SELECTION GUIDE FOR OMEGA® ZENER BARRIERS FOR INTRINSIC SAFETY

OMEGA® SOLID STATE RELAYS AND ZENER BARRIERS FOR INTRINSIC SAFETY

The maximum energy possible at the switch terminals of the OMEGA® zener barriers is far below the explosive point of the most volatile surrounding gas conditions. The type of non-voltage-producing switch or sensor best fitted for the application can be used, since the entire switching circuit is rendered intrinsically safe by the OMEGA® zener barrier. Because the switching circuit is low voltage, there is no shock hazard to operating or maintenance personnel.

INSTALLATION AND MAINTENANCE

OMEGA® zener barrier units are normally installed in a safe area and connected to the sensor in a hazardous location; no explosion-proof or protective housings are needed. Units install singly in any position, or can be grouped on a common earth-grounded plate with mounting tabs to provide electrical grounding. Between 6 and 32 threaded electrical terminals are conveniently placed atop the unit housings.

<table>
<thead>
<tr>
<th>Approvals</th>
<th>Hazardous Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model No.</td>
<td>UL</td>
</tr>
<tr>
<td>Single Channel Zener Barriers</td>
<td></td>
</tr>
<tr>
<td>SBG111950</td>
<td>X</td>
</tr>
<tr>
<td>SBG111954</td>
<td>X</td>
</tr>
<tr>
<td>SBG111956</td>
<td>X</td>
</tr>
<tr>
<td>SBG113000</td>
<td>X</td>
</tr>
<tr>
<td>SBG114166</td>
<td>X</td>
</tr>
<tr>
<td>Dual Channel Zener Barriers</td>
<td></td>
</tr>
<tr>
<td>SBG54803</td>
<td>X</td>
</tr>
<tr>
<td>SBG54806</td>
<td>X</td>
</tr>
</tbody>
</table>

Note: Zener barrier model numbers SBG54803 and SBG54806 are certified by CSA for mounting inside a suitable enclosure in Div. 2 or non-hazardous locations and must be connected by means of the 2 studs provided to a grounded copper busbar or equivalent.
INTRODUCTION TO SOLID STATE SINGLE- AND DUAL-CHANNEL ZENER BARRIERS FOR INTRINSIC SAFETY

OMEGA® SINGLE-CHANNEL AND DUAL-CHANNEL ZENER BARRIERS FEATURE INTRINSIC SAFETY WITH SOLID STATE RELIABILITY—AND THESE ADDITIONAL ADVANTAGES:

✓ Installation Economy
✓ No Explosion-Proof Enclosures of any Kind Needed for Sensor Wiring
✓ Compact Size—Streamlines Multiple Installations
✓ Encapsulated Construction—Impervious to Dust and Moisture, Shock and Vibration Resistant

SINGLE- AND DUAL-CHANNEL BARRIERS

For most non-voltage-producing devices located in a hazardous area, a single zener barrier that is negative-earth-grounded (see figure 1) can be used for intrinsic safety. Instrumentation that produces an output (signal conditioners) usually requires two barriers, one for each “floating” lead. Here, a dual-channel barrier can be provided (see figure 2), or for applications in which the instrument signal return level cannot be reduced, a supply barrier and a low resistance return barrier can be supplied (see diagram 2B on page K-114).

Sensor switch may be any non-voltage-producing device. Flow and level switches, temperature switches (thermostats), pressure switches, or passive, resistive transducers or transmitters are typical.

Fig. 1 Positive single-channel zener barrier with negative ground.
Fig. 2 Positive dual-channel zener barrier with floating leads.
Note: Terminals 3, 4, 5, and 6 are common and are bonded to the mounting tabs for positive redundant grounding.

INSTALLATION AND MAINTENANCE

OMEGA® Zener barriers are installed in non-hazardous (safe) locations, and may be grouped on a common, earth-grounded mounting plate. Intrinsically safe sensor wiring must be separated from non-intrinsically-safe input wiring in separate conduits or raceways to prevent by-pass during testing or servicing. Routine inspections every two years or less to check integrity of earth-grounding and electrical connections, and to make sure the unit is clean, constitute the only maintenance normally required.

Installation and maintenance must be in accordance with the National Electrical Code and the applicable OMEGA® operator’s manual."
SINGLE-CHANNEL ZENER BARRIERS, DC

Mounting Accessories

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Price</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL-35-2</td>
<td>$15</td>
<td>2 m mounting rail</td>
</tr>
<tr>
<td>SBG-RAIL-18</td>
<td>18</td>
<td>18” mounting rail</td>
</tr>
<tr>
<td>SBG113530</td>
<td>16</td>
<td>Rail mounting clip</td>
</tr>
</tbody>
</table>

Single-channel zener barriers can be supplied with a clip for rail mounting. Clip attaches to barrier with mounting screw supplied.

Ordering Example: SBG11950, zener barrier, $103, with SBG-RAIL-18, $18, and SBG113530, rail mounting clip, $16, $103 + 18 + 16 = $137.

Note: Order rail mounting clip and mounting rails separately.
DUAL-CHANNEL ZENER BARRIERS, DC

Typical applications for dual-channel zener barriers include solenoids, switches or 4 to 20 mA DC transmitters. When applicable, using a dual-channel barrier can save money in installation over 2 single-channel barriers.

To Order (Specify Model Number)

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Price</th>
<th>DC Input to Barriers, Max</th>
<th>Fuse Rating Current, mA</th>
<th>Signal Polarity</th>
<th>Series Resist. Ω</th>
<th>Applications Groups Class I &amp; II, Div. 1, 2</th>
<th>Reactive Limits</th>
<th>Ambient Operating Temp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBG54803</td>
<td>$244</td>
<td>20 100</td>
<td>Positive</td>
<td>270</td>
<td>Groups A, B, C, D</td>
<td>Capacitance μF</td>
<td>Inductance mH</td>
<td>0 to 60°C</td>
</tr>
<tr>
<td>SBG54806</td>
<td>244</td>
<td>30 60</td>
<td>Positive</td>
<td>270</td>
<td>Group D</td>
<td>0.4</td>
<td>0.9</td>
<td>(32 to 140°F)</td>
</tr>
</tbody>
</table>

Ordering Example: SBG54803 20 V, 100 mA zener barrier, $244, SBG61783, mounting clip, $16, $244 + 16 = $260.

Note: Order rail mounting clips SBG61783 separately.
Choosing a suitable barrier for a particular application involves a number of considerations:

1. Select a barrier that has the Agency Approvals and Hazardous Location Ratings required (see page K-109).
2. Choose the barrier by the Loop or Entity concept, whichever applies. If the associated equipment has been approved under the loop concept, then the specified barrier must be used. If the associated equipment is approved under the entity concept, then the barrier can be chosen using the entity parameters. The entire loop or system should be evaluated including possible failures or miswiring causing shorts or open loops.

Intrinsic Safety barriers are chosen based on the following parameters as defined by Testing Agencies:

1. Maximum Open Circuit Voltage
2. Maximum Short–Circuit Current
3. End to End Resistance—this is the total resistance of the barrier. The entire circuit loop resistance should be evaluated, to make sure the loop will still function with the barrier installed.
4. Maximum allowed external series inductance
5. Maximum allowance capacitance.

**APPLICATION DATA**

**TYPICAL INTRINSIC SAFETY BARRIER WIRING DIAGRAMS**

I. **Switches**

**1A**

[Diagram showing a dual channel zener barrier in a circuit where the load is activated from a switch in the hazardous area.]

**1B**

[Diagram showing a single channel zener barrier used with an OMEGA® level switch or any other non-voltage producing device located in a hazardous area.]

**1C**

[Diagram showing two single channel zener barriers used with an OMEGA® flow switch located in a hazardous area for flow/no flow indication.]

**1D**

[Diagram showing three zener barriers for an optically coupled microprocessor. One single channel supply barrier with two return barriers for the SPDT switch.]
II. Two-wire, 4-20 mA Transmitters

**2A**

HAZARDOUS AREA  NON-HAZARDOUS AREA

A Dual Channel zener barrier in a current loop used with an approved intrinsically safe transmitter in a process control system.

**2B**

HAZARDOUS AREA  NON-HAZARDOUS AREA

Two Single Channel zener barriers for a floating system in a current loop with an approved intrinsically safe transducer. The signal return barrier is used to minimize the total resistance in the loop.

III. Intrinsically-Safe Solenoids

**3A**

HAZARDOUS LOCATION  NON-HAZARDOUS AREA

A Dual Channel zener barrier used for supply & return voltage leads. This circuit is used whenever a floating power system must be maintained. For optimum power transfer, the total resistance of the barrier must be matched to the resistance of the solenoid.

**3B**

HAZARDOUS AREA  NON-HAZARDOUS AREA

A Single Channel zener barrier used where the load in a hazardous area can function with a negative signal that is earth-grounded.

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**Warning:**

Product must be maintained and installed in strict accordance with the National Electrical Code and the applicable OMEGA® operator's manual. Failure to observe this warning could result in serious injuries or damages.

**Ci and Li Must Also Take Into Account The Interconnecting Wiring Inductance Lw And The Interconnecting Wiring Capacitance Cw.**
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- **Heaters**