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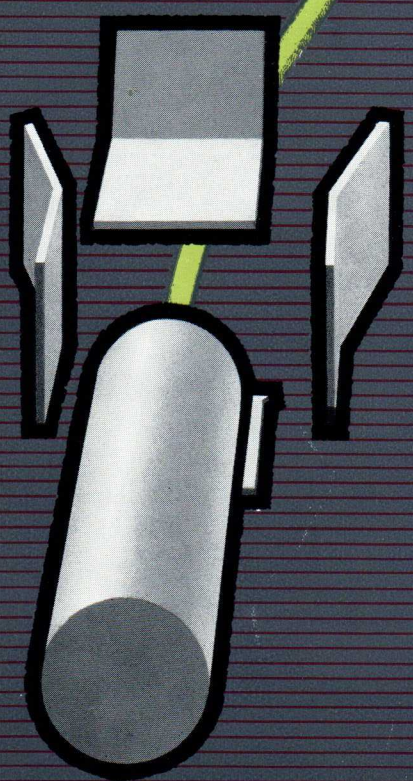
instrument cathode-ray tubes for measuring equipment



PHILIPS ELECTRON TUBE DIVISION

PHILIPS

CATHODE-RAY TUBES FOR MEASURING EQUIPMENT

In the field of measuring equipment a growing demand can be observed for oscilloscopes, and particularly for those types that actually show a proportional relation between the display on the screen and the voltage applied to the signal plates. Closely related to this demand is, of course, the need for the most essential component of such apparatus: the cathode-ray tube.

It is this trend, as well as the ever-increasing demands made on the cathode-ray tubes, which have stimulated our laboratories into evolving an entirely new series of oscilloscope tubes, the 78-series. Their properties are such that the performance of the measuring equipment is in no way limited by the cathode-ray tube.

Below a survey is given of the new techniques that were introduced in the 78-series, which at present consists of the types DH 7-78, DH 10-78 and DH 13-78.

Post-deflection acceleration

In the tubes of the 78-series post-deflection acceleration is effected by means of a high-resistance electrode applied helically on the inside of the envelope. This method ensures a gradual rise of the post-deflection potential, and results in a considerable increase of the ratio of acceleration to post-acceleration voltage, as compared with the conventional method of single-step post-acceleration. In this way a combination of high light output and high deflection sensitivity has been reached.

Elimination of distortion; control of astigmatism

The isolation shield inserted between two pairs of deflection plates has been connected to a separate contact. By varying the potential of this shield, it is possible to control "pin-cushion" or "barrel" pattern distortion. In addition, the separation of the accelerator electrode and the isolation shield allows a variation of the voltage at the acceleration electrode (which may be necessary to control astigmatism), without the deflection sensitivity being influenced.

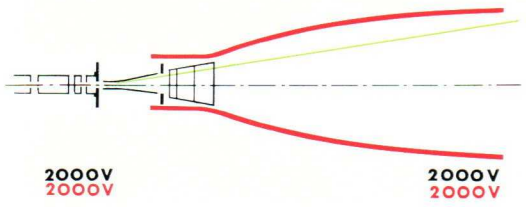
Metal-backed screen; side contacts

Type DH 13-78, which is provided with side contacts for the deflection plates and with a metal-backed screen, is especially suitable for frequencies up to 100 Mc/s and applications in which high writing speeds are necessary.

Decelerating lens

The tube DH 7-78 has a so-called decelerating lens, which means that the accelerating electrodes g_2 and g_4 have been brought out separately. Thus it is possible to apply to g_2 a high voltage (which ensures high spot quality and ample screen current), and at the same time to g_4 a very low voltage (ensuring high sensitivity).

PRINCIPLE OF POST-DEFLECTION ACCELERATION



SENSITIVITY (V/cm)	BRIGHTNESS (mcd/cm²)
N	B
N	B

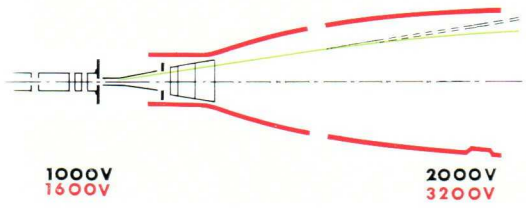
Fig. 1

To evaluate the influence of the various post acceleration methods the following systems are compared:

(a) tube without post acceleration (Fig. 1);

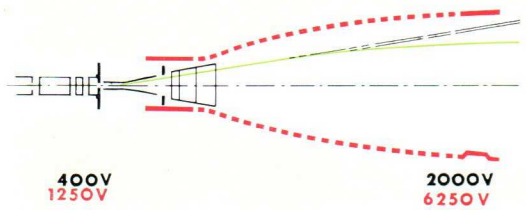
(b) tube with conventional one-step post acceleration; the ratio of post-acceleration voltage to acceleration voltage is max. 2 (Fig. 2);

(c) tube with modern helical post-acceleration electrode (in the example given in Fig. 3 the ratio of post-acceleration voltage to acceleration voltage is 5).



$\frac{1}{1.6}$ N	B
N	1.6 B

Fig. 2



$\frac{1}{3.1}$ N	B
N	3.1 B

Fig. 3

It can be seen from the figures that, when the voltages are adjusted for a given brightness B, the application of post acceleration results in an increased sensitivity N. Notably a helical post-acceleration electrode shows a considerable improvement in this respect. Conversely, in the same instances the brightness will be appreciably increased when the sensitivity is kept constant.

H-phosphor

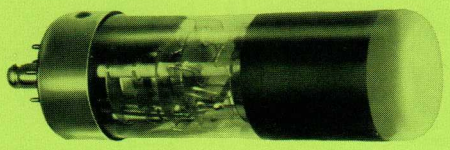
In the 78-series of cathode-ray tubes the recently developed H-phosphor is applied, which improves the brightness of the screen still further.

Our programme also comprises a dual-trace tube, type DHM 10-93. In contrast to the other types, this tube has two (independent) vertical deflection systems. Since the deflection system for the timebase is common, spot deflection in horizontal direction is identical for two vertical signals, which is of great use in those applications where a relation between two phenomena must be determined.

For inexpensive and compact measuring equipment our well-known range of 7-cm indicator tubes still finds wide application thanks to their favourable properties, such as small dimensions, good sensitivity and spot quality, and low anode voltage.

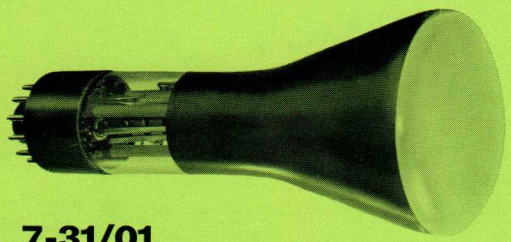
To conclude this survey, a special type of cathode-ray tube is mentioned, the DH 3-91, which was designed for indicating and monitoring purposes in all kinds of electronic equipment. Its anode voltage has been kept low, so that a very simple power supply unit suffices. Another advantage of the tube is its automatic focus control.

Summarizing, our range of cathode-ray tubes, as displayed in this pamphlet, will offer a good choice for every application in the field of oscilloscopy.

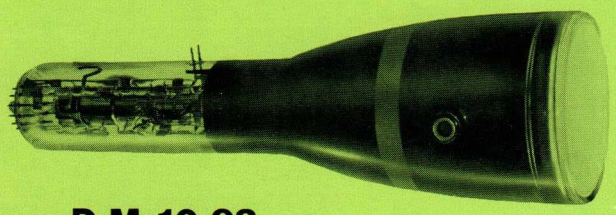


D. 3-91

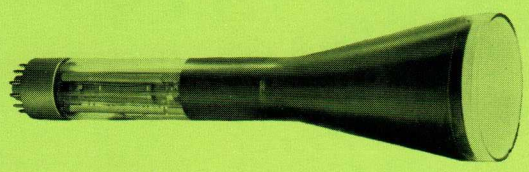
D. 7-5
D. 7-6



D. 7-31/01
D. 7-32/01



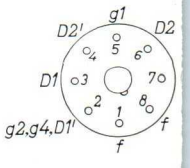
D.M 10-93



D. 7-36

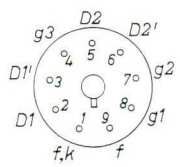
	D. 3-91
Maximum acceleration voltage	1000
Maximum post acceleration voltage	
Acceleration voltage (typical)	500
Post acceleration voltage (typical)	
Ratio of post accel. voltage to accel. voltage	
Sensitivity D_1D_1' (vertical) [5]	45
Sensitivity D_2D_2' (horizontal) [5]	53
Scan D_1D_1' (vertical) [5]	full
Scan D_2D_2' (horizontal) [5]	full
Line width under typical conditions with 0.5 μA I_1	0.6
Maximum length	105
Symmetric/asymmetric deflection	asymmetric
Tube holder — Base	English loctal
Tube holder — Holder	5902/20 [3] 40213 [4]
Tube holder — Mounting ring	
Mu-metal screen	55525
Post deflection acceleration connector	
Side contacts	
Available screen versions	H

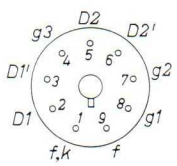
[1] in vertical direction
[2] for each vertical deflection system the useful scan is min. 70 mm; the overlap of the two scans is max. 50 mm
[3] synthetic resin
[4] ceramic
[5] typical conditions

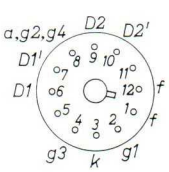


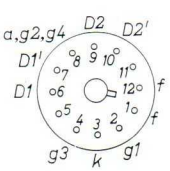
cathode-ray tubes for compact equipment

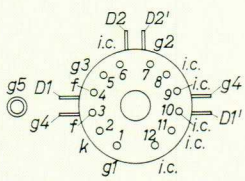
	D. 7-5	D. 7-6	D. 7-31/01	D. 7-32/01	dual-trace tube D.M 10-93	units
	1000	1000	800	800	4000	V
					8000	V
	800	800	500	500	1500	V
					3000	V
					2	
	40	40	21	21	27	V/cm
	62.5	62.5	37	37	27	V/cm
	full	full	full	full	70 [2]	mm
	full	full	full	full	90	mm
	0.7	0.7	0.5	0.5		mm
	160	160	172	172	393	mm
-)	symmetric	asymmetric	asymmetric	symmetric	asymmetric [1]	
8 p.	English loctal 9 p.	English loctal 9 p.	duodecal 12 p.	duodecal 12 p.	B 12 F	
	5906/20 [3] 40212 [4]	5906/20 [3] 40212 [4]	5912/20 [3]	5912/20 [3]	55562 [4]	
	55530	55530	55530	55530	55542	
					55563	
					55561	
	B, G, P, R	B, G, P, R	G	G		

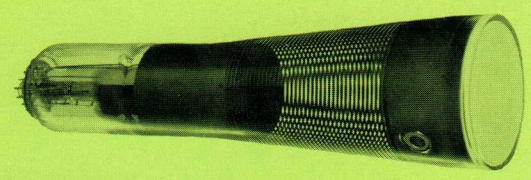










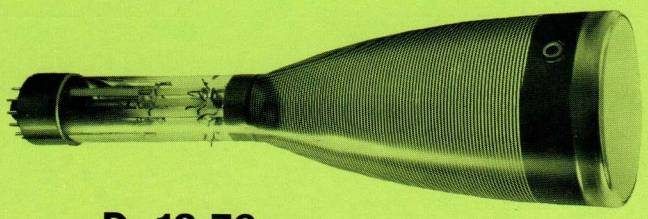


D. 7-78

D. 10-78

D. 13-10

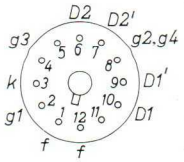
D. 13-34



D. 13-76
D. 13-78

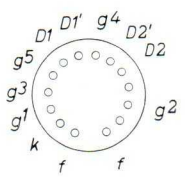
		D. 7-36
Maximum acceleration voltage		2500
Maximum post acceleration voltage		
Acceleration voltage (typical)		1500
Post acceleration voltage (typical)		
Ratio of post accel. voltage to accel. voltage		
Sensitivity D_1D_1' (vertical) [4]		18.5
Sensitivity D_2D_2' (horizontal) [4]		27
Scan D_1D_1' (vertical) [4]		57
Scan D_2D_2' (horizontal) [4]		68
Line width under typical conditions with 0.5 μA I_1		0.4
Maximum length		296
Symmetric/asymmetric deflection		symmetric
Tube holder	Base	duodecal 12 p.
	Holder	5912/20 [1]
	Mounting ring	
Mu-metal screen		55531
Post deflection acceleration connector		
Side contacts		
Available screen versions		G, B, N

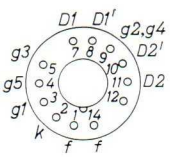
[1]) synthetic resin
[2]) ceramic
[3]) on request
[4]) typical conditions

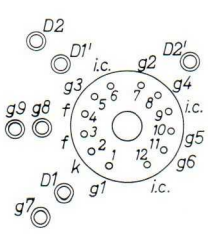


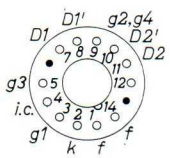
cathode-ray tubes for professional measuring equipment

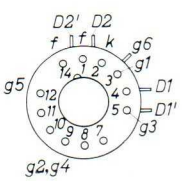
D. 7-78	D. 10-78	D. 13-10	D. 13-34	D. 13-76	D. 13-78	units
2100	2100	3300	2600	2200	2200	V
5000	8000	17300	6000	6000	12000	V
300	1000	1500	1500	2000	1670	V
1200	4000	15000	3000	4000	10000	V
4	4	10	2.3	4	6	
3.65	10.8	2.7	13.2	5.9	6.45	V/cm
10.7	34	11.2	23.6	22	30	V/cm
45	55	60	100	60	40	mm
60	75	100	100	100	100	mm
0.45	0.45	0.8	0.4	0.45	0.4	mm
285	305	508	430	468	468	mm
symmetric	symmetric	symmetric	symmetric	symmetric	symmetric	
all-glass 14 p.	diheptal 12 p.	B 12 F	diheptal 12 p.	diheptal 12 p.	diheptal 12 p.	
40467	5914/20 [1]	55562 [2]	5914/20 [1]	5914/20 [1]	5914/20 [1]	
	40638		40638	40638	40638	
55532	55541	[3]	55550	55551	55551	
55563	55560	55563	55560	55563	55563	
		55563		55561	55561	
H, N	B, H, N	H	B, G, P	B, H, N	B, H, N	

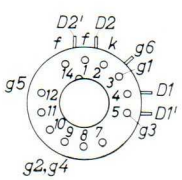


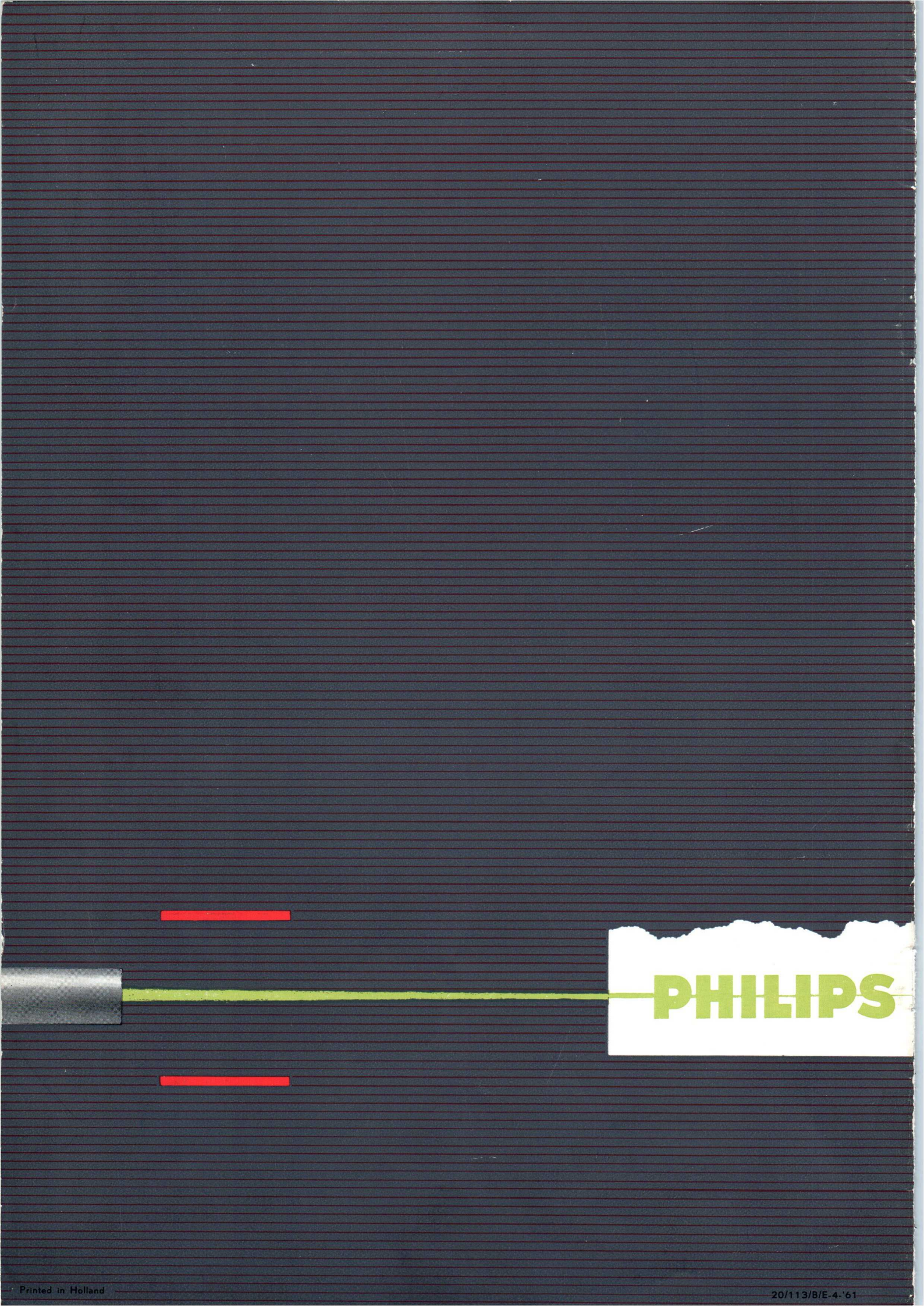












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20/113/B/E-4-'61