

Fault Finding in Smoke Detection System SDS-2/6:

How to Test Zener Barriers

General Information

In a hazardous area means must be provided to prevent an ignition or explosion by sparks or over temperature of an electrical circuit. A typical method to realize this is the use of “intrinsic safe” circuits. In an intrinsic safe circuit the values for voltage and current are limited to safe values.

One method of limiting voltage and current of the intrinsic safe circuit is the application of zener barriers. A typical zener barrier has one or more zener diodes, which in combination with a resistor limit the voltage passing into the protected circuit. The resistor also reduces the current passing to the intrinsic safe circuit. Furthermore a fuse interrupts the circuit, if the currents exceeds a predefined value.

Zener Barrier Type Z967

In the Smoke Detection System SDS-2/6 the zener barrier Z967 is being used for the electrical circuits connected to the smoke detectors and for the (separate) circuits connected to the airflow indicators / resistor pcb.

If you are not sure, if a certain zener barrier is working properly, you can carry out the following examination steps (refer to drawing BG01.720.04 attached to this document):

1. Disconnect all wires connected to the zener barrier
2. Measure the resistance between terminals 1 and 8. You should read approx. 130 Ohm. If there is no connection between terminals 1 and 8, the fuse is likely to be broken. For safety reasons the fuse cannot be replaced. The zener barrier must be exchanged.
3. Measure the resistance between terminals 4 and 5 according step 2.
4. Measure the resistance between the terminals 1/4/5/8 and one of the four earth terminals 2/3/6/7. At each of the terminals 1/4/5/8 the zener diodes should have an extremely high resistance and probably the measuring instrument will not show any reaction for a healthy zener barrier.

If a fuse of a zener barrier is broken, the smoke detection system will display (depending on the appropriate circuit):

FAULT: Smoke Detector Line -x- or:
FAULT: Airflow Line -x-y-z-

If a zener diode does not have a high resistance under normal conditions, this could lead to false fire alarms due to increased current on that circuit (very seldom).