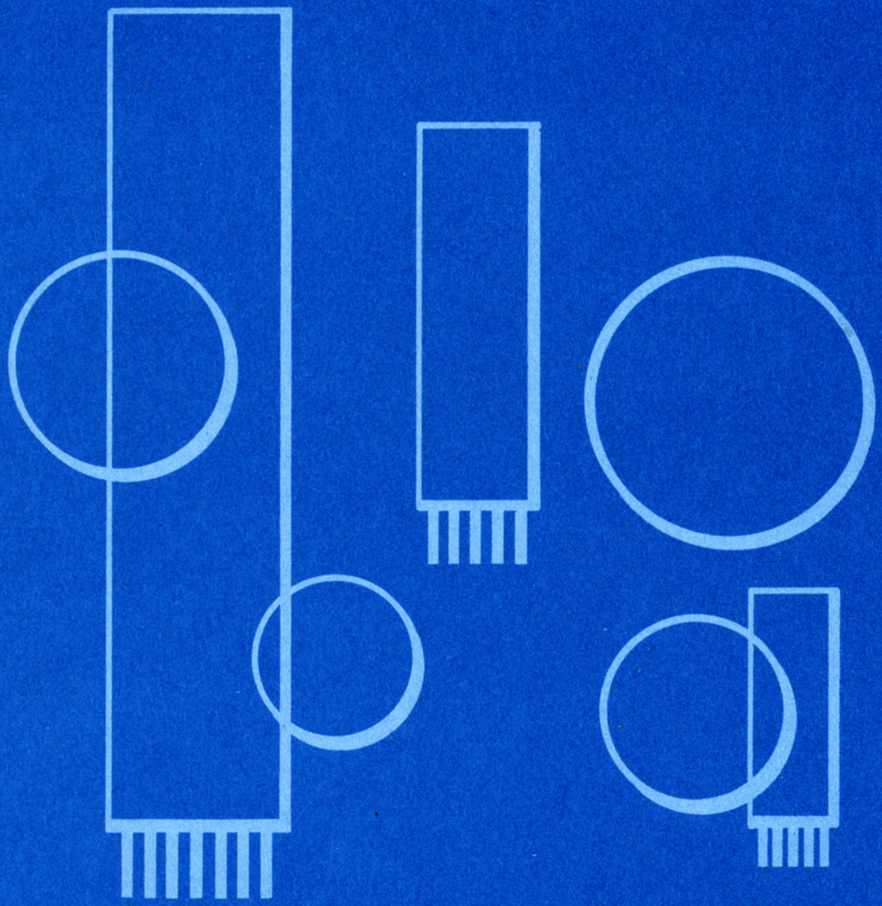
Amperex®



vidicon/newvicon®/sivicon® camera tubes

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General Operational Notes – Camera Tubes and Vidicons

A. Principles of Operation of Vidicons with Magnetic Focusing; Magnetic Deflection

1. With integral mesh

Mechanical design

The schematic arrangement of the vidicon with its accessories is shown in Fig. 1.

The vidicon may be assumed to consist of three sections, namely the electron gun, the scanning section, and the target section.

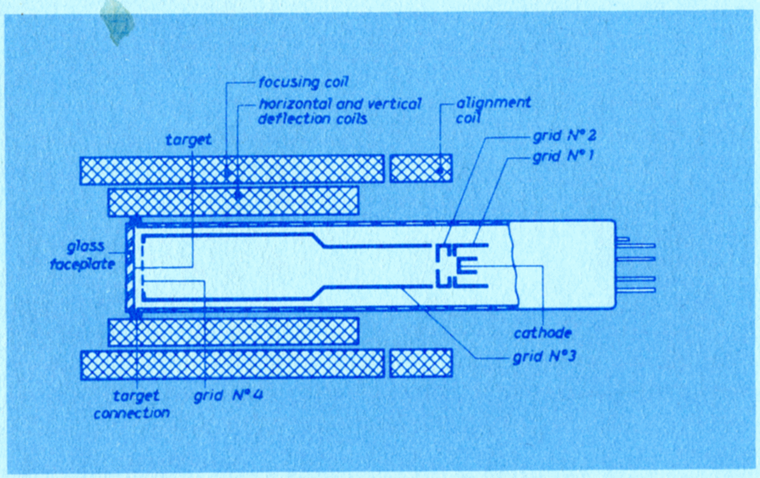

Fig. 1. Schematic – electrode and coil arrangement

The electron gun contains a thermionic cathode, a grid g_1 controlling the beam current, and a limiter electrode g_2 which accelerates the electrons and releases them in a fine beam through its diaphragm.

The scanning section. The electron beam released by g_2 enters the space enclosed by the cylindrical electrode g_3. By means of the combined action of the adjustable electrical field of g_3 (beam focus control) and a fixed axial magnetic field produced by the focusing coil, the electrons are focused in one loop on to the target.

The far end of the g_3 cylinder is closed with a fine metal mesh, g_4, electrically connected to g_3, which produces a uniform, decelerating field in front of the target. The focused beam is magnetically deflected by two pairs of deflection coils so that it scans the target. Proper alignment of the beam with the axial magnetic field is achieved by either an adjustable magnet, or, as shown in Fig. 1, by two sets of alignment coils producing an adjustable transverse magnetic field.

The target section. The external signal-electrode ring is connected via a load resistor to a positive voltage in the order of 40 V (see Fig. 2).

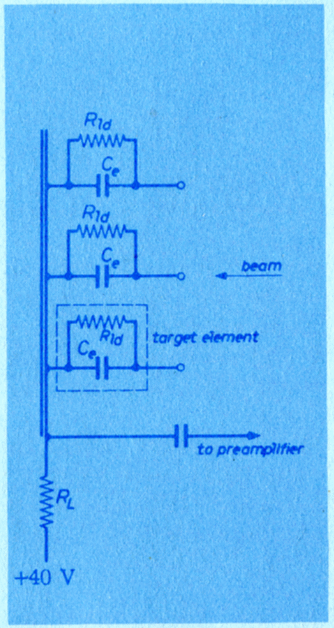

Figure 2.

The target may be assumed to consist of a large number of target elements corresponding to the number of picture elements. Each target element consists of a small capacitor (C_e), connected on one side to the signal electrode via the transparent film and shunted by a light-dependent resistor (R_{ld}), see Fig. 3).

When the target is scanned by the beam its surface will be "stabilized" at approximately the cathode potential (low-velocity stabilization) and a potential difference will be established across the photoconductive layer, in other words, each elementary capacitor will be charged to nearly the same potential as applied to the electrode ring.

In the dark, the photoconductive material is a fairly good insulator, so that only a minute fraction of the charge of the elementary capacitors will leak away between successive scans. This charge will be restored by the beam; the resulting current to the signal electrode is termed "dark current".

2. With a separate mesh construction

The focus coils commonly used in vidicon cameras do not produce an ideal focus field distribution in the vicinity of the vidicon's photoconductive target.

The resulting "landing errors" of the scanning beam reduce the sensitivity and resolution at the periphery of the picture. The beam landing errors can be corrected by electron-optical means. A lens for this purpose may be formed by the cylindrical electrode (g_3) and the mesh electrode (g_4). In the vidicons with a separate mesh electrode g_4 is electrically insulated from g_3 and connected to a separate base pin.

The mesh electrode (g_4) should be made positive with respect to the cylindrical electrode (g_3); the optimum potential difference depends on:

a. the operating mode of the vidicon (choice of the focusing field and V_{g3});
b. the particular type of deflection coil unit used.

As a rule, to obtain the best resolution and most uniform whites the V_{g4} should be from 1.3 to 1.5 times higher than V_{g3}.

Caution. If the camera wiring has been adapted for the use of vidicons with separate mesh, insertion of an integral-mesh vidicon will result in normal performance of the tube and do no harm to the tube or the wiring of the camera. However, it should be remembered that the insertion of a separate-mesh vidicon in an unmodified camera may be detrimental to the vidicon, its target being damaged by ion bombardment; moreover, performance will be unsatisfactory.

B. Antimony Trisulfide Vidicon (Sb_2S_3)

The general purpose camera tube used in industrial, medical, broadcast and consumer equipment.

C. Sivicon (Silicon Vidicon)

Vidicon TV camera tube with a photosensitive target consisting of a mosaic array of silicon planar diodes.

This pick-up tube features a wide spectral response (including near infrared), high resolution, low dark current and lag, and long life with freedom from internal X-ray deterioration when operated at typical vidicon electron gun voltages.

NOTE: If the tube is applied in cameras originally designed for vidicon tubes, the automatic sensitivity control circuitry should be made inoperative and the signal electrode voltage set to value indicated on test sheet.

D. Newvicon

This television camera tube has a photoconductive target composed of cadmium and zinc tellurides featuring high resolution and an extremely high sensitivity.

NOTE: If the tube is applied in cameras originally designed for vidicon tubes, the automatic sensitivity control circuitry should be made inoperative and the signal electrode voltage set to value indicated on test sheet.

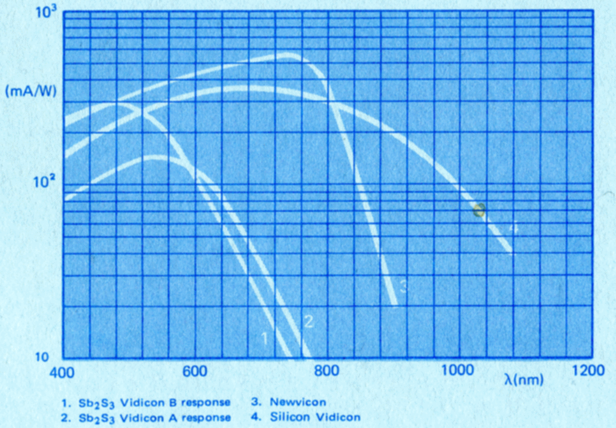

Figure 3. Typical Spectral Response Curves

E. Instructions for Use

Vidicons with Magnetic Focusing and Magnetic Deflection

1. In the case of a separate-mesh vidicon make certain that the camera is adapted for separate-mesh vidicons.
2. Clean the faceplate of the tube.
3. Insert the tube in the deflection unit so that the direction of the horizontal scan is essentially parallel to the plane defined by the short index pin and the longitudinal axis of the tube.
4. Press the socket firmly onto the base pins.
5. Cap lens and close iris.
6. Set: (a) grid No. 1 bias control at maximum negative bias (beam cut-off)
   (b) signal-electrode voltage to the voltage specified on the data sheet
   (c) scanning amplitude to maximum scan.
7. Switch on camera equipment and monitor; allow a few minutes for heating up.
8. Adjust monitor to produce a faint, non overscanned, raster.
9. Direct camera to the scene to be televised and uncap lens.
10. Turn grid No. 1 bias-control slowly till a picture is produced on the monitor. If this picture appears washed out, increase beam current. If the picture is too faint, increase lens aperture.
11. Adjust beam focus (V_{g_3}, V_{f4} for integral-mesh tubes, V_{g4} for separate-mesh tubes) and optical focus alternately for best possible focus.
12. Adjust scanning amplitudes:
    (a) by means of a mask, which is in contact with and centered at the faceplate, decrease horizontal and vertical deflecting currents till the periphery of this mask is just outside the raster on the monitor. This procedure may be facilitated by small adjustment of the centering controls;
    (b) If no mask is available, direct the camera to a test chart having correct aspect ratio (3 : 4) and adjust the centering controls in such a way that the target ring is just visible in the corners of the picture. Adjust distance from camera to test chart and optical focus alternately till the picture of the test chart completely fills the scanned raster on the monitor.
13. Adjust alignment controls so that the center of the picture does not move when beam focus (V_{g3} and V_{g4} for integral-mesh tubes, V_{g3} for separate mesh tubes) is varied.
14. Cap lens and adjust signal-electrode voltage to such a value that further increase would cause the background signal to become objectionally high or non-uniform.
15. Uncap lens. Adjust beam focus control for optimal picture uniformity in respect of picture whites and resolution.
16. Adjust iris for a picture of sufficient contrast and adjust beam current to the minimum value which will give details in the picture highlights.
17. Check alignment, beam focus and optical focus.

Antimony Trisulfide Vidicons

Type	Length mm/in.	Mesh Construction I - Integral S - Separate	Out-Line Dwg.	Focus-ing Method	Deflec-tion Method	Max Image Size mm (Scan diagonal)	Heater		TYPICAL OPERATION CONDITIONS (2854K Source) Sensitivity			Response (4 x 3 Aspect)			Application Remarks
							Current (mA)	Power (Watts)	Photo Con-ductor (See Fig. 3)	At Dark Current (nA)	Output Signal nA at F.C.	At Mesh Voltage	Amp Response at 400TV Lines/PH (%)	Limiting Resolution (TV-Lines) or (Line Pair/mm)	
XQ1031	130 5.118	I	1	M	M	16	95	0.6	2 (A. Resp)	20	200 at 0.5	300	40	600	1" Broadcast or Critical application
XQ1032	130 5.118	I	1	M	M	16	95	0.6	2 (A. Resp)	20	200 at 0.5	300	40	600	1" Industrial or non-critical application
7735B	159 6.260	I	2	M	M	16	600	3.8	2 (A. Resp)	20	300 at 1	300 750	30 45	700 800	1" Broadcast application
7735A	159 6.260	I	2	M	M	16	600	3.8	2 (A. Resp)	20	270 at 1	300	30	700	1" High Quality Industrial
7735	159 6.260	I	2	M	M	16	600	3.8	2 (A. Resp)	20	240 at 1	300	30	700	1" Industrial or non-critical application
XQ1240/ 4809B	159 6.260	S	2	M	M	16	95	0.6	2 (A. Resp)	20	200 at 1	425 950	50 65	750 1000	1" Broadcast for Blue Channels (Film Chain)
XQ1240/ 4846B	159 6.260	S	2	M	M	16	95	0.6	2 (A. Resp)	20	200 at 1	425 950	50 65	750 1000	1" High Quality Industrial
XQ1240/ 4809	159 6.260	S	2	M	M	16	95	0.6	2 (A. Resp)	20	200 at 1	425 950	50 65	750 1000	1" Broadcast or Critical applications, (Film Chain)
XQ1240/ 8507A	159 6.260	S	2	M	M	16	95	0.6	2 (A. Resp)	20	200 at 1	425 950	50 65	750 1000	1" High Quality Industrial
XQ1241/ 8541A	159 6.260	S	2	M	M	16	95	0.6	2 (A. Resp)	20	200 at 1	425 950	50 65	750 1000	1" High Quality Industrial
XQ1241/ 8507	159 6.260	S	2	M	M	16	95	0.6	2 (A. Resp)	20	200 at 1	425 950	50 65	750 1000	1" Industrial or non-critical application
XQ1241/ 8541	159 6.260	S	2	M	M	16	95	0.6	2 (A. Resp)	20	200 at 1	425 950	50 65	750 1000	1" Industrial or non-critical application
XQ1241/ 4846	159 6.260	S	2	M	M	16	95	0.6	2 (A. Resp)	20	200 at 1	425 950	50 65	750 1000	1" High Quality Industrial
XQ1240	159 6.260	S	2	M	M	16	95	0.6	2 (A. Resp)	20	200 at 1	425 950	50 65	750 1000	1" X-Ray (Medical & Industrial)
XQ1241	159 6.260	S	2	M	M	16	95	0.6	2 (A. Resp)	20	200 at 1	425 950	50 65	750 1000	1" High Quality Industrial
XQ1280	159 6.260	S	3	M	M	16.2	95	0.6	1 (B. Resp)	20	300 at 1	425 950	–	60LP/mm	1" Medical or Industrial X-Ray Equipment
XQ1285	159 6.260	S	4	M	M	15.8	95	0.6	1 (B. Resp)	20	300 at 1	425 950	–	50LP/mm	1" Medical or Industrial X-Ray Equipment with Fiber Optic Faceplate

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Antimony Trisulfide Vidicons Cont'd

Type	Length mm/in.	Mesh Construction I - Integral S - Separate	Out-Line Dwg.	Focus-ing Method	Deflec-tion Method	Max Image Size mm (Scan diagonal)	Heater Current (mA)	Heater Power (Watts)	TYPICAL OPERATION CONDITIONS (2854K Source) Sensitivity: Photo Con-ductor (See Fig. 3)	Sensitivity: At Dark Current (nA)	Sensitivity: Output Signal nA at F.C.	Response (4 x 3 Aspect): At Mesh Voltage	Response (4 x 3 Aspect): Amp Response at 400TV Lines/PH (%)	Response (4 x 3 Aspect): Limiting Resolution (TV-Lines) or (Line Pair/mm)	Application Remarks
XQ1270/ 20PE11	108 4.235	S	5	M	M	11	95	0.6	2 (A. Resp)	20	150 at 1	400	35	500	2/3" Industrial and consumer CCTV applications
XQ1271/ 20PE13	108 4.235	S	5	M	M	11	95	0.6	2 (A. Resp)	20	150 at 1	400	35	500	2/3" Industrial and consumer CCTV applications
XQ1272/ 20PE14	108 4.235	S	5	E	M	11	95	0.6	2 (A. Resp)	20	150 at 1	600	35	500	2/3" Industrial CCTV applications with electrostatic focus

Newvicons

XQ1440/ S4076	159 6.260	S	6	M	M	16	95	0.6	3	–	240 at 0.5	500	50	800	1" Industrial CCTV application
XQ1442/ S4093	160 6.299	S	7	M	M	16	95	0.6	3	–	240 at 0.5	500	50	650	1" Industrial CCTV application with fiber optic faceplate
XQ1274/ S4075	108 4.235	S	5	M	M	11	95	0.6	3	–	260 at 0.5	400	50	800	2/3" Industrial CCTV application
XQ1275/ S4092	108 4.235	S	5	E	M	11	95	0.6	3	–	260 at 0 5	35 to 55	40	600	2/3" Industrial CCTV application with electrostatic focus

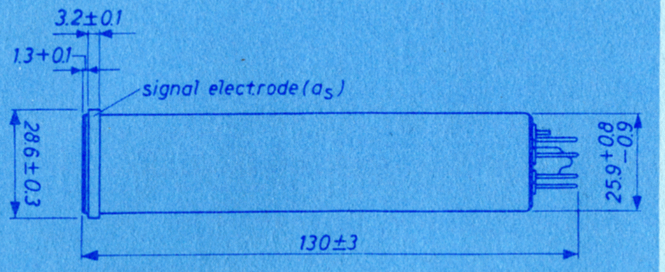
Silicon Vidicons

S1200	159 6.260	S	6	M	M	16	95	0.6	4	–	550 at 0.1	350	45	750	1" Broadcast or High Quality Industrial CCTV
S1201	159 6.260	S	6	M	M	16	95	0.6	4	–	550 at 0.1	350	40	700	1" Industrial CCTV
S1202	159 6.260	S	6	M	M	16	95	0.6	4	–	550 at 0.1	350	40	700	1" Industrial CCTV application

Intensified Silicon Vidicons are available, contact your nearest Amperex Sales Office (listed on back cover).

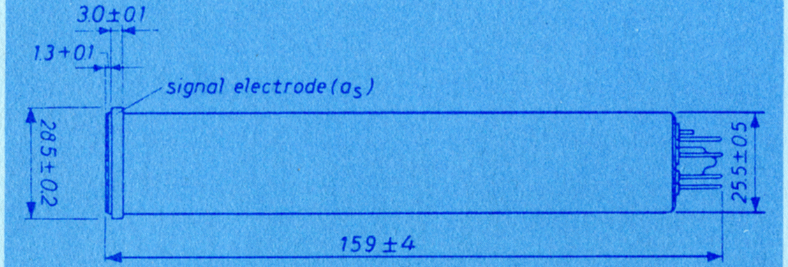
Deflection and Focusing Coil Units

Type	Max. Out Side Dia. (MM)	Overall Length (MM)	Weight (g)	Inductance (mH) Line Deflection Coils	Inductance (mH) Frame Deflection Coils	Resistance (ohms) Line Deflection Coils	Resistance (ohms) Frame Deflection Coils	Resistance (ohms) Focus Coil	Current (mA) Line Deflection Coils	Current (mA) Frame Deflection Coils	Current (mA) Focus Coils	Tube Diameter	Remarks
AT1102/01	55.2	139	536	0.95	27	2.6	84	3770	250 p-p	34 p-p	23	1"	Front load, for B/W applications
AT1103	57.4	140	576	0.97	22	2.4	68	150	210 p-p	32 p-p	110	1"	Front load, for B/W applications
AT1116	60.4	136.7	615	0.78	28	2.4	62	149	300 p-p	43 p-p	105	1"	Front load, for B/W and color applications
KV-12	46	84	300	0.86	28.7	3.2	146	55	160 p-p	25 p-p	120	2/3"	Front load, for B/W applications
KV-19G	30	80	56	0.9	23	4.6	146	–	160 p-p	25 p-p	–	2/3"	Front load, "Electro-Magnetic" for B/W applications



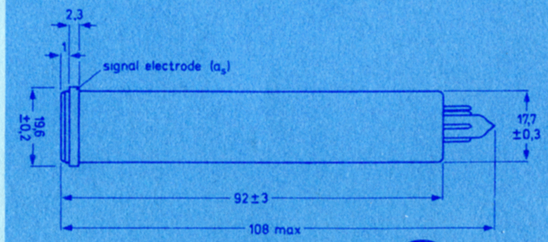
1

MECHANICAL DATA
Mounting position: any
Weight: approx. 50 g
Base: JEDEC no. E8-11, IEC 67-I-33a



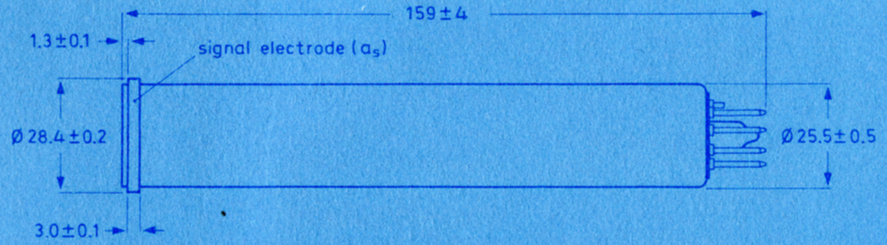
2

MECHANICAL DATA
Mounting position: any
Weight: approx. 55 g
Base: JEDEC no. E8-11 except for pumping stem IEC 67-I-33a



5

MECHANICAL DATA
Mounting position: any
Weight: approx. 18 g
Base: Small button miniature 7-pin (IEC 67-I-10a, JEDEC E7-1) with pumping stem.



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MECHANICAL DATA
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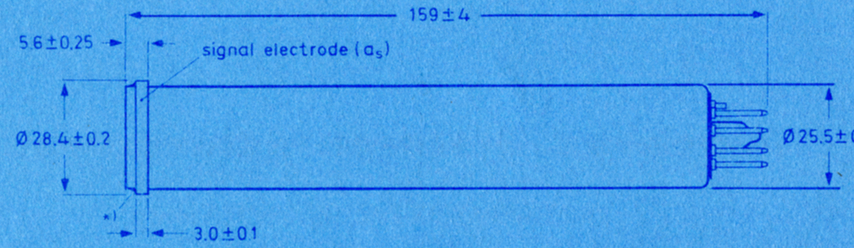
Base: IEC 67-I-33a (JEDEC E8-11)



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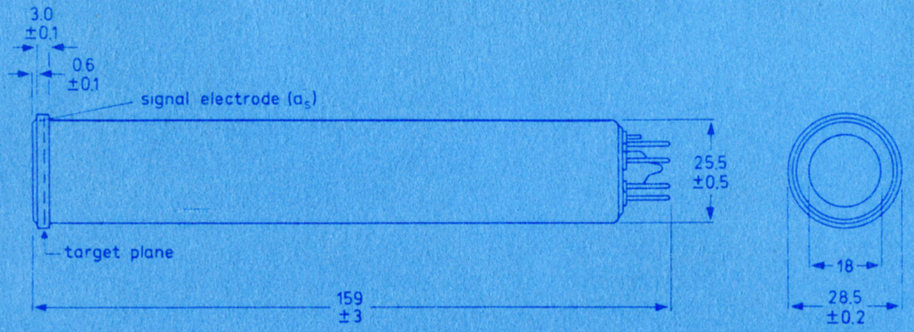
Mounting position: any
Weight: approx. 55 g
Base: JEDEC E8-11: IEC67-1-33a



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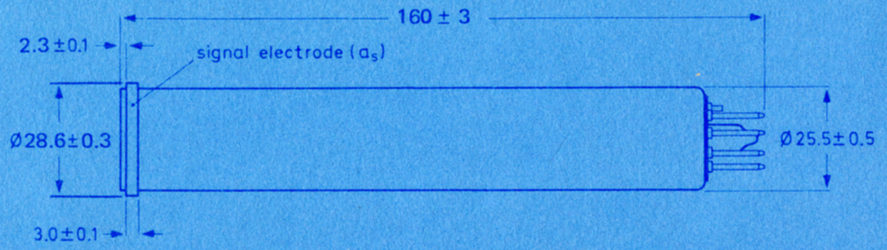
MECHANICAL DATA
Mounting position: any
Weight: approx. 55 g
Base: JEDEC E8-11 except length of stem



7

MECHANICAL DATA
Mounting position: any
Weight: approx. 60 g
Base: IEC 67-I-33a (JEDEC E8-11) except for pumping stem

Tube Outline Drawings

DIMENSIONS IN MM

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