## EB3C Relay Barriers

## Input contacts can be used in any explosive gas and Zone 0/Class I Div. 1 areas.

| Explosion <br> protection | Relay Barrier: <br> Switch (EB9Z-A): <br> Switch (EB9Z-A1): | [Exia] II C |
| :--- | :--- | :--- |
| Exia II CT6 BT6 |  |  |

- IEC60079 compliant.
- Wide variety of models ranging from 1 -circuit to 16 circuit types.
-8- and 16-channel are available in common wiring, ideal for connection to PLCs. 16-circuit also available with a connector.
- No grounding required.
- IDEC's original spring-up terminal minimizes wiring time.
- 35 -mm-wide DIN rail mounting or direct screw mounting.
- Global usage IECEx
USA: FM, UL Europe: CE marking, ATEX
China: CQST Korea: KCS
Taiwan TS
Japan: TIIS
- Ship class: NK (Japan), KR (Korea)



## 

## Relay Barriers

| Power Voltage | Connection to Non-intrinsically Safe Circuit | Input Wiring Method | Output |  | Number of Channels | Part No. | Weight (g) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 100 to 240 V AC | Screw Terminal | Separate/Common Wiring Compatible | Relay |  | 1 | EB3C-R01AN | 150 |
|  |  |  |  |  | 2 | EB3C-R02AN | 180 |
|  |  |  |  |  | 3 | EB3C-R03AN | 190 |
|  |  |  |  |  | 5 | EB3C-R05AN | 260 |
|  |  |  |  |  | 6 | EB3C-R06AN | 270 |
|  |  |  |  |  | 8 | EB3C-R08AN | 300 |
|  |  |  |  |  | 10 | EB3C-R10AN | 380 |
|  |  | Common Wiring Only |  |  | 8 | EB3C-R08CAN | 280 |
|  |  | Separate/Common Wiring Compatible | Transistor (Sink/Source) |  | 1 | EB3C-T01AN | 140 |
|  |  |  |  |  | 2 | EB3C-T02AN | 170 |
|  |  |  |  |  | 3 | EB3C-T03AN | 180 |
|  |  |  |  |  | 5 | EB3C-T05AN | 250 |
|  |  |  |  |  | 6 | EB3C-T06AN | 260 |
|  |  |  |  |  | 8 | EB3C-T08AN | 320 |
|  |  |  |  |  | 10 | EB3C-T10AN | 340 |
|  |  | Common Wiring Only | Transistor (Sink) |  | 8 | EB3C-T08CKAN | 260 |
|  |  |  |  |  | 16 | EB3C-T16CKAN | 260 |
|  |  |  | Transistor (Source) |  | 8 | EB3C-T08CSAN | 260 |
|  |  |  |  |  | 16 | EB3C-T16CSAN | 260 |
| 24V DC |  | Separate/Common Wiring Compatible | Relay |  | 1 | EB3C-R01DN | 130 |
|  |  |  |  |  | 2 | EB3C-R02DN | 170 |
|  |  |  |  |  | 3 | EB3C-R03DN | 180 |
|  |  |  |  |  | 5 | EB3C-R05DN | 250 |
|  |  |  |  |  | 6 | EB3C-R06DN | 260 |
|  |  |  |  |  | 8 | EB3C-R08DN | 260 |
|  |  |  |  |  | 10 | EB3C-R10DN | 360 |
|  |  | Common Wiring Only |  |  | 8 | EB3C-R08CDN | 270 |
|  |  |  |  |  | 16 | EB3C-R16CDN | 390 |
|  |  | Separate/Common Wiring Compatible | Transistor (Sink/Source) |  | 1 | EB3C-T01DN | 120 |
|  |  |  |  |  | 2 | EB3C-T02DN | 160 |
|  |  |  |  |  | 3 | EB3C-T03DN | 170 |
|  |  |  |  |  | 5 | EB3C-T05DN | 240 |
|  |  |  |  |  | 6 | EB3C-T06DN | 250 |
|  |  |  |  |  | 8 | EB3C-T08DN | 250 |
|  |  |  |  |  | 10 | EB3C-T10DN | 320 |
|  |  | Common Wiring Only | Transistor |  | 8 | EB3C-T08CKDN | 250 |
|  |  |  |  | Sink | 16 | EB3C-T16CKDN | 350 |
|  |  |  |  |  | 8 | EB3C-T08CSDN | 250 |
|  |  |  |  | Source | 16 | EB3C-T16CSDN | 350 |
|  | Connector |  |  | Sink | 16 | EB3C-T16CKD-CN | 330 |
|  |  |  |  | Source |  | EB3C-T16CSD-CN | 330 |

## Accessories

| Name | Part No. | Ordering No. | Package Quantity | Description |
| :---: | :--- | :--- | :--- | :--- |
| DIN Rail | BAA1000 | BAA1000PN10 | 10 | Aluminum (1m long) |
|  | BAP1000 | BAP1000PN10 | 10 | Steel (1m long) |
| End Clip | BNL6 | BNL6PN10 | 10 | For fastening EB3C units on the DIN rail. |
| Static Electricity Caution Plate | EB9Z-N1 | EB9Z-N1PN10 | 10 | Polyester 20 (W) $\times 6$ (H) mm |

## Explosion-Protection and Electrical Specifications

| Explosion Protection |  |  |  | Intrinsic safety type |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Degree of Protection |  |  |  | IP20 (IEC60529) |  |
| Installation Location |  |  | Relay Barrier | Safe indoor place (safe area: non-hazardous area) |  |
|  |  |  | Switch | For zone 0, 1, 2 hazardous areas |  |
| Non-intrinsically Safe Circuit Maximum Voltage (Um) |  |  |  | 250 V AC |  |
|  | Wiring Method |  |  | 1-channel Separate Wiring | $\begin{array}{\|l\|} \hline \text { 16-channel } \\ \text { Common Wiring } \end{array}$ |
|  | Rated Operating Voltage |  |  | 12 V DC $\pm 10 \%$ |  |
|  | Rated Operating Current |  |  | $10 \mathrm{~mA} \mathrm{DC} \pm 20 \%$ |  |
|  | Maximum Output Voltage (Uo) |  |  | 13.2 V DC |  |
|  | Maximum Output Current (lo) |  |  | 14.2 mA | 227.2 mA |
|  | Maximum Output Power (Po) |  |  | 46.9 mW | 750 mW |
|  | Maximum External  <br> Capacitance (Co)  <br> (Note 1)  |  |  | $470 \mathrm{nF}(470 \mathrm{nF})$ | 490 nF ( 365 nF ) |
|  | Maximum External Inductance (Lo) (Note 2) |  |  | $\begin{aligned} & 87.5 \mathrm{mH}(87.5 \\ & \mathrm{mH}) \end{aligned}$ | $0.6 \mathrm{mH}(0.425 \mathrm{mH})$ |
|  | Allowable Wiring Resistance (Rw) |  |  | $300 \Omega$ | $\begin{aligned} & 600 /(\mathrm{N}+1) \Omega \\ & (\mathrm{N}=\text { number of } \\ & \text { common } \\ & \text { channels }) \\ & \hline \end{aligned}$ |
|  | Maximum Channels per Common Line |  |  |  | 16 |
|  |  | Contact Configuration |  | 1NO |  |
|  |  | Rated Insulation Voltage (Ui) |  | 250 V AC, 125 V DC |  |
|  |  | Thermal Current (lth) |  | 3A (common terminal: 8A) |  |
|  |  | Contact | Resistive Load | AC: $750 \mathrm{VA}, \mathrm{DC}: 72 \mathrm{~W}$ |  |
|  |  | Allowable <br> Power | Inductive Load | AC: $750 \mathrm{VA}(\cos \varnothing=0.3$ to 0.4$)$ DC: 48 W ( $\mathrm{L} / \mathrm{R}=7 \mathrm{~ms}$ ) |  |
|  |  |  | Resistive Load | 250 V AC 3A, 24V DC 3A |  |
|  |  | Load | Inductive Load | $\begin{aligned} & \text { 250V AC 3A }(\cos \varnothing=0.3 \text { to } 0.4) \\ & 24 \mathrm{~V} \text { DC } 2 \mathrm{~A}(\mathrm{~L} / \mathrm{R}=7 \mathrm{~ms}) \end{aligned}$ |  |
|  |  | Minimum Applicable Load |  | 0.1 V DC, 0.1 mA (reference value) |  |
|  |  | Contact Resistance |  | $50 \mathrm{~m} \Omega$ maximum (initial value) |  |
|  |  | Turn ON Time |  | 12 ms maximum (rated voltage) |  |
|  |  | Turn OFF Time |  | 10 ms maximum (rated voltage) |  |
|  |  | Mechanical Life |  | 20,000,000 operations minimum (at 18,000 operations/hour, without load) |  |
|  |  | Electrical Life |  | 100,000 operations minimum (at 1,800 operations/hour, rated load) |  |
|  |  | Short-circuit Protection |  | None |  |
|  |  | Rated Voltage |  | 24V DC |  |
|  |  | Maximum Voltage |  | 30 V DC |  |
|  |  | Maximum Current |  | 100 mA (connector type: 15 mA ) |  |
|  |  | Leakage Current |  | 0.1 mA maximum |  |
|  |  | Voltage Drop |  | 1.5 V maximum |  |
|  |  | Clamping Voltage |  | 33 V (1W) |  |
|  |  | Inrush Current |  | 0.5A maximum ( 1 sec ) |  |
|  |  | Turn ON Time |  | 0.1 ms maximum (resistive load) |  |
|  |  | Turn OFF Time |  | 0.4 ms (typical) (resistive load) |  |
|  |  | Short-circuit Protection |  | None |  |

Note: Values in ( ) are those approved by TIIS (Technology Institution of Industrial Safety, Japan).

## Certification No.

| Certification Organization | Explosion Protection | Certification No. |
| :---: | :---: | :---: |
| FM | $\begin{aligned} & \text { Class I, III, III Div. } 1 \\ & \text { Group A, B, C, D, E, F, G } \end{aligned}$ | 3047250 |
|  | Class I, Zone 0 AEx [ia] II C |  |
| UL | Class I, II, III, Div. 1 Group A, B, C, D, E, F, G | E234997 |
|  | Class I, Zone 0 AEx [ia] II C |  |
| PTB (ATEX) | [Exia] II C: Gas, Vapour [Exia] III C: Dust | PTB09 ATEX2046 |
| PTB (IECEx) | [Exia] II C: Gas, Vapour <br> [Exia] III C: Dust | IECEx PTB10.0015 |
| CQST | [Exia Ga] II C | CNEx14.0047 |
| KCS | [Exia] II C | 14-AV4B0-0373 |
| TIIS | Relay barrier: [Exia] II C | TC20539 |
|  | Switch (EB9Z-A): Exia II CT6 | TC15758 |
|  | Switch (EB9Z-A1): Exia II BT6 | TC15961 |
| NK | [Exia] II C | Type Test No. 13 T606 |
| KR | [Exia] II C | TYK17821-EL003 |

Note: For details about switches, see "Switch Explosion-Protection
Specifications" on page T-6 and " 3 . Switches in the Hazardous
Area" on page T-10.

## General Specifications

| Power Voltage | AC Power | DC Power |
| :---: | :---: | :---: |
| Rated Power Voltage | 100 to 240 V AC | 24 V DC |
| Allowable Voltage Range | -15 to +10\% | $\pm 10 \%$ |
| Rated Frequency | $50 / 60 \mathrm{~Hz}$ (allowable range: 47 to 63 Hz ) | - |
| Inrush Current | $\begin{aligned} & \text { 10A (100V AC) } \\ & 20 \mathrm{~A}(200 \mathrm{~V} \text { AC) } \\ & \hline \end{aligned}$ | 10A |
| Dielectric Strength (1 minute, 1 mA ) | Between intrinsically safe circuit and non-intrinsically safe circuit: 1526.4V AC |  |
|  | Between AC power and output terminal: 1500V AC |  |
|  | Between DC power and transistor output terminal: 1000V AC (screw terminal type only) |  |
| Operating Temperature | -20 to $+60^{\circ} \mathrm{C}$ (no freezing) |  |
| Storage Temperature | -20 to $+60^{\circ} \mathrm{C}$ (no freezing) |  |
| Operating Humidity | 45 to 85\% RH (no condensation) |  |
| Atmosphere | 800 to 1100 hPa |  |
| Pollution Degree | 2 (IEC60664) |  |
| Insulation Resistance | $10 \mathrm{M} \Omega$ minimum ( 500 V DC megger, between the same poles as the dielectric strength) |  |
| Vibration Resistance (damage limits) | Panel mounting: 10 to 55 Hz , amplitude 0.75 mm |  |
|  | DIN rail mounting: 10 to 55 Hz , amplitude 0.35 mm |  |
| Shock Resistance (damage limits) | Panel mounting: $500 \mathrm{~m} / \mathrm{s}^{2}$ (3 times each on $\left.\mathrm{X}, \mathrm{Y}, \mathrm{Z}\right)$ |  |
|  | DIN rail mounting: $300 \mathrm{~m} / \mathrm{s}^{2}$ (3 times each on $\left.\mathrm{X}, \mathrm{Y}, \mathrm{Z}\right)$ |  |
| Terminal Style | M3 screw terminal |  |
| Mounting | $35-\mathrm{mm}$-wide DIN rail or panel mounting (M4 screw) |  |
| $\begin{array}{l}\text { Power Consumption } \\ \text { (approx.) }\end{array}$ | 9.6 VA (EB3C-R10AN at 200V AC)4.8W (EB3C-R16CDN at 24V DC) |  |

Switches \& Pilot Lights

## Flush

Silhouette Switches
Emergency Stop Switches

Control Stations

## Display

 LightsOperator Interfaces

PLCs

Softwares

Relays

Sockets

Timers

Terminal
Blocks

Circuit
Protectors

Power
Supplies

Sensors

Ex-proo
Control
Boxes

Barriers

LEDs

Safety
Products

Information

## EB3C Relay Barriers

## Switch Explosion-Protection Specifications (Japan only)

Simple apparatuses in accordance with relevant standards of each country can be installed in the hazardous area and connected to the EB3C located in the safe area. In Japan, any switches, though regarded as simple apparatuses, must be certified for explosion-proof devices. EB9Z-A and EB9Z-A1 are IDEC's generic Part No. of any single apparatuses certified by TIIS for use with the EB3C, therefore simple apparatuses with specifications shown below can be used as those approved by the Japanese explosion-proof certification.

| Switch Part No. | EB9Z-A | EB9Z-A1 |
| :---: | :---: | :---: |
| Explosion Proof (Note 1) | Exia II CT6 | Exia II BT6 |
| Operating Temperature | -20 to $+60^{\circ} \mathrm{C}$ (no freezing) |  |
| Operating Humidity | 45 to 85\% RH (no condensation) |  |
| Degree of Protection | IP20 |  |
| Dielectric Strength | 500 V AC, 1 mA |  |
| Intrinsic Safety Ratings and Parameters | 1-channel Separate Wiring Maximum input voltage (Ui): 13.2 V Maximum input current (ii): 14.2 mA Maximum input power (Pi): 46.9 mW Internal capacitance (Ci): $\leq 2 \mathrm{nF}$ Internal inductance (Li): $\leq 5 \mu \mathrm{H}$ | 16-channel Common Wiring <br> Maximum input voltage (Ui): 13.2 V <br> Maximum input current (ii): 227.2 mA <br> Maximum input power (Pi): 750 mW <br> Internal capacitance (Ci): $\leq 32 \mathrm{nF}$ <br> Internal inductance (Li): $\leq 80 \mu \mathrm{H}$ |
|  | Metallic: Magnesium content must be 7.5\% or less (steel and aluminum are acceptable) |  |
| Enclosure Material | Plastic: Switch operator exposed area <br> IIC: $20 \mathrm{~cm}^{2}$ maximum <br> IIB: $100 \mathrm{~cm}^{2}$ maximum <br> When the switch has a wider exposed area, attach a caution label as shown at right. | Caution  <br> To prevent electrostatic  <br> charges, do not rub the  <br> switch surface during  <br> operation. Use a soft  <br> cloth dipped with water  <br> for cleaning.  <br> Caution Label Example  |
| Switch Ratings (Note 2) | Contact rating: Ui, li minimum   <br> Contact resistance: $0.5 \Omega$ maximum   <br> Cross sectional area of wire: $0.000962 \mathrm{~mm}^{2}$ minimum   <br> Printed circuit board: Thickness 0.5 mm minimum   <br>     <br>  Copper foil width 0.15 mm minimum   <br> A resistor to prevent contact welding and an LED can be connected to 1 -channel separate wiring circuits.    <br> Consult IDEC for details.    |  |

Note 1: See "Precautions for Operation" on page T-10.
Note 2: For details, see "3. Switches in the Hazardous Area" on page T-10.

## Internal Circuit Block Diagram



## Dimensions

## Connector Type

EB3C-T16CD-CN



Mounting Hole Layout (Screw Mounting)


## External Wiring Examples

Transistor Output (Ex.: EB3C-T06AN)


Note: On the sink/source transistor output type, terminals A can be used as a positive common line.

## Relay Output

(Ex.: EB3C-R06AN)


Transistor Sink Output
(Ex.: EB3C-T08CKDN)


Transistor Source Output (Ex.: EB3C-T08CSDN)


Relay Output Common Wiring
(Ex.: EB3C-R16CDN)


## Timers

## EB3C Relay Barriers

## Connector Type Output Wiring Diagram

## EB3C-T16CKD-CN (Sink)



EB3C-T16CSD-CN (Source)
CH9 CH10 CH11 CH12 CH13 CH14 CH15 CH16


Wiring Example with IDEC's MicroSmart PLC Input Modules

| EB3C-T16CKD-CN |  | FC4A-N16B3 |  | EB3C-T16CSD-CN |  | FC4A-N16B3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Terminal | Output | Input | Terminal | Terminal | Output | Input | Terminal |
| 20 | A1 | 10 | 20 | 20 | A1 | 10 | 20 |
| 19 | A9 | 110 | 19 | 19 | A9 | 110 | 19 |
| 18 | A2 | 11 | 18 | 18 | A2 | 11 | 18 |
| 17 | A10 | 111 | 17 | 17 | A10 | 111 | 17 |
| 16 | A3 | 12 | 16 | 16 | A3 | 12 | 16 |
| 15 | A11 | 112 | 15 | 15 | A11 | 112 | 15 |
| 14 | A4 | 13 | 14 | 14 | A4 | 13 | 14 |
| 13 | A12 | 113 | 13 | 13 | A12 | 113 | 13 |
| 12 | A5 | 14 | 12 | 12 | A5 | 14 | 12 |
| 11 | A13 | 114 | 11 | 11 | A13 | 114 | 11 |
| 10 | A6 | 15 | 10 | 10 | A6 | 15 | 10 |
| 9 | A14 | 115 | 9 | 9 | A14 | 115 | 9 |
| 8 | A7 | 16 | 8 | 8 | A7 | 16 | 8 |
| 7 | A15 | 116 | 7 | 7 | A15 | 116 | 7 |
| 6 | A8 | 17 | 6 | 6 | A8 | 17 | 6 |
| 5 | A16 | 117 | 5 | 5 | A16 | 117 | 5 |
| 4 | +V | COM | 4 | 4 | -V | COM | 4 |
| 3 | NC | COM | 3 | 3 | NC | COM | 3 |
| 2 | COM | NC | 2 | 2 | COM | NC | 2 |
| 1 | NC | NC | 1 | 1 | NC | NC | 1 |

Note: The wiring in dashed line does not affect the operation of the EB3C. Applicable connector is IDEC's JE1S-201.
Input power for PLC inputs is supplied by the EB3C, therefore the PLC input does not need an external power supply.

## Wiring Example of Intrinsically Safe External Inputs

## Common Wiring (Maximum 16 circuits)

All input lines are wired to a common line inside the intrinsically safe switch (one common line per intrinsically safe circuit).


Some input lines are wired to a common line inside the intrinsically safe switches, while others are outside switches (one common line per intrinsically safe circuit).


All input lines are wired to a common line outside the intrinsically safe switch (one common line per intrinsically safe circuit).


## 2. Separate Wiring

Each input line of the EB3C makes up one independent intrinsically safe circuit.


Diagram Symbols


Serial-Parallel Connection of Switches


Notes

- As shown in the diagram on the left, a required number of "contacts in one switch" (3 contacts in the example at left) can be added to the "contacts in one switch" connected to one input channel.
- Similarly, a required number of "contacts in one switch" can be added to a common line connected to multiple input channels.
- The capacitance and inductance of the added "contacts in one switch" must be included in the calculation of the wiring capacitance and inductance in "Precautions for Operation, 5 . Wiring for Intrinsic Safety, (7)" on page T-11.
- In addition, a required number of contacts can be added in the enclosure of "contacts in one switch." In this case, however, do not include the capacitance and inductance in the calculation of the wiring capacitance and inductance on page $\mathbf{T}-11$. Instead, make sure that the internal capacitance (Ci) and internal inductance (Li) are within the values shown in the table "Switch Explosion-Protection Specifications (Japan only)" on page T-6.

Recommended Connector Cable for Connector Types

| Description | No. of Poles | Length (m) | Part No. | shape | Applicable Type |
| :---: | :---: | :---: | :---: | :---: | :---: |
| With Shield | 20 | 0.5 | FC9Z-H050A20 |  | IDEC MicroSmart I/O Module |
|  |  | 1 | FC9Z-H100A20 |  |  |
|  |  | 2 | FC9Z-H200A20 |  |  |
|  |  | 3 | FC9Z-H300A20 |  |  |
| Without Shield |  | 0.5 | FC9Z-H050B20 |  | IDEC MicroSmart I/O Module |
|  |  | 1 | FC9Z-H100B20 |  |  |
|  |  | 2 | FC9Z-H200B20 |  |  |
|  |  | 3 | FC9Z-H300B20 |  |  |
| Cable with Crimping Terminal |  | 1 | BX9Z-H100E4 |  | Screw Terminal |
|  |  | 2 | BX9Z-H200E4 |  |  |
|  |  | 3 | BX9Z-H300E4 |  |  |
| 40-pin Cable for PLC |  | 1 | BX9Z-H100L |  | Mitsubishi A Series |
|  |  | 2 | BX9Z-H200L |  | (positive common) |
|  |  | 3 | BX9Z-H300L |  | EB3C-T16CKD-CN |

FC9Z-H $\square \square \square A$, FC9Z-H $\square \square \square B$ Internal Connection

```
\begin{array} { c } { \text { Fujitsu Connector} } \\ { \text { FCN-367J024-AU/F} } \end{array}
FCN-367J024-AU/F
```

BX9Z $\square \square \square$ E4 Internal Connection

IDEC Connector JE1S-201 Terminal

Y-shaped Compresion (Marking Tube No.)

(Connecting Side)


Switches \& Pilot Lights

## Flush

Silhouette
Switches
Emergency
Stop
Switches
Control Stations

## Display

Lights

Operator Interfaces

PLCs

Softwares

Relays

Sockets

Timers

Terminal Blocks

Circuit
Protectors

Power
Supplies

Sensors

Ex-proof
Control
Boxes
Barriers

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## Precautions for Operation

## 1. Installation of EB3C Relay Barriers

(1) The EB3C can be installed in any direction.
(2) Install the EB3C relay barrier in a safe area (non-hazardous area) in accordance with intrinsic safety ratings and parameters. To avoid mechanical shocks, install the EB3C in an enclosure which suppresses shocks.
(3) When installing or wiring the EB3C, prevent electromagnetic and electrostatic inductions in the intrinsically safe circuit. Also prevent the intrinsically safe circuits from contacting with another intrinsically safe circuit and any other circuits.
Maintain at least 50 mm clearance, or provide a metallic separating board between the intrinsically safe circuit and non-intrinsically safety 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 enclosure and board is 1.5 mm at the maximum
The clearance of 50 mm between the intrinsically safe circuit and non-intrinsically safe circuit may not be sufficient when a motor circuit or high-voltage circuit is installed nearby. In this case, provide a wider clearance between the circuits referring to 5 (3) "Minimum Parallel Distance between the Intrinsically Safe Circuit and Other Circuits."
(4) In order to prevent contact between intrinsically safe circuits and non-intrinsically safe circuits, mount EB3C units with terminals arranged in the same direction.

(5) Maintain at least 6 mm (or 3 mm according to IEC60079-11: 1999) clearance between the terminal of intrinsically safe circuit and the grounded metal part of a metal enclosure, and between the relay terminal block of an intrinsically safe circuit and the grounded metal part of a metal enclosure.
(6) For installing the EB3C, mount on a $35-\mathrm{mm}$-wide DIN rail or directly on a panel using screws. Make sure to install securely to withstand vibration. When mounting on a DIN rail, push in the clamp completely. Use the BNL6 end clips on both sides of the EB3C to prevent from moving sideways.
(7) Excessive extraneous noise may cause malfunction and damage to the EB3C. When extraneous noise activates the voltage limiting circuit (thyristor), remove the noise source and restore the power.

## 2. Terminal Wiring

(1) Using a $\varnothing 5.5 \mathrm{~mm}$ or smaller screw driver, tighten the terminal screws (including unused terminal screws) to a torque of 0.6 to $1.0 \mathrm{~N} \cdot \mathrm{~m}$ (recommended value).
(2) Make sure that IP20 is achieved when wiring. Use insulation tubes on bare crimping terminals.
(3) To prevent disengaged wires from contacting with other intrinsically safe circuits, bind together the wires of one intrinsically safe circuit.
(4) When the adjacent terminal is connected to another intrinsically safe circuit, provide an insulation distance of at least 6 mm .

## 3. Switches in the Hazardous Area

 (For Japan application only)(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, such as a pushbutton switch. See below.
Applicable Switches

| Control <br> Switches | Push-pull Switches | Pushbutton, Foot, Trigger, Rocker, Grip |
| :--- | :--- | :--- |
|  | Twisting Switches | Rotary, Selector, Cam, Drum, Thumb <br> wheel |
|  | Lever and Slide <br> Switches | Toggle, Multidirectional, Wobble stick, <br> Lever, Slide switch |
| Sensing <br> Switches | Displacement <br> Switches | Microswitch, Limit, Magnetic proximity, <br> Door, Reed, Mercury |
|  | Level Switches | Liquid level |
|  | Others | Pressure, Temperature |

Note: For installation in hazardous areas and connection to the EB3C, use switches which are certified, approved, or considered to be simple apparatus in relevant standards in each country.
(2) When the switch has internal wiring or lead wire, make sure that the values of internal inductance (Li) and capacitance (Ci) are within the certified values.
(3) Enclose the switch contact's bare live part in an enclosure of IP20 or higher protection.
(4) Depending on the explosion-protection specifications according to TIIS, the exposed area of plastic switch operator is limited as follows:

- Exia II CT6 (EB9Z-A): $20 \mathrm{~cm}^{2}$ maximum
- Exia II BT6 (EB9Z-A1): $100 \mathrm{~cm}^{2}$ maximum
(5) Attach the certification mark supplied with the EB3C on the EB9Z-A or EB9Z-A1 switch (for Japan application).
(6) When the switch operator of plastic enclosure has a wider exposed area than the following limits, attach a caution label as shown below.

II C: $20 \mathrm{~cm}^{2}$ maximum
II B: $100 \mathrm{~cm}^{2}$ maximum

| Caution <br> To prevent electrostatic <br> charges, do not rub the switch <br> surfaec during operation. <br> Use a soft cloth dipped with <br> water for cleaning. |
| :--- |

(7) For the 1-circuit separate wiring, a resistor to prevent reed switch contact welding and an LED miniature pilot lights can be connected in series with the contact. See below. Use the terminal screw of M3 or larger.
Applicable Resistor Ratings

| Resistance | $100 \Omega$ maximum |
| :--- | :--- |
| Rated Wattage | 0.5 to 3W |
| Type | Metal (oxide) film resistors |



## Applicable LED

IDEC's IPL1 series LED miniature pilot lights. See pages T-14 and T-17.

## Precautions for Operation

## 4. Output Specifications

(1) When wiring the output from the EB3C, connect the nonintrinsically safe circuit to terminals A and C. The EB3C output circuit is not equipped with short-circuit protection. If required, provide a protection in the external circuit.
(2) Relay Output

Some types of loads generate reverse emf (such as solenoids) or cause a large inrush current (incandescent lamps), resulting in a shorter operation life of output relay contacts. The operation life of contacts can be extended by preventing the reverse emf using a diode, RC, or varistor, or by suppressing the inrush current using a resistor or RL.

Contacts are made of gold-clad silver. When using at a small current and a low voltage (reference value: 0.1 mA , 0.1 V ), test the contact on the actual circuit in advance.
(3) Transistor Output

When connecting a small load, the load may not turn off because of a leakage current, even though the transistor output is turned off. If this is the case, connect a resistor in parallel with the load to bypass the leakage current.
When an excessively high voltage (clamps at 33V, 1W) or a reverse voltage is applied to the output terminals, the clamping circuit or output transistor may be damaged.
When driving an inductive load, be sure to connect a diode across the load to absorb reverse emf.


## Example of Overvoltage Absorption Circuit

(4) In the common wiring only types, the output terminals are not isolated from each other.
(5) When connecting the connector type EB3C's in parallel, use one power supply to power the EB3C's. Do not connect any wiring to the C1 and C2 terminals.

## 5. Wiring for Intrinsic Safety

(1) The voltage applied on the general circuit connected to the non-intrinsically safe circuit terminals of the EB3C relay barrier must be 250 V AC, $50 / 60 \mathrm{~Hz}$, or 250 V DC at the maximum under any conditions, including the voltage of the input power and the internal circuit.
(2) When wiring, take into consideration the prevention of electromagnetic and electrostatic charges on intrinsically safe circuits. Also, prevent intrinsically safe circuits from contacting with other circuits.
(3) The intrinsically safe circuits must be separated from nonintrinsically safe circuits. Contain intrinsically safe circuits in a metallic tube or duct, or separate the intrinsically safe circuits referring to the table below.
Note: Cables with a magnetic shield, such as a metallic sheath, prevent electromagnetic induction and electrostatic induction, however, a non-magnetic shield prevents electrostatic induction only. For non-magnetic shields, take a preventive measure against electromagnetic induction.
Finely twisted pair cables prevent electromagnetic induction. Adding shields to the twisted pair cables provides protection against electrostatic induction.

Minimum Parallel Distance between the Intrinsically Safe Circuit and Other Circuits (mm)

| Voltage and Current of <br> Other Circuits | Over <br> 100 A | 100 A or <br> less | 50 A or <br> less | 10 A or <br> less |
| :---: | :---: | :---: | :---: | :---: |
| Over 440V | 2000 | 2000 | 2000 | 2000 |
| 440 V or less | 2000 | 600 | 600 | 600 |
| 220 V or less | 2000 | 600 | 600 | 500 |
| 110 V or less | 2000 | 600 | 500 | 300 |
| 60 V or less | 2000 | 500 | 300 | 150 |

(4) When identifying intrinsically safe circuits by color, use light blue terminal blocks and cables.
(5) When using two or more EB3C's to set up one intrinsically safe circuit in the common wiring configuration, interconnect two neutral terminals (N1 through N10) on each EB3C between adjacent EB3C's in parallel.
(6) Make sure that the power of the EB3C and contact are turned off before starting inspection or replacement.
(7) When wiring the intrinsically safe circuit, determine the distance to satisfy the wiring parameters shown below. Note that parameters are different between separate wiring and common wiring.
a) Wiring capacitance $\mathrm{Cw} \leq \mathrm{Co}-(\mathrm{Ci}+\mathrm{N} \times 2 \mathrm{nF})$

Co: Maximum external capacitance of the EB3C
Ci : Internal capacitance of the switch
N : The number of switches connected in series or parallel (the number is infinite)
b) Wiring inductance $\mathrm{Lw} \leq \mathrm{Lo}-(\mathrm{Li}+\mathrm{N} \times 5 \mu \mathrm{H})$

Lo: Maximum external inductance of the EB3C
Li: Internal inductance of the switch
N : The number of switches connected in series or parallel (the number is infinite)
c) Wiring resistance $\leq R w$

Rw: Allowable wiring resistance
d) Allowable wiring distance $\mathrm{D}(\mathrm{km})$ is the smallest value of those calculated from the capacitance, inductance, and resistance.
$\mathrm{D} \leq \mathrm{Cw} / \mathrm{C} \quad \mathrm{C}(\mathrm{nF} / \mathrm{km})$ : Capacitance of cable per km
$D \leq L w / L \quad L(m H / k m)$ : Inductance of cable per km
$D \leq R w / 2 R R(\Omega / k m)$ : Resistance of cable per km
Note: For the details of wiring the intrinsically safe circuits, refer to a relevant test guideline for explosion-proof electric equipment in each country.
(8) Applicable Wire Size
0.5 to $2.0 \mathrm{~mm}^{2}$ (AWG20 to AWG14): two wires

However, one wire for $2.0 \mathrm{~mm}^{2}$ (AWG14)

## Mounting Bracket

The following mounting brackets can be used to install the EB3C relay barriers and EB3L lamp barriers on the mounting holes of IBRC contact signal transducer, IBPL pilot relay barrier, and IBZ buzzer.

| No. of Channels | Part No. | Dimension (mm) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 28.0 | 44.0 | 61.0 |  |
| 1 | EB9Z-K02 | 51.0 | 59.5 | 76.0 |  |
| 2 | EB9Z-K03 | 51.0 | 75.0 | 91.5 |  |
| 3 | EB9Z-K05 | 97.0 | 105.0 | 122.0 |  |
| 5 | EB9Z-K06 | 97.0 | 120.0 | 137.0 |  |
| 6 | EB9Z-K10 | 97.0 | 181.0 | 198.0 |  |
| 10 |  |  |  |  |  |



All dimensions in mm.

Switches \& Pilot Lights

## Flush

Silhouette Switches

Emergency
Stop
Switches
Control
Stations
Display
Lights

Operator
Interfaces

PLCs

Softwares

Relays

Sockets

Timers

Terminal
Blocks

Circuit
Protectors
Power
Supplies

Sensors

Ex-proof
Control
Boxes

Barriers

