Miniature elapsed time indicator

Data Sheet

RS stock number 258-164

The RS miniature elapsed time indicator is a small and inexpensive, low power consumption device which is essentially a small sealed mercury electrolysis unit. It consists of a short length of capillary tube with two columns of mercury separated by a droplet of electrolyte. Positioned in the electrolyte is a solid index which ensures mechanical separation of the two columns of mercury when subjected to shock or vibration. Electrical connection to the mercury is made by electrodes mounted on to end caps of a standard 11/4" glass cartridge fuse case in which the capillary tube is mounted. The device is ideal for mounting into RS fuse holder e.g. (RS stock no. 418-625), or direct mounting to PCB's utilising leads attached to the end caps.

Specification

Maximum dc current _____ 85µA
Minimum dc current _____ 0.6µA
Maximum full scale time range _____ 10000 hrs.
Minimum full scale time range _____ 100hrs.
Reading accuracy _____ ±5%

Operation

When a dc potential is connected across the device current flows through the product and electrochemically transfers mercury from the anode to the cathode. The rate at which mercury is transferred is proportional to the amount of current flowing through the device. Hence, the anode will shorten and the cathode will lengthen, moving the index along the length of tube. If a constant current is used, the amount of mercury electrochemically transferred from anode to cathode is proportional to the length of time the current is applied. Full scale times of 100-10000hrs. may be selected, simply by connecting an appropriate series resistor to limit the current through the device.

Device consumption for

1000hrs full scale travel_____ ____2mW
Device current (dc) for a
full scale travel of 1000hrs_____6.77µA
Device current (It) for other full scale times is given by:

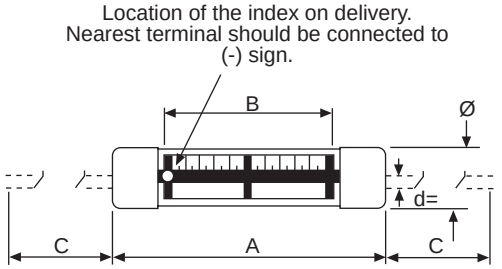
$$I_t = 6.77 \times \frac{1000\mu A}{T} \qquad \text{Eq.1}$$

where T = required full scale time.

Features

- Low cost
- Reversible
- Low power consumption
- Very small size
- Convenient 11/4" glass cartridge fuse type package.

Dimensions



A±1	B±0.1	C min.	Ø±1	d±0.1
32	16.5	40	6.35	0.8

Resetting

To reset the device to zero, apply a reverse polarity current of 85µA.

N.B.

The electrolyte droplet should always be kept within the scale of the device. If the device is allowed to considerably over run the scale range, bringing the electrolyte in contact with one electrode ie. all of the mercury in one column is transferred to the other, the device will permanently cease to function. However, the devise is normally resettable simply by reversing the polarity of the supply.

Applications

The device has many uses, some of which are listed below:-

M.T.B.F./reliability measurement

Because of the low cost and small size of these devices, they will find uses where the traditional methods of time recording make the costs uneconomical or overall size/power consumption too high. Thus, it is possible to gain more information concerning life times of individual components or assemblies.

Warranty by actual hours of use

By mounting the product inside a piece of equipment, the device will provide a visual record of actual hours of use. Warranty periods may then by stated realistically in hours of use.

Calibration scheduling and preventive maintenance

Equipment calibration, servicing and preventive parts replacement within specified periods is essential to ensure that the equipment remains within specification during use. Indeed, catastrophic failure of some equipment can result from components being used beyond their normal life expectancy. In some instances, periodic preventive maintenance may be unnecessary when based on calendar days, if the equipment has not been used at times during that period. Therefore, RS miniature elapsed time indicators may be used to accurately determine optimum maintenance periods.

Charge and discharge monitoring

The device operates according to the quantity of electricity passing through the mercury. The increase in length of the mercury column may be defined as follows:

$L = K.C$

where C is in coulombs, and

$K = 1.477$ C/mm.

Repetitive pulse counter

Because the device is essentially a current/time integrator, it may also be used as a pulse counter (provided the pulse width is ≥1mS). The number of pulses per mm travel of the index is given by the ratio $\frac{K}{C}$

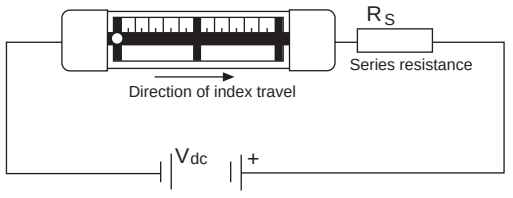
where $K = 1.477$ C/mm and

C is in coulombs

Connection to device

Typical connection:

Figure 1



Series resistor

Example of calculation of series resistor required for full scale time of 2000hrs. and Vd.c. 12V. From Eq. 1,

$$I_t = 6.77 \times \frac{1000}{2000} = 3.385\mu A$$

$$\therefore R_s = \frac{12}{3.385 \times 10^{-6}} = 3.55M\Omega$$

N.B.

Care should be taken not to apply excessive heat to the device when soldering direct to a PCB as damage to the device may occur. If the device is required to operate from an ac voltage, a diode should be connected in series with R_s and calculations should be made using the mean value.