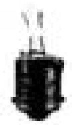
INDICATING LIGHTS



755 Lamp

LED Lamp

Stacklight LED

Stacklight Incandescent Lamp

Notes on the Application of Industrial Control Indicating Lights

This is a guide to the application of indicating lights used for industrial control. Of primary interest and concern are the factors which influence lamp life and reliability. The topics discussed are culled from application experience and questions from users.

Common Causes of Lamp Failure

There are four common causes of lamp failure:

Notching

Evaporation of the tungsten filament until a thin section breaks. In long, high voltage filaments this usually occurs at a support point located at the middle of the filament. It occurs earlier on DC than AC and less frequently on half-wave AC.

Excessive Voltage

Particularly from voltage spikes or transients. Lamp life increases (or decreases) with the 12th power of voltage reduction (or increase) while light output is affected only by about the 3.6 power of voltage reduction so a substantial life increase can be achieved with a small decrease in brightness.

Vibration and Shock

Long thin filaments are particularly vulnerable to shock and vibration.

In general, the longer filaments in higher voltage lamps are more susceptible to failure due to shock and vibration.

Excessive Heat

Excessive heat contributes to notching for incandescent lights and may melt the plastic sleeve on LED lamps.

Data on life published by lamp manufacturers is based on controlled laboratory testing in AC applications, at rated current, and at a constant rated voltage—with no consideration for the effects of transients and mechanical shock. It is not necessarily the same as service life; environmental influences may result in a shorter life.

AC Applications

Transformer Type

Energizing a low voltage lamp through a specially designed isolating transformer virtually eliminates transient voltage and voltage spike failure. Through careful design, the transformer can be matched to the lamp characteristics in such a way as to extend the life of the lamp to several times its rated life. The lower voltage lamp used in transformer type lights is also more resistant to most industrial shock and vibration. The majority of industrial installations use the transformer type light.

These transformers are designed with a magnetic coupling between the primary and secondary. This design absorbs voltage surges and supplies a constant voltage value to the lamp filament. If the lamp tries to draw more current, the secondary voltage drops to prevent this from happening.

The secondary voltage is usually set at a voltage less than the rated lamp voltage for extended lamp life with little reduction in light output. The secondary voltage must be measured with the lamp connected. Open circuit voltage will be two or three times the correct value; each lamp type will determine it's own voltage. A 10 percent reduction in voltage will almost quadruple the rated lamp life.

The 6-volt lamp (connected to the transformer secondary) has a short, thick filament that has a resonant frequency well above that of most industrial vibration. It is highly resistant to mechanical shock. The shorter filament does not require midpoint support - this reduces the effect of notching discussed earlier.

Direct Connected (Full Voltage) and Resistor Type

These types have a lower initial cost. They can be considered where the light is used infrequently so that lamp life is not an important consideration, where the AC voltage supply is exceptionally well regulated with no spikes or transients and where there is little shock or vibration. This is especially so if lamp failure is only a nuisance and is not critical to the operation. Application experience has shown that an initial low price should usually not be a primary consideration in selecting lamp types because of the high cost of frequent replacements due to voltage spikes on AC lines.

DC Applications

In DC applications the advantages of the transformer cannot be realized. The only types available are the direct connected and resistor type. Fortunately, most DC sources have excellent regulation and spikes and transients are not a factor. If there is a problem, it must be dealt with through corrective action in the power circuit. As noted earlier, notching is a more severe problem in DC so reduction of the voltage applied to the lamp is very important.