Ensures machine safety in an explosive atmosphere

First ever in the world! Safety relay barrier rated by Japan TIIS ([Exia] II C) and Machine Safety Standard ISO 13849-1 (PLe, Cat 4)

EB3N ensures explosion protection safety and machine safety

Conventional system does not ensure machine safety

By combining the EB3N safety relay barrier with safety input devices, such as emergency stop switches or interlock switches, and contactors compliant with safety standards, explosion protection safety and machine safety can be achieved. In addition, safety control devices, such as safety relay modules or safety controllers, can also be combined to build a safety system.

Combining a conventional contact signal transducer with safety input devices, such as emergency stop switches or interlock switches, and safety control devices such as safety relay modules, safety controllers, or safety PLCs will also meet explosion protection safety, but does not meet machine safety.
Build a safety system in an explosive atmosphere

**General Specifications**

- **Safety Input Points**
  - 2: 2NO
  - 2: 2NO

- **Safety Output Points**
  - Without
  - 5 (1 common)

- **Auxiliary Input Points**
  - (Note 1)
  - (Note 1)

- **Auxiliary Output Points**
  - (Relay Output)
  - 5NO (1 common)

- **Reset (Start)**
  - (Note 2, Note 3)
  - Auto reset (Auto start)
  - Manual reset (Manual start)

- **Ordering Type No.**
  - EB3N-A2ND
  - EB3N-A2M2ND
  - EB3N-A2RD
  - EB3N-M2RD

**Explosion-Protection Specifications**

- **Explosion Protection**
  - [Exia] II C

- **Non-intrinsically Safe Circuit**
  - (Um)
  - 250V

- **Intrinsically Safe Circuit**
  - Maximum Voltage (Uo)
  - 13.2V
  - Maximum Current (Io)
  - 227.2 mA
  - Maximum Power (Po)
  - 750 mW

- **Non-intrinsically Safe Circuit**
  - Maximum Voltage (Um)
  - 250V

**Safety Specifications**

- **Category**
  - 4

- **Performance Level (PL)**
  - e

- **Mean Time to Dangerous Failure (MTTFd)**
  - 100 years

- **Diagnosic Range**
  - 99% minimum

**Calculation conditions for MTTFd**

- \( t_{cyc} \): Mean operation cycle = 1 hour
- \( t_{op} \): Mean operation hours per day = 24 hours
- \( d_{op} \): Mean operation days per year = 365 days

**Note:** When \( t_{cyc} \) is shorter than 1 hour, MTTFd will decrease.
**EB3N Safety Relay Barrier**

### Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>Width</th>
<th>Height</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB3N-A2ND</td>
<td>75.0</td>
<td>75.0</td>
<td>77.5</td>
</tr>
<tr>
<td>EB3N-M2ND</td>
<td>65.0</td>
<td>75.0</td>
<td>77.5</td>
</tr>
<tr>
<td>EB3N-A2RSD</td>
<td>110.5</td>
<td>75.0</td>
<td>77.5</td>
</tr>
<tr>
<td>EB3N-M2RSD</td>
<td>65.0</td>
<td>75.0</td>
<td>77.5</td>
</tr>
</tbody>
</table>

- **Mounting Hole Layout**
  - EB3N-A2ND
  - EB3N-M2ND
  - EB3N-A2RSD
  - EB3N-M2RSD

**Terminal Functions**

<table>
<thead>
<tr>
<th>Stake</th>
<th>Supply Voltage</th>
<th>Input/Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>24V DC</td>
<td>Reset (Start) input</td>
<td></td>
</tr>
<tr>
<td>Y1-Y2</td>
<td>Safety input 1</td>
<td></td>
</tr>
<tr>
<td>11-12</td>
<td>Safety input 2</td>
<td></td>
</tr>
<tr>
<td>21-22</td>
<td>Safety input 3</td>
<td></td>
</tr>
<tr>
<td>N1, N2</td>
<td>Signal input</td>
<td></td>
</tr>
<tr>
<td>P, N3</td>
<td>Auxiliary input</td>
<td></td>
</tr>
<tr>
<td>13-14</td>
<td>Safety output 1</td>
<td></td>
</tr>
<tr>
<td>23-24</td>
<td>Safety output 2</td>
<td></td>
</tr>
<tr>
<td>A, C1</td>
<td>Auxiliary output</td>
<td></td>
</tr>
</tbody>
</table>

### EB3N System Configuration Examples

- **1:1 connection with a safety input device, compliant with Category 4**

  - A safety relay module or safety controller is used to set up a safety circuit, using the reset (start) function of the safety relay module or safety controller.

- **Connection with multiple safety input devices, capable of monitoring up to 5 contact operations, compliant with Category 3**

  - For monitoring operating statuses of safety input devices located in a non-hazardous area

  - A safety relay module or safety controller is used to set up a safety circuit, using the reset (start) function of the safety relay module or safety controller.

  - The manual reset (manual start) function of the EB3N is used to set up a safety circuit, without using a safety control device.

- **Installing a reset switch in a hazardous area, using auxiliary input and output**

  - A safety relay module or safety controller is used to set up a safety circuit, using the reset (start) function of the safety relay module or safety controller.

  - The manual reset (manual start) function of the EB3N is used to set up a safety circuit, without using a safety control device.

All dimensions in mm.

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(10/02/05)
EB3N Safety Relay Barrier

Safety Input Devices Connectable to Safety Input Terminals (Examples)

Emergency stop switch: (Non-illuminated) XW1E-BV402MFRH, XN4E-BL412MRH
Safety switch: HS6B-02B05, HS1B-02R

Instructions

• Notes for Operation
  1. Do not disassemble, repair, or modify the EB3N safety relay barrier, otherwise the safety characteristics may be impaired.
  2. Use the EB3N within its specification values.
  3. The EB3N can be mounted in any direction.
  4. Mount the EB3N on a 35-mm-wide DIN rail or directly on a panel surface using screws. When mounting on a DIN rail, push in the clamp and use end clips to secure the EB3N. When mounting on a panel surface, tighten the screws firmly.
  5. Excessive noise may cause malfunction or damage to the EB3N. When the internal voltage limiting circuit (thyristor) has shut down the power due to noise, remove the cause of the noise before powering up again.
  6. The internal power circuit contains an electronic fuse to suppress overcurrents. When the electronic fuse has tripped, shut down the power, remove the cause of the overcurrent before powering up again.
  7. Use crimping terminals with insulation sheath for wiring. Tighten the terminal screws, including unused terminal screws, to a recommended tightening torque of 0.6 to N·m using a screwdriver of ø5.5 mm in diameter.
  8. Before inspecting or replacing the EB3N, turn off the power.

• Notes for Machine Safety
  1. Operate the safety input device to check the EB3N functionality everyday.
  2. For safety input devices, such as safety switches or emergency stop switches, connected to the EB3N, use safety standard-compliant devices with direct opening action and 2NC contacts.
  3. Do not use the auxiliary input as a safety input.
  4. For safety control devices connected with the EB3N, use machine safety standard-compliant devices with a disparity detection function.
  5. Use safety inputs and safety outputs in a circuit configuration compliant with safety requirements.
  6. To calculate the safety distance, take into consideration the response time of all devices comprising the system, such as the EB3N and safety devices connected to the EB3N.
  7. Separate the input and output wiring from power lines and motor lines.
  8. When using multiple EB3N safety relay barriers, do not connect one switch to more than one EB3N. Use separate switches for each EB3N.
  9. To ensure EMC, use shielded cables for safety inputs and auxiliary inputs. Connect the shield to the FG of the control panel on which the EB3N is mounted.
  10. For protection against overcurrents, connect an IEC60127-2-compliant 2A fast-blow fuse (5 × 20 mm).
  11. Evaluate the ISO 13849-1 category and performance level in consideration of the entire system.

• Notes for Explosion Protection Safety
  1. Install the EB3N in an enclosure capable of protecting against mechanical shocks at a hazardous location in accordance with intrinsic safety ratings and parameters.
  2. Install and wire the EB3N so that the EB3N is not subject to electromagnetic and electrostatic induction and does not contact with other circuits. For example, keep a minimum spacing of 50 mm between intrinsically safe and non-intrinsically safe circuits, or provide a metallic separating board between the intrinsically safe circuit and non-intrinsically safe circuit. When providing a metallic separating board, make sure that the board fits closely to the enclosure (top, bottom, and both sides). Allowable clearance between the board and the enclosure is 1.5 mm at the maximum. When a motor circuit or high-voltage circuit is installed nearby, keep a wider spacing than 50 mm between intrinsically safe and non-intrinsically safe circuits.
  3. Keep a minimum spacing of 3 mm between the terminal or relay terminal block of the intrinsically safe circuit and the grounded metal parts of the metal enclosure.
  4. Connect the terminals so that IP20 is ensured.
  5. To prevent disengaged wires from contacting with other intrinsically safe circuits, bind together the end of wires.
  6. Make sure that the voltage of the power supply for the devices connected to the non-intrinsically safe circuit or the internal voltage of such devices does not exceed 250V AC/DC 50/60 Hz or 250V DC under any normal and abnormal conditions.
  7. Make sure that the wiring of intrinsically safe circuits does not contact with other circuits or is not subject to electromagnetic and electrostatic inductions, otherwise explosion protection is not ensured.
  8. When identifying intrinsically safe circuits by color, use light blue terminal blocks and cables.
  9. When wiring the intrinsically safe circuit, determine the distance to satisfy the wiring parameters shown below.
    a) Wiring capacitance \( C_w \leq \frac{1}{Co} \) – \( \frac{1}{Ci} \)
    b) Internal capacitance \( C_i \) – \( C_m \)
    c) Inductance \( L_w \leq \frac{1}{Li} \) – \( \frac{1}{Lo} \)
    d) Internal inductance of switches \( L_m \) – \( L_i \)
  10. To ensure the proper operation of switches, do not contact other circuits.

• Switches in the Hazardous Area
  1. A switch contains the switch contact, enclosure, and internal wiring. A switch contact refers to an ordinary switching device which consists of contacts only.
  2. When the switch has integral wiring or lead wire, make sure that the values of internal capacitance \( (C_i) \) and inductance \( (Li) \) are within the certified values.
  3. Enclose the bare live part of the switch contact in an enclosure of IP20 or higher protection.
  4. Depending on the explosion-protection specifications of TIIS, the exposed area of switch selector, when installed in Japan, is limited as follows:

<table>
<thead>
<tr>
<th>Certification</th>
<th>Explosion Protection</th>
<th>Exposed Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC15758</td>
<td>Exia II CT6</td>
<td>20 cm² maximum</td>
</tr>
<tr>
<td>TC15961</td>
<td>Exia II BT6</td>
<td>100 cm² maximum</td>
</tr>
</tbody>
</table>

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