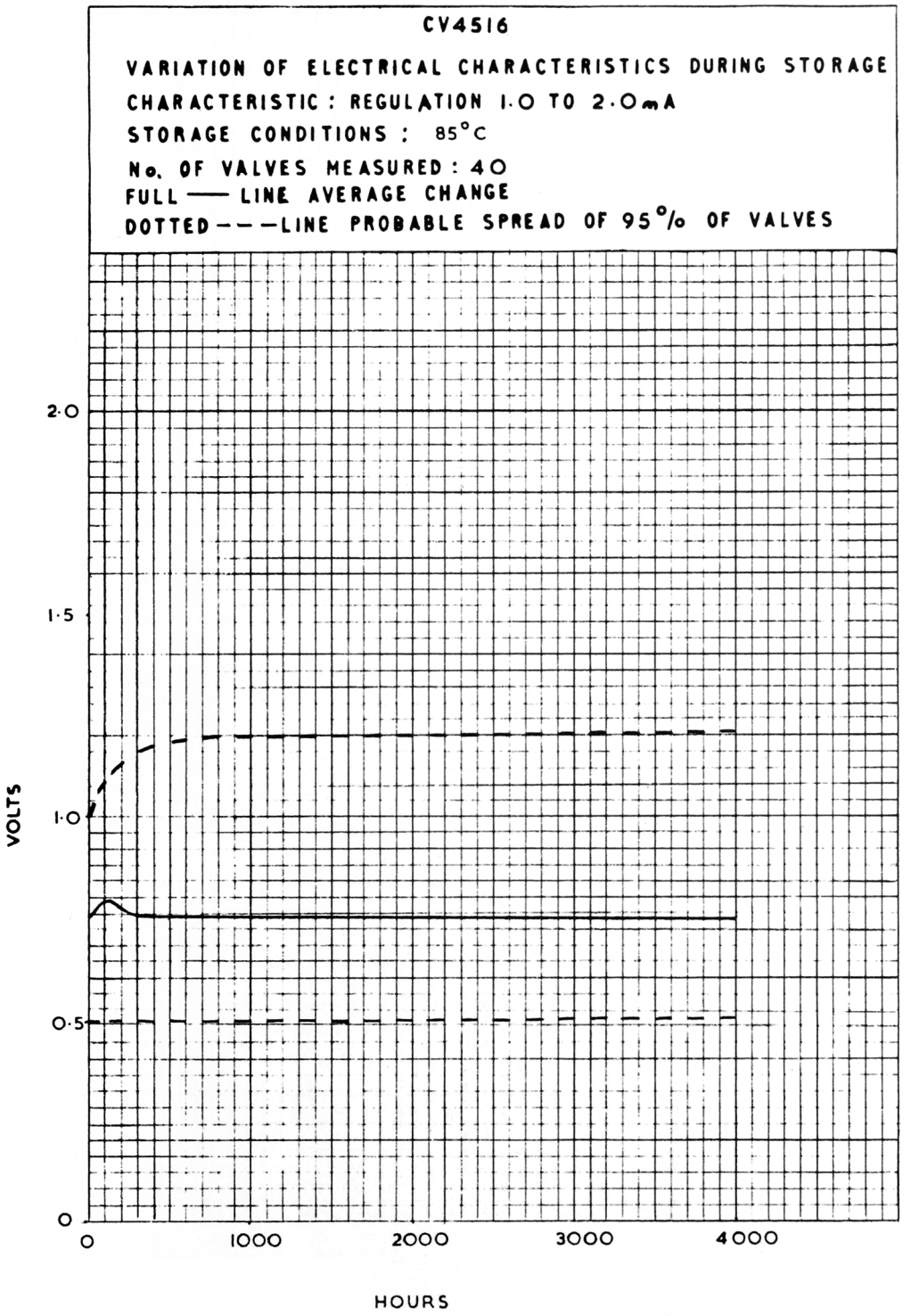

CV4516
VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE
CHARACTERISTIC : REGULATION 1.0 TO 2.0 mA
STORAGE CONDITIONS : 50°C
No. OF VALVES MEASURED : 40
FULL —— LINE AVERAGE CHANGE
DOTTED - - - LINE PROBABLE SPREAD OF 95% OF VALVES
VOLTS
2·0
1·5
1·0
0·5
0
0
1000
2000
3000
4000
HOURS


CV4516
VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE
CHARACTERISTIC : REGULATION 1.0 TO 2.0mA
STORAGE CONDITIONS : 70°C
No. OF VALVES MEASURED : 40
FULL —— LINE AVERAGE CHANGE
DOTTED - - - LINE PROBABLE SPREAD OF 95% OF VALVES
2·0
1·5
1·0
0·5
0
VOLTS
0
1000
2000
3000
4000
HOURS

CV4516


CV4516
VARIATION OF ELECTRICAL CHARACTERISTICS DURING STORAGE
CHARACTERISTIC : REGULATION 1·0 TO 2·0mA
STORAGE CONDITIONS : 85°C
No. OF VALVES MEASURED : 40
FULL —— LINE AVERAGE CHANGE
DOTTED - - - LINE PROBABLE SPREAD OF 95% OF VALVES
VOLTS
2·0
1·5
1·0
0·5
0
0
1000
2000
3000
4000
HOURS

MAINTAINING VOLTAGE