Microprocessor based glossmeter

R H Suresh Bapu, N U Nayak, C Srividya Rajagopalan, M Razia Begum, K Andal and Y Mahadeva Iyer

Central Electrochemical Research Institute, Karaikudi - 623 006, INDIA

Gloss or surface brightness is of considerable importance in plating/finishing industry. To evaluate a bright plating bath or to examine the decolouration of painted surfaces due to corrosion, it is very important to make gloss measurements on the surfaces. The developed instrument measures the brightness of plated/finished samples in comparison with a standard. The digital output displays the number of measurements made on the surface, the average brightness value, the maximum brightness value and the minimum brightness value.

Key words: Glossmeter, microprocessor, specular gloss

INTRODUCTION

S urface brightness or gloss is a physiological sensation. There are many varieties of gloss of which specular gloss is the most important in metal finishing and corrosion research and industry. The specular gloss is defined as the ratio of the intensity of the reflected light to the specular gloss standard at the same angle of incidence. Glossmeters use a gloss standard with which the intensity of the reflected light is adjusted to 100°. The measuring head is then placed on the surface under test and the reading is read as the percentage gloss. The most common angles of incidence and reflection used in the brightness measurements are 20°, 45° and 60° measured from the normal to the surface of the specimen. 20° angle is used for very bright specimens, 45° angle for medium bright surfaces and 60° for matt or dark surfaces.

INSTRUMENT

The block schematic of the instrument is given in Fig. 1. The measuring head consists of a stabilised light source from which the light is incident at an angle of 45° on the specimen placed below the head. A light dependent resistor (LDR) properly aligned to receive the reflected light at 45° angle from the specimen senses the intensity of specular reflection. The signal from the LDR is processed and amplified. The amplified signal is fed to an 8 bit A/D converter, ADC 8700 which has a conversion time of 2 ms. The digital data of the ADC is connected to the port 'A' of 8255 programmable peripheral interface. The 'initiate conversion' and 'buzy' pins of 8700 are connected to Port 'C' of 8255. The light source is connected to Port 'C' through a driver. The CPU used in the system is Intel 8085. A 2716 EPROM of 2K memory is connected by memory maping. Two RAM chips (2114A) are used to get 1K Read/Write memory. Six momentary contact keys and six seven segment displays are connected to a programmable keyboard/display interface, 8279 through decoders/drivers.

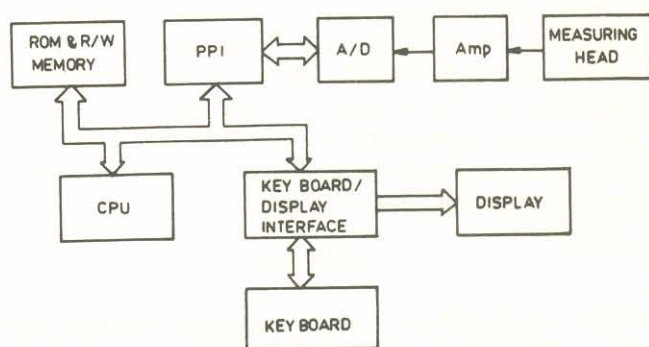The flow chart for the instrument is given in the Fig. 2.
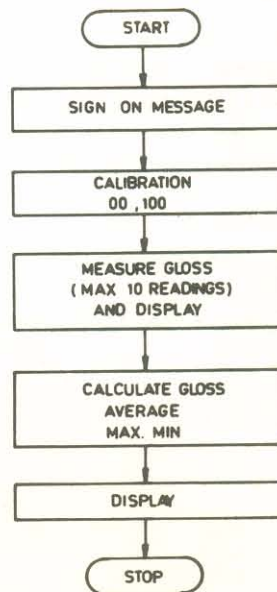

Fig. 1: Block schematic

Fig. 2: Flow chart

OPERATION/FUNCTIONAL DESCRIPTION OF THE INSTRUMENT .

The instrument has six keys for the user operation. When the instrument is switched on, it will display "Brit μp" message. Then the measuring head is placed on the gloss standard and the 'CAL' key is pressed. The instrument will display 'CA' and it will be in the calibration mode. The 'Zero' knob is adjusted to get 00 on the display. Again 'CAL' key is pressed and 'CAL' knob is adjusted to display 100. Now the measuring head is placed on the specimen to be evaluated. The 'MEAS' key is pressed. The instrument will display both the trial number and the surface reflectivity. The measuring head is placed at different places on the sample and instrument displays each trial number and corresponding reflectivity. The above readings are also stored in the Read/Write memory. On pressing hi, LO, AE keys, the instrument will display the highest, lowest and average reflectivity values. On pressing 'RST' key the instrument will be ready to measure on other specimens.

The instrument is calibrated using the standards for specular gloss measurements.

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