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.

OEOMEGA® zener barriers must be installed in conformance with the National Electrical Code and the Instruction, Installation and Service Bulletin supplied with all units. Periodic checks of ground bonding and cleanliness of units and terminals constitute the only maintenance required.

### SELECTION GUIDE FOR OMEGA® ZENER BARRIERS FOR INTRINSIC SAFETY

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Approvals</th>
<th>Hazardous Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UL</td>
<td>FM</td>
</tr>
<tr>
<td>Single Channel Zener Barriers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBG111950</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SBG111954</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SBG111956</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SBG113000</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SBG114166</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dual Channel Zener Barriers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBG54803</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SBG54806</td>
<td>X</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-110).

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>SBG113530</td>
<td>$20</td>
<td>TS32 style 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.

To Order (Specify Model Number)

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Price</th>
<th>DC Input to Barrier, Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fuse Rating Current, mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Signal Polarity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Series Resist. Ω</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Applications Groups Class I &amp; II, Div. 1, 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reactive Limits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capacitance µF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inductance mH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ambient Operating Temperature</td>
</tr>
</tbody>
</table>

| SBG11950   | $132  | +15          |
| SBG11954   | 132   | +24          |
| SBG11956   | 132   | +30          |
| SBG11300   | 132   | +30          |

Signal Return Barrier

| SBG114166  | 132   | +30          |

The exceptionally compact, almost "wafer-thin" design single-channel zener barriers save space and simplify installation, especially in multiples on a common mounting plate. Single-screw mounting is standard; units can be supplied with an optional clip for rail mounting. The single through-mounting screw also provides an electrical connection to ground through the earth-grounded mounting surface.

Ordering Example: SBG11954, zener barrier, 24 V, 62 mA and SBG113530, rail mounting clip, $132 + $20 = $152.

Note: Orderrail mounting clip separately.
DUAL-CHANNEL ZENER BARRIERS, DC

Mounting Accessories

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Price</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBG61783</td>
<td>$20</td>
<td>Rail mounting clips for dual-channel zener barriers</td>
</tr>
</tbody>
</table>

Dimensions: mm (in)

- MOUNTING TAB: 152.4 (6)
- OUTPUT TERMINALS NO. 6-32 THD: 139.7 (5-1/2)
- 5.6 (7/22) DIA, 3 MTG HOLES: 41.3 (1-5/8)
- INPUT TERMINALS NO. 6-32 THD: 120.6 (4-3/4)
- HOUSING: 69.8 (2-3/4)
- RAIL MOUNTING OPTIONAL

Dual-channel zener barriers can be mounted with a clip for rail mounting.

Standard tabs on barrier allow surface mounting.

A protective cover ensures intrinsic safety integrity of sensor terminals and wiring.

Note 1: Dual-channel zener barriers are internally fused. If a “fault” or abnormal signal level continues for a sustained period, the internal fusing within the barrier will open, disconnecting the barrier. External fuses (Littlefuse Type 3AG or equal) are recommended to protect the barrier from incorrect wiring at start-up, or from other equipment fault.

Note 2: Housing material is blue Lexan®.

Note 3: For typical wiring diagrams, see pages K-109 and K-110.

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 Barrier, Max</th>
<th>DC Input to Barrier, Max</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>
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<tbody>
<tr>
<td>SBG54803</td>
<td>$315</td>
<td>20 100 Positive 270</td>
<td>Groups A, B, C, D</td>
<td>-3.2 -10</td>
<td>-40 to 60°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBG54806</td>
<td>315</td>
<td>30 60 Positive 270</td>
<td>Group D</td>
<td>2.4 6.0</td>
<td>(-40 to 140°F)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ordering Example: SBG54803, 20 V, 100 mA zener barrier, and SBG61783, mounting clips, $315 + 20 = $335.

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.

**APPLICATION DATA**

Typical Intrinsic Safety Barrier Wiring Diagrams

I. Switches

1A. A Dual Channel zener barrier in a circuit where the load is activated from a switch in the hazardous area.

1B. A Single Channel zener barrier used with an OMEGA® level switch or any other non-voltage producing device located in a hazardous area.

1C. Two Single Channel zener barriers used with an OMEGA® flow switch located in a hazardous area for flow/no flow indication.

1D. 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**

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

**32 1**

NON-HAZARDOUS

AREA

HAZARDOUS

TRANSDUCER

OR

CONVERTER

DC POWER

SUPPLY

(–)

(+) FUSE*

LOAD

BARRIER

SIGNAL

RETURN

BARRIER

TERM. EQUIP.

BY CUST

**2B**

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**

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**

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

**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.

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**HAZARDOUS AREA**

**NON-HAZARDOUS AREA**

**INTRINSICALLY SAFE APPARATUS**

Maximum Open Circuit Voltage Vmax

Maximum Short Circuit Current Imax

Maximum Unprotected Capacitance Ci

Maximum Unprotected Inductance Li

**INTRINSIC SAFETY BARRIER**

Maximum Open Circuit Voltage Voc

Maximum Short Circuit Current Isc

Maximum Allowed Capacitance Ca

Maximum Allowed Inductance La

Ci and Li Must Also Take Into Account The Interconnecting Wiring Inductance Lw And The Interconnecting Wiring Capacitance Cw.
More than 100,000 Products Available!

- **Temperature**

- **Flow and Level**
  Air Velocity Indicators, Doppler Flowmeters, Level Measurement, Magnetic Flowmeters, Mass Flowmeters, Pitot Tubes, Pumps, Rotameters, Turbine and Paddle Wheel Flowmeters, Ultrasonic Flowmeters, Valves, Variable Area Flowmeters, Vortex Shedding Flowmeters

- **pH and Conductivity**
  Conductivity Instrumentation, Dissolved Oxygen Instrumentation, Environmental Instrumentation, pH Electrodes and Instruments, Water and Soil Analysis Instrumentation

- **Data Acquisition**

- **Pressure, Strain and Force**
  Displacement Transducers, Dynamic Measurement Force Sensors, Instrumentation for Pressure and Strain Measurements, Load Cells, Pressure Gauges, Pressure Reference Section, Pressure Switches, Pressure Transducers, Proximity Transducers, Regulators, Strain Gages, Torque Transducers, Valves

- **Heaters**