

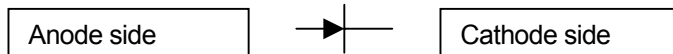
Technical Reference

Topic: Diode Application for use with Membrane Electrode Cells

Diodes are used with Membrane Electrode Cells to stop 'reverse current' conditions. Typically if 'reverse current' is occurring in an ED system, you will be able to see deposits of ED paint on the exterior surface of the membrane on the cell that is operating at a lower voltage than others cells in the same ED tank. Each ME Cells of the lower voltage zone should have its own diode.

How does a diode work? It serves as an electrical 'check valve' in which electrical current can flow in only none direction.

What symbol is used for diodes? It is an arrowhead pointing into a vertical line. The direction of electric current flow is the same as the direction of the arrowhead.



Why would there be more than one voltage in an ED tank? Most high production ED tanks such as used for automobiles have a low voltage at the beginning and a higher voltage zone towards the exit. A low voltage at the entry reduces ED paint film defects and a higher voltage at the exit insures hard to reach and/or recessed regions have sufficient ED paint film thickness.

Does a diode require heat sinks? A diode will consume about $\frac{3}{4}$ of a volt to perform its function. This voltage drop times the current passing through the diode, or watts, expresses the amount of heat generation the diode creates.

I already have diodes in the DC rectifier. Why do I need more diodes located at each ME Cell? This is a good question. Diodes are typically used in the construction of a DC rectifier. However, these diodes are generally located on the anode output and protect the internal components of the rectifier. Diodes located at an individual ME Cell will protect the cell from localized 'reverse current' occurrences.

What is the problem with a paint deposit on the external face of the membrane? First, these ED paint solids serve as a dirt generator and it also leads to an increase in the resistance of the affected cells.

How is a diode specified? Usually the diode has a rugged case (i.e. DO8) and will withstand some abuse. Its voltage rating should be twice the maximum expected, and the current rating should be twice the expected maximum.

What is a reverse polarity diode? The typical DO8 type diode has a threaded stud on one side and a flexible pigtail on the other end. The stud is part of the case and it is the cathode of the diode. For a cathode ED paint where the ME cell is the anode, the diode would be attached to a heat that is connected to the electrode (i.e. anode). If the diode is to be attached to the anode bus bar (which then also serves as the heat sink – make sure the bus bar is large enough and exposed to the ambient for cooling so it can perform this function too), then the case of the diode must be the anode and this type of diode is called a 'reverse polarity' type.

Some multi-zone ED systems do not require diodes. Why is this? Again, lets consider cathodic ED paint. If the anode bus bar is common (for all the different voltage zones) and the cathode bus bar is split, then diodes are not necessary. In other ED systems, the designer has specified a minimum distance between the last cell of the low voltage zone and the first cell of the high voltage zone. This distance which can be as much as 3 m (~10 feet) is sufficient to reduce the likelihood that the higher voltage electric current can travel far enough to create a reverse current condition(s).