

PHILIPS
PRODUCT SURVEY

INSTRUMENT CATHODE-RAY TUBES

MONITOR TUBES

ELECTRONIC COMPONENTS AND
MATERIALS DIVISION



INTRODUCTION

There's more in cathode ray tubes these days than meets the eye. Once upon a time a simple gun, a set of deflection plates, and a fluorescent screen were enough. Admittedly there isn't much more than that in our mono-accelerator tubes, except precision and a lot of experience; but the others are quite another matter. Precision and experience are there in even greater measure, but also incorporated are post-deflection accelerator systems, mesh screens, and delay line systems or sectioned y-deflection plates. Built-in edge lighted graticules are common, too; and, speaking of mesh screens, they've come down in the world; whereas they were once an expensive adjunct, you will now find them in our medium price range.

Our range of monitor tubes is also comprehensive, it includes tubes for every purpose from high definition studio monitoring to industrial or medical displays: resolution now extends to 1100 lines with very high brightness factors.

Apart from their original purpose of converting optical images to electrical signals in tv studios, flying spot scanners are being increasingly used in data processing systems and in identification systems for, amongst other things, signatures. With the growth of interest in educational aids, projection tubes are being used for large screen presentation in closed circuit tv systems. Our range includes colour projection tubes as well as black and white. Flying spot scanners and projection tubes are listed as 'Tubes for Special Applications'.

Prices are not what they were, and here mass-production and automation have played a major part in bringing costs down. And it's thanks to automation that we can maintain such close correspondence between tubes of a given type. Mass production engenders precision, but so does having the strictest quality control team in the world breathing down the back of one's neck! One way and another we're kept on our toes.

Another point worth noting is that from basic research to finished product, everything, glass, guns, and phosphors are our own produce, subject to our own exacting standards; and more important, conceived and produced for a specific end product, whether it be a simple mono-accelerator tube or one of our most advanced high frequency tubes.

Our tubes are backed by an excellent application laboratory service that from time to time publishes its findings in the form of Application Informations and Application Notes. But whenever a customer is faced with an application problem not covered in these we are pleased to offer our help: It is part of our service.

In this Survey we have divided instrument tubes into three rough classifications: mono-accelerator tubes; post-deflection accelerator tubes; high frequency tubes. They appear in that order in the following pages and are succeeded by monitor tubes and tubes for special applications.

MONO-ACCELERATOR INSTRUMENT TUBES

These tubes are intended for the large proportion of applications that make no very great demands as regards bandwidth; their needs are often met by a non-p.d.a. tube that has the concomitant advantages of reliability, excellent geometry, and a well defined trace. This type of tube is being increasingly used for digital register display in calculators and business machines.

Beam blanking by means of a special electrode has always meant a reduction of useful beam current and, if image distortion (caused by spot shift) were to be avoided, has placed severe demands on the flatness of the unblanking pulse. Now, thanks to our intro-

duction of inexpensive beam-blanking circuits a special electrode is no longer necessary. *

In this range the D7-190, D10-160, and D13-480 * are outstanding. They are up-to-date flat-faced tubes based on the same gun, which means that components are fabricated in large series, keeping costs to a minimum while maintaining exceptional tolerance standards.

Particular advantages of this series are:

- Rugged construction
- Compactness
- High current efficiency
- High control grid sensitivity

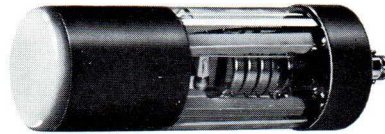
* Application Information on this subject is available from your tube supplier or will be so shortly.

DH3-91

3 cm (1") monitor tube;

low accelerator voltage,
symmetrical x deflection,
asymmetrical y deflection.

Contrast is improved by a conductive layer between screen and phosphor; connecting this layer to the accelerator electrode prevents electrostatic image distortion.



TYPICAL OPERATING CONDITIONS

Accelerator voltage	500 V	Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
Deflection factors { vertical	49 V/cm	Overall length	max. 105 mm
	56 V/cm		English loctal 8 p.
Useful scan in both directions	min. 28 mm	Base	
Line width	0.6 mm		

DG7-31, DG7-32

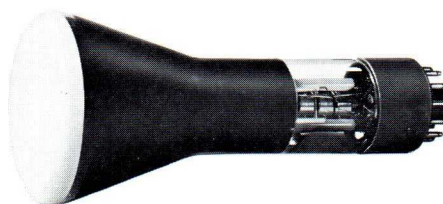
7 cm (3") monitor tubes;

low accelerator voltage.

The DG7-31 has asymmetrical x deflection
and symmetrical y deflection.

The DG7-32 has symmetrical x and y deflection.

These tubes have a similar contrast improving coating to that of the DH3-91.



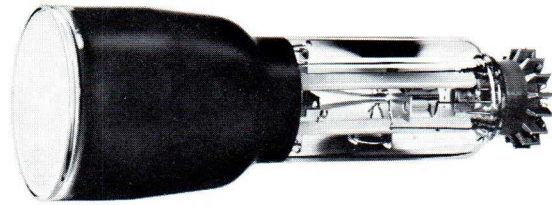
TYPICAL OPERATING CONDITIONS

Accelerator voltage	500 V	Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
Deflection factors { vertical	21 V/cm	Overall length	max. 172 mm
	37 V/cm		duodecal 12 p.
Useful scan in both directions	min. 65 mm	Base	
Line width	0.4 mm		

D7-190 . .

7 cm (3") flat faced tube for inexpensive oscilloscopes and monitors;

symmetrical x and y deflection.



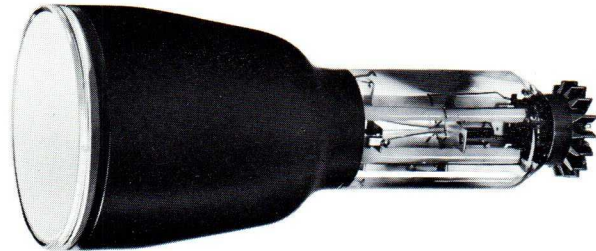
TYPICAL OPERATING CONDITIONS

Accelerator voltage		1000 V			
Deflection factors	{	vertical	12 V/cm	Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
		horizontal	29 V/cm		
Useful scan	{	vertical	min. 50 mm	Base	14 p. all glass
		horizontal	min. 60 mm	Available phosphors	GH, GM, GP
Line width		0.3 mm			

D10-160 . .

10 cm (4") flat faced tube for inexpensive oscilloscopes and read-out devices;

symmetrical x and y deflection.



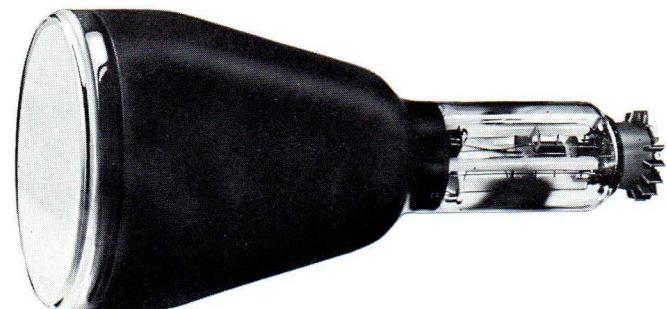
TYPICAL OPERATING CONDITIONS

Accelerator voltage		1500 V			
Deflection factors	{	vertical	14.5 V/cm	Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
		horizontal	33 V/cm		
Useful scan	{	vertical	min. 60 mm	Base	14 p. all glass
		horizontal	min. 80 mm	Available phosphors	GH, GM, GP
Line width		0.3 mm			

D13-480 . .

13 cm (5") flat faced tube for inexpensive oscilloscopes and read-out devices;

symmetrical x and y deflection.



TYPICAL OPERATING CONDITIONS

Accelerator voltage		2000 V			
Deflection factors	{	vertical	15 V/cm	Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
		horizontal	31 V/cm		
Useful scan	{	vertical	min. 80 mm	Base	14 p. all glass
		horizontal	min. 100 mm	Available phosphors	GH, GM, GP
Line width		0.3 mm			

POST-DEFLECTION ACCELERATOR TUBES

These tubes are generally intended for those applications calling for greater bandwidth than is offered by mono-accelerator tubes, and which consequently demand brighter spots and more sensitive deflection systems.

Tubes worth noting in the range are D14-120, D14-121 (rectangular screen), and D10-170 (circular screen). These are equipped with a mesh between deflection plates and p.d.a. electrode, to counter the lens effect of the post acceleration field and to allow a greater ratio between the p.d.a. and acceleration voltages.

Hitherto meshes have been confined to the more expensive tubes, but the combination of automation and large scale production allows us to include them in the medium price range. What has been noted about beam-blanking circuits for mono-accelerator tubes, also applies to the post-deflection accelerator tubes.

Most tubes in the range that operate above 4 kV are fitted with a metal backed screen to brighten the image.

D.7-11, D.7-78

7 cm (3") flat faced tubes for small service oscilloscopes;

high sensitivity,
helical post-deflection acceleration,
symmetrical x and y deflection.

Low heater consumption makes the D.7-11 especially suitable for transistorized equipment.



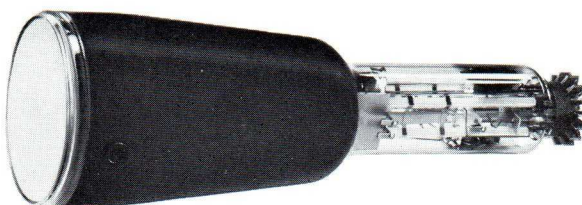
TYPICAL OPERATING CONDITIONS

Acceleration voltage	1200 V	Heater	
Post-acceleration voltage	1200 V	D.7-11	$V_f = 6.3 \text{ V}, I_f = 95 \text{ mA}$
Deflection factors	vertical	D.7-78	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
	horizontal		
Useful scan	vertical	Overall length	max. 296 mm
	horizontal	Base	14 p. all glass
Line width	0.65 mm	Available phosphors	B, H, N, P

D10-170 . .

10 cm (4") flat faced tube;

post-deflection acceleration electrode with mesh,
symmetrical x and y deflection.



TYPICAL OPERATING CONDITIONS

Acceleration voltage	1000 V	Heater	
Post-acceleration voltage	6000 V	Overall length	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
Deflection factors	vertical	Base	14 p. all glass
	horizontal	Available phosphors	BE, GH, GM, GP
Useful scan	vertical		
	horizontal		
Line width	0.42 mm		

D13-27 ..

13 cm (5") flat faced tube;

helical post-deflection acceleration electrode,
beam blanking electrode,
symmetrical x and y deflection.



TYPICAL OPERATING CONDITIONS

Acceleration voltage	1500 V
Post-acceleration voltage	3000 V
Deflection factors	vertical 11.5 V/cm
	horizontal 24 V/cm
Useful scan	min. 80 mm
	full
Line width	0.25 mm

Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
Overall length	max. 350 mm
Base	14 p. all glass
Available phosphors	BE, GH, GM, GP

D14-120 .., D14-121 ..

14 cm (5 1/2" diagonal) flat faced rectangular tube;

post-deflection acceleration electrode with mesh,
metal-backed screen,
symmetrical x and y deflection.

The D14-121 .. has side connections to the deflection plates and is intended for transistorized oscilloscopes up to 50 MHz.



TYPICAL OPERATING CONDITIONS

Acceleration voltage	1500 V
Post-acceleration voltage	10000 V
Deflection factors	vertical 4.2 V/cm
	horizontal 15.5 V/cm
Useful scan	min. 80 mm
	min. 100 mm
Line width	0.4 mm

Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
Overall length	max. 385 mm
Base	14 p. all glass
Available phosphors	BE, GH, GM, GP

E10-12 .., E10-130 ..

10 cm (4") double-gun flat faced tubes;

helical post-deflection acceleration electrode,
beam blanking electrode,
metal-backed screen (E10-130 .. only).



TYPICAL OPERATING CONDITIONS

	E10-12 ..	E10-130 ..
Acceleration voltage	1000	1000 V
Post-acceleration voltage	3000	4000 V
Deflection factors	vertical 7	7.4 V/cm
	horizontal 15	17 V/cm
Useful scan	min. 70	70 mm
	full	full
Line width	0.5	0.4 mm

Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
Overall length	max. 410 mm
Base	14 p. all glass
Available phosphors	BE, GH, GM, GP

HIGH FREQUENCY INSTRUMENT TUBES

The moment someone announces a really advanced oscilloscope - someone else demands one twice as fast - with twice the screen area, a brighter trace - and goodness knows what else. It's a hard struggle to keep up, particularly for the tube maker! For one thing tube deflection systems must be able to handle very high frequencies and must, in any case, be exceptionally sensitive. Beam densities, too, must be adapted to give a clear trace at high writing speeds. For us it means producing tubes that give the oscilloscope makers a bit of leeway.

Our latest all-purpose high-frequency tube *, the D13-500, is more than a step ahead of current demand. It has a vertical deflection system good for 800 MHz (sensitivity - 2 V/cm), a 6 cm x 10 cm display, and brightness to match. The delay line deflection system is separated from the p.d.a. system by a mesh; vertical sensitivity and scan are doubled by an electrostatic quadrupole lens. The aluminized face is flat, rectangular with a 13 cm diagonal, and incorporates an internal graticule for parallax-free measurement.

Neck mounted coils allow trace alignment, vertical shift, and orthogonality correction.

The D13-450 is also a rectangular faced tube *, but intended for transistorized oscilloscopes with a bandwidth of 100 MHz to 250 MHz. The internal graticule can be illuminated by a special light conductor: Alignment, shift, and orthogonality correction are catered for by neck mounted coils.

Special needs call for special tubes - the whole design being directed to a specific purpose. In the D13-23, the vertical deflection system is intended to form part of an external resonant circuit: adaptor units allow tuning from 300 MHz to 900 MHz. The tube is used in television transmitters for analysing and measuring the waveform of the signal. The D13-49 can display signals up to 2500 MHz over a 2 cm x 6 cm field. It is used in measurements where the signal is strong enough to drive the deflection system direct, as in some nuclear measurements, for example.

* Application Information on this subject is available from your tube supplier.

D13-23GH

13 cm (5") flat faced tube;

helical post-deflection acceleration electrode, metal-backed screen, side connections to the deflection plates, symmetrical x and y deflection.

The tube is intended for narrow-band high-frequency applications, where the y-plates form part of an external resonant circuit tunable to frequencies in the range 300 MHz to 900 MHz.



TYPICAL OPERATING CONDITIONS

Acceleration voltage	1300 V				
Post-acceleration voltage	6000 V				
Deflection factors	<table> <tr> <td>{ vertical</td> <td>)</td> </tr> <tr> <td>{ horizontal</td> <td>14 V/cm</td> </tr> </table>	{ vertical)	{ horizontal	14 V/cm
{ vertical)				
{ horizontal	14 V/cm				
Useful scan	<table> <tr> <td>{ vertical</td> <td>50 mm</td> </tr> <tr> <td>{ horizontal</td> <td>100 mm</td> </tr> </table>	{ vertical	50 mm	{ horizontal	100 mm
{ vertical	50 mm				
{ horizontal	100 mm				

) Dependent on frequency and on the external circuit

Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
Overall length	max. 596 mm
Base	14 p. all glass

D13-26 . .

13 cm (5") flat faced tube;

post-deflection acceleration electrode with mesh, metal-backed screen, side connections to the deflection plates, symmetrical x and y deflection.

High sensitivity makes this tube suitable for transistorized equipment.
Can be delivered with edge-lit internal graticule: type number D13-26 . . /01.



TYPICAL OPERATING CONDITIONS

Acceleration voltage	1500 V				
Post-acceleration voltage	15000 V				
Deflection factors	<table> <tr> <td>{ vertical</td> <td>2.9 V/cm</td> </tr> <tr> <td>{ horizontal</td> <td>10.9 V/cm</td> </tr> </table>	{ vertical	2.9 V/cm	{ horizontal	10.9 V/cm
{ vertical	2.9 V/cm				
{ horizontal	10.9 V/cm				
Useful scan	<table> <tr> <td>{ vertical</td> <td>min. 60 mm</td> </tr> <tr> <td>{ horizontal</td> <td>min. 100 mm</td> </tr> </table>	{ vertical	min. 60 mm	{ horizontal	min. 100 mm
{ vertical	min. 60 mm				
{ horizontal	min. 100 mm				
Line width	0.4 mm				

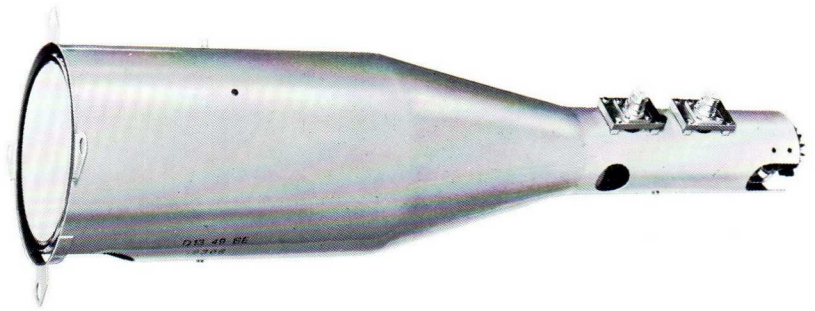
Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
Overall length	max. 460 mm
Base	14 p. all glass
Available phosphors	BE, GH, GM, GP

D13-49BE

13 cm (5") flat faced tube;

helical post-deflection acceleration electrode,
metal-backed screen,
delay-line system for vertical deflection,
symmetrical x deflection,
asymmetrical y deflection.

The tube can display signals up to 2500 MHz.



TYPICAL OPERATING CONDITIONS

Acceleration voltage	4000 V
Post-acceleration voltage	24000 V
Deflection factors	vertical 10 V/cm
	horizontal 32 V/cm
Useful scan	vertical min. 17 mm
	horizontal min. 60 mm
Line width	0.12 mm

Heater
Overall length
Base

$V_f = 6.3 \text{ V}$, $I_f = 300 \text{ mA}$
max. 625 mm
14 p. all glass

D13-450GH/01

13 cm (5" diagonal) rectangular flat faced tube;

post-deflection acceleration electrode with mesh,
metal-backed screen,
sectioned y-plates,
edge-lit internal graticule,
symmetrical x and y deflection.

The tube is suitable for transistorized oscilloscopes with a bandwidth from 100 to 250 MHz; it is provided with coils for orthogonality correction, shift of scanned area and picture rotation.



TYPICAL OPERATING CONDITIONS

Acceleration voltage	1500 V
Post-acceleration voltage	15000 V
Deflection factors	vertical 3 V/cm
	horizontal 9.9 V/cm
Useful scan	vertical min. 60 mm
	horizontal min. 100 mm
Line width	0.40 mm

Heater
Overall length
Base

$V_f = 6.3 \text{ V}$, $I_f = 300 \text{ mA}$
max. 459 mm
14 p. all glass

D13-500 . . /01

13 cm (5" diagonal) rectangular flat faced tube;

post-deflection acceleration electrode with mesh,
metal-backed screen,
vertical deflection by a symmetrical helix system,
vertical scan magnification by an electrostatic quadrupole lens,
symmetrical x deflection,
edge-lit internal graticule.

An all-purpose oscilloscope tube with high sensitivity and large useful scan, capable of displaying signals up to 800 MHz; it has coils for alignment, vertical shift and orthogonality correction.

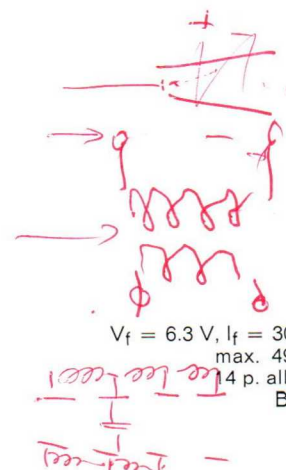
TYPICAL OPERATING CONDITIONS

First accelerator voltage	2500 V
Final accelerator voltage	15000 V
Deflection factors	vertical 2 V/cm
	horizontal 15 V/cm
Useful scan	vertical min. 60 mm
	horizontal min. 100 mm
Line width	0.35 mm



Heater
Overall length
Base
Available phosphors

$V_f = 6.3 \text{ V}$, $I_f = 300 \text{ mA}$
max. 493 mm
14 p. all glass
BE, GH



MONITOR TUBES

As the name suggests these tubes were originally intended for television studios, and with the growth of TV this still represents their largest outlet. Nevertheless industry has discovered an important use for monitor tubes in closed circuit television, partly because of the quality of their image and their stable and predictable characteristics, but also because they are guaranteed to be available for many years. In other areas, too, the popularity of monitor tubes is increasing; in data display, large screen oscilloscopes and so on,

our monitor tubes are setting standards that are hard to beat. Our range includes tubes from 17 cm to 36 cm, and with deflection angles of from 70° to 110°; particular attention being drawn to the M17-140W and M17-141W. These are both rectangular, flat-faced tubes, intended mainly as viewfinders for TV cameras but, because of their excellent resolution, highly recommended for other applications where the display of fine detail is important.

M17-140W, M17-141W

Rectangular picture tubes for use as television camera view finder;

17 cm (7") diagonal,
70° deflection angle,
flat faced,
metal-backed screen,
very high resolution,
bonded face plate
metal mounting band } M17-141W only



TYPICAL OPERATING CONDITIONS

	M17-140W	M17-141W		
Final accelerator voltage	14	16 kV	Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
First accelerator voltage	400	600 V	Overall length	
Grid No. 1 voltage	-30 to -62	-40 to -90 V	M17-140W	max. 240 mm
Resolution at screen centre	min. 1000	1100 lines	Neck diameter	28 mm
			Base	B8H

M21-11W

Rectangular picture tube for use as precision monitor;

21 cm (8") diagonal,
90° deflection angle,
metal-backed screen,
low-wattage heater.



TYPICAL OPERATING CONDITIONS

Final accelerator voltage	12 kV	Heater	$V_f = 11 \text{ V}, I_f = 68 \text{ mA}$
First accelerator voltage	400 V	Overall length	max. 222 mm
Grid No. 1 voltage	-32 to -69 V	Neck diameter	28 mm
Resolution at screen centre	min. 650 lines	Base	B8H

M21-12W

Rectangular picture tube for use as industrial monitor;

21 cm (8") diagonal,
110° deflection angle,
metal-backed screen.



TYPICAL OPERATING CONDITIONS

Final accelerator voltage	16 kV	Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
First accelerator voltage	300 V	Overall length	max. 205 mm
Grid No. 1 voltage	-35 to -72 V	Neck diameter	28 mm
Resolution at screen centre	min. 625 lines	Base	B8H

M28-12W

Rectangular picture tube for use as monitor;

28 cm (11") screen diameter,
90° deflection angle,
metal-backed screen,
low-wattage heater,
integral protection.



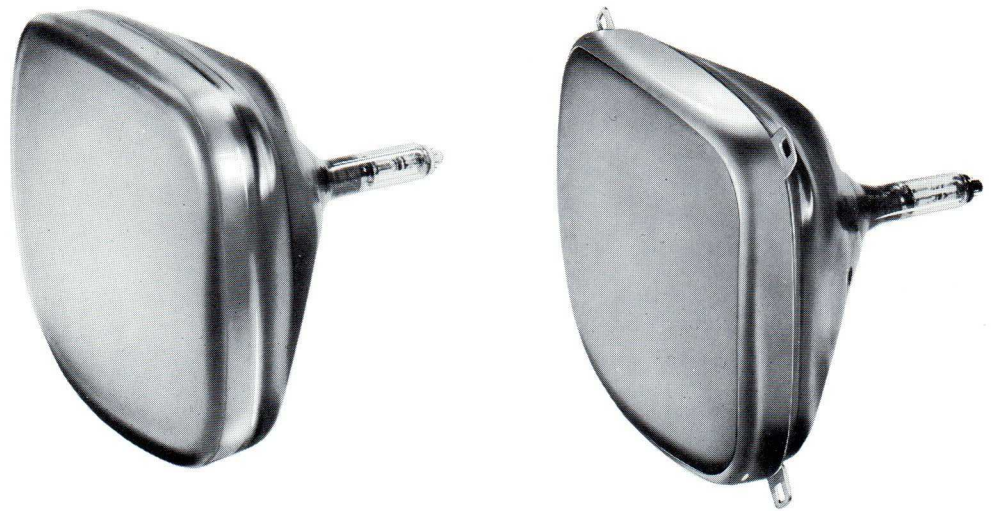
TYPICAL OPERATING CONDITIONS

Final accelerator voltage	13 kV	Heater	$V_f = 11 \text{ V}, I_f = 68 \text{ mA}$
First accelerator voltage	350 V	Overall length	max. 250 mm
Grid No. 1 voltage	-46 to -91 V	Neck diameter	20 mm
Resolution at screen centre	min. 850 lines	Base	7 p. miniature

M36-11W, M36-16W

Rectangular picture tube for use as precision monitor;

36 cm (14") screen diameter,
90° deflection angle,
metal-backed screen,
low-wattage heater,
integral protection (M36-16W only).



TYPICAL OPERATING CONDITIONS

Final accelerator voltage	16 kV	Heater	$V_f = 11 \text{ V}, I_f = 68 \text{ mA}$
First accelerator voltage	600 V	Overall length	max. 317 mm
Grid No. 1 voltage	-43 to -98 V	Neck diameter	28 mm
Resolution at screen centre	min. 650 lines	Base	B8H

M36-13W

Rectangular picture tube for use as industrial monitor;

36 cm (14") screen diameter,
110° deflection angle,
metal-backed screen.



TYPICAL OPERATING CONDITIONS

Final accelerator voltage	16 kV	Heater	$V_f = 6.3 \text{ V}, I_f = 300 \text{ mA}$
First accelerator voltage	400 V	Overall length	max. 268.5 mm
Grid No. 1 voltage	-40 to -85 V	Neck diameter	28 mm
Resolution at screen centre	min. 625 lines	Base	B8H

TUBES FOR SPECIAL APPLICATIONS

MC13-16, MK13-16

13 cm (5") flying spot scanner tubes;

useful screen diameter min. 108 mm,
high resolution,
40° deflection angle,
magnetic deflection,
magnetic focusing,
metal-backed screen.

MC13-16 with purplish blue phosphor of very short persistence.

MK13-16 with green phosphor of short persistence.



TYPICAL OPERATING CONDITIONS

Accelerator voltage	25 kV	Heater	$V_f = 6.3 \text{ V}$, $I_f = 300 \text{ mA}$
Grid No. 1 voltage	-50 to -100 V	Overall length	max. 347 mm
Resolution at screen centre	1000 lines	Base	duodecal 7 p.

MW13-38, MG13-38 MY13-38 MU13-38

13 cm (5") projection tubes;

useful screen area 92 x 69 mm²,
47° deflection angle,
high brightness,
magnetic deflection,
magnetic focusing.

MW13-38 for large screen projection of black and white television pictures.

MG 13-38 } for large screen projection of colour television
MY 13-38 } pictures.
MU 13-38 }



TYPICAL OPERATING CONDITIONS

Accelerator voltage	50 kV	Heater	$V_f = 6.3 \text{ V}$, $I_f = 300 \text{ mA}$
Grid No. 1 voltage	-100 to -170 V	Overall length	max. 374 mm
		Base	duodecal 7 p.

SCREEN PHOSPHORS AND EQUIVALENTS

Designation		Colour			Persistence	Typical use
Pro-Electron		Jedec	Fluorescence	Phosphorescence		
new	old					
BE	B	P11	blue	blue	medium short	oscillography and photography
GH	H	P31	green	green	medium short	general purpose oscillography
GJ	G	P1	yellowish-green	yellowish-green	medium	general purpose oscillography
GM	P	P7	purplish-blue	yellowish-green	long	low-speed oscillography
GP	N	P2	bluish-green	green	medium short	medium-speed oscillography, photography
BA	C	—	purplish-blue	— —	very short	flying spot scanners
GE	K	P24	green	green	short	flying spot scanners
W	W	P4	white	— —	medium short	television and monitoring devices

COMPLETE TYPE RANGE AND STATUS CODE

Status code:

N: new design type.

Recommended for new designs, but not necessarily available in full production quantities at the date this Survey is published.

D: design type.

Recommended for design and available in full production quantities.

C: current type

Available for equipment production and for replacement.
Not recommended for design.

M: maintenance type.

Available for maintenance only.

O: obsolescent type

Available until stocks are exhausted.

Type No.	Phosphors	Status	Type No.	Phosphors	Status
D.3-91	H	D	D13-24 . .	BE	O
D.7-5	B, G, P	C	D13-26 . .	BE, GH, GM, GP	D
D.7-6	B, G, P	C	D13-26 . ./01	BE, GH, GM, GP	D
D.7-11	B, H, N, P	D	D13-27 . .	BE, GH, GM, GP	D
D.7-31	G	D	D.13-32	G, H, P	M
D.7-32	G	D	D.13-34	B, G, H, N, P	M
D.7-36	B, G, N, P	M	D.13-78	H, N	M
D.7-78	B, H, N, P	D	D13-49 . .	BE	D
D7-190 . .	GH, GM, GP	N	D13-450 . ./01	GH	N
D.10-2	G	O	D13-480 . .	GH, GM, GP	N
D.10-3	G	O	D13-500 . ./01	BE, GH	N
D.10-5	G	O	D14-120 . .	BE, GH, GM, GP	N
D.10-6	B, G, P	M	D14-121 . .	BE, GH, GM, GP	N
D10-11 . .	BE, GH, GM, GP	C	E10-12 . .	BE, GH, GM, GP	D
D10-12 . .	BE, GH, GM, GP	C	E10-130 . .	BE, GH, GM, GP	N
D.10-74	G	M	M.6-2	G, U, Y	O
D.10-78	B, H, N, P	M	M.13-16	C, K	D
D10-160 . .	GH, GM, GP	N	M.13-38	G, U, Y, W	D
D10-170 . .	BE, GH, GM, GP	N	M17-140.	W	N
D.13-2	B, G, P	M	M17-141.	W	N
D13-15 . .	BE, GH, GM, GP	M	M21-11.	W	D
D13-16 . .	BE, GH, GM, GP	C	M21-12.	W	D
D13-16 . ./01	GH, GM	C	M28-12.	W	C
D13-19 . .	GH, GM, GP	O	M36-11.	W	D
D13-21 . .	BE, GH, GM, GP	C	M36-13.	W	D
D13-23 . .	GH	D	M36-16.	W	N

Other phosphors are available to special order.

