

EM 1 Electronic indicator

The electronic indicator EM 1 is designed on the lines of a high vacuum tube and is thus able to react without the slightest lag. It consists essentially of the virtual indicator itself, comprising a cathode, anode (screen or target) and four deflection plates. The anode is conical in shape and is coated on the inside with a fluorescent substance, the glow of this fluorescent screen, caused by the electrons striking it, being visible from the end of the valve. Between the cathode and this screen there are four deflection plates, mounted radially, which, as their name implies, exert a deflecting effect upon the electrons passing to the screen. In this way the screen, which is connected directly to the positive high-tension line of the receiver, gives rise to four bands of shadow of variable width.

In a normal receiver circuit the tuning to the desired transmitting station is set to give maximum width of the lighted sectors.

The lower part of the electronic indicator consists of a triode which amplifies the variable control voltage from the automatic gain control circuit, and the anode of this triode is connected internally to the deflection plates and externally, through a resistor of 2 megohms, to the positive side of the H.T. supply.

The variable control voltage on the grid produces variations in potential at the anode and therefore also on the deflector plates, thus varying the width of the sectors of light.

The EM 1 can be used equally well in 6.3 V A.C. receivers, car-radio sets and A.C./D.C. models with their heaters fed in series. Since the direct voltage on the fluorescent screen must not drop below 200 V, however, the use of this tube in A.C./D.C. sets is limited to those working on 220 V D.C. without voltage doubling, A.C. 220 V mains, and 110 V A.C. mains with voltage doubling.



Fig. 1
Dimensions in mm.

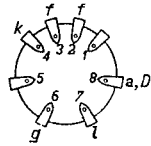
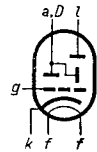


Fig. 2
Arrangement of electrodes and base connections.

HEATER RATINGS

Heating: indirect by A.C. or D.C., series or parallel supply.

Heater voltage $V_f = 6.3 \text{ V}$
 Heater current $I_f = 0.200 \text{ A}$

OPERATING DATA

Supply voltage	$V_b = 200 \text{ V}$	250 V
Anode series resistor	$R_a = 2 \text{ M ohms}$	2 M ohms
Grid bias for smallest angle of light sector	$V_g = 0 \text{ V}$	0 V
Grid bias for largest angle of light sector	$V_g = -4 \text{ V}$	-5 V
Anode current at $V_g = 0 \text{ V}$	$I_a = 75 \mu\text{A}$	95 μA
Anode current at $V_g = -4 \text{ V}$ or -5 V	$I_a = 20 \mu\text{A}$	21 μA
Screen current at $V_g = 0 \text{ V}$	$I_l = 0.13 \text{ mA}$	0.13 mA
Screen current at $V_g = -4 \text{ V}$ or -5 V	$I_l = 0.14 \text{ mA}$	0.14 mA
Angle of light at the edge of the screen, measured at $V_g = 0 \text{ V}$	$\beta = 20^\circ$	16°
Angle of light at the edge of the screen, measured at $V_g = -4$ and -5 V	$\beta = 90^\circ$	90°

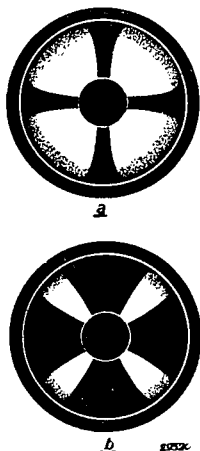


Fig. 4
a. Width of light sectors on the fluorescent screen with a high bias on the grid of the triode section.
b. The same on a low grid bias.

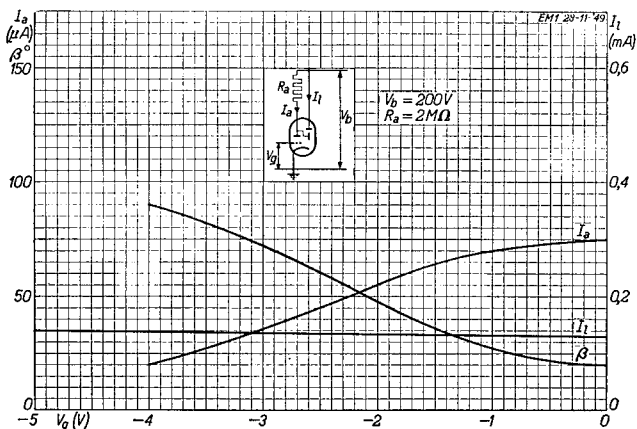


Fig. 3
Anode current of the triode section, I_a , current on fluorescent screen I_1 , and light angle β measured at the edge of the screen, as functions of the grid bias, at $V_b = 200$ V.

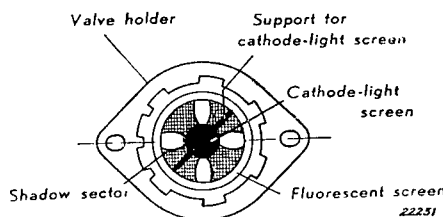


Fig. 5
Top view of the indicator in the holder. The support for the cathode-light screen indicates the position of the cross.

MAXIMUM RATINGS

- $V_{a0} = \text{max. } 550$ V
- $V_a = \text{max. } 250$ V
- $V_{l0} = \text{max. } 550$ V
- $V_l = \text{max. } 250$ V¹⁾
- $R_{fk} = \text{max. } 5,000$ ohms
- $R_{gk} = \text{max. } 2.5$ M ohms
- $V_{fk} = \text{max. } 100$ V²⁾

¹⁾ Allowing for 10 % over-voltage of the mains.
²⁾ Direct voltage or effective value of alternating voltage.

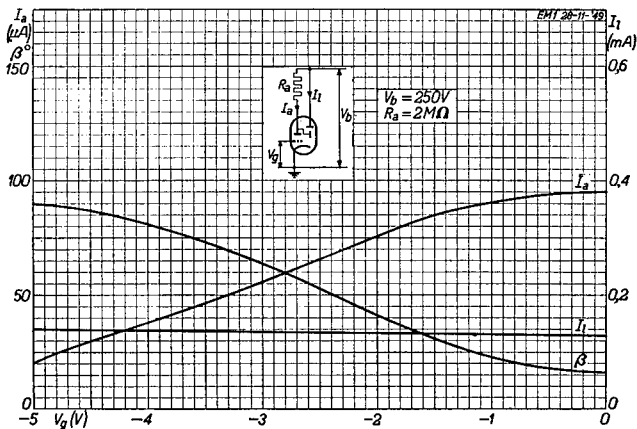


Fig. 6
Anode current of the triode section I_a , current on fluorescent screen I_1 , and light angle β measured at the edge of the screen as functions of the grid bias, at $V_b = 250$ V.