

1. Preface

Thank you for purchasing our products. This User's Manual explains the handling and safety precautions for use of the BARD-600/700/800/810/820/830. Before using them, read this manual thoroughly to ensure correct and safe use.

● Checking Items in the Package

After opening the package:

- (1) Check that the appearance is not defective.
- (2) Check the model code printed on the side of each product and confirm that any one of the delivered products is not a wrong model.
- (3) Check that the standard accessory (a bracket) for each product is included.

● Handling of This Manual

Please hand over this manual to your end users. No part of this manual may be transferred or reproduced without prior written consent from Yokogawa Electric Corporation. The contents of this manual are subject to change without prior notice.

● Safety, Protection, and Modification of the Product

In order to protect the system controlled by the products and the products themselves and ensure safe operation, observe the safety precautions described in this manual. Yokogawa assumes no liability for safety if users fail to observe these instructions when handling a product. A BARD composes an intrinsically safe system; modification to it, including a change to a circuit constant is strictly prohibited.

● Disclaimer of Warranty

The warranty period for each product depends on the contract at purchase. For inquiry for repair, contact the vendor from which you purchased the product or your nearest sales representative.

Whether a faulty product can be fixed under warranty is determined by an investigation at Yokogawa main factory. The warranty does not apply to the following even during the contracted warranty period:

- A fault attributable to improper or careless handling by the customer
- A fault attributable to handling or use under conditions incompliant with Yokogawa-specified installation criteria and specification requirements.
- A fault and/or damage caused by a natural disaster or fire, or not caused by the product itself.

2. Model and Suffix Codes

Model	Suffix Codes	Description
BARD		Safety barrier
Use	-6.....	For use with a thermocouple *1
	-7.....	For use with an RTD *1
	-8.....	For use with a 4 to 20 mA signal *2
	-9.....	Power supply set *3
Type	00.....	Zener barrier
	10.....	Zener barrier for a CS multiplexer module
	20.....	Isolated barrier for a transmitter with communication functions
	30.....	Isolated barrier for a control element
	40.....	With one power feed unit on a DIN rail
	50.....	With dual redundant power feed units on a DIN rail
Style code	*A	Style A

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*1: Available only with type code 00.

*2: Available with type code 00, 10, 20, or 30.

*3: Available with type code 40 or 50.

3. Intrinsic Safety Specifications and Precautions

3.1 BARD-600

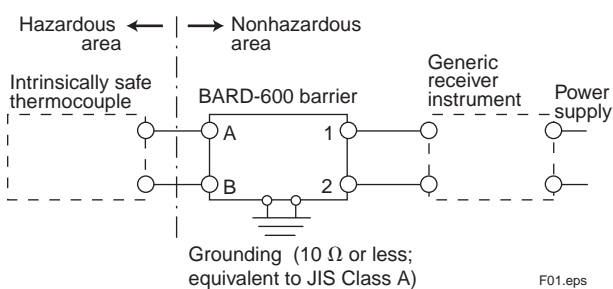
Intrinsic Safety Specifications

Explosion-protected Construction Grade	Protection Concepts and Apparatus (Gas) Group
Grade: i3aG5	Concepts and group: [Ex ia] IIC
Working temperature range: -10° to 50°C	Working temperature range: -10° to 50°C
Ratings: $V_{MAX} = 10\text{ V}$ $I_{CC} = 100\text{ mA}$ $P_{MAX} = 0.25\text{ W}$ $C_{EXT} = 1\text{ }\mu\text{F}$ $L_{EXT} = 2.2\text{ mH}$ $V_M = 250\text{ V AC, 50/60 Hz}$ or 250 V DC	Ratings: $U_o = 10\text{ V}$ $I_o = 100\text{ mA}$ $P_o = 0.25\text{ W}$ $C_o = 1\text{ }\mu\text{F}$ $L_o = 2.2\text{ mH}$ $U_m = 250\text{ V AC, 50/60 Hz}$ or 250 V DC

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Precautions

- 1) A BARD-600 intrinsic safety (IS) barrier must be used in such a configuration as shown below.



- 2) IS barriers must be installed in a nonhazardous (safe) area.
- 3) IS barriers must be grounded independently to the high integrity ground point at a grounding resistance of $10\ \Omega$ or less (equivalent to Japanese Industrial Standard Class A).
- 4) The IS device connected to an IS barrier (a thermocouple for a BARD-600) must have obtained type certification solely, not as a particular combination, and meet the following criteria.

Explosion-protected Construction Grade	Protection Concepts and Apparatus Group
1. Intrinsic safety ratings Maximum allowable IS-circuit voltage (V_m) $\geq 10\ \text{V DC}$ Maximum allowable IS-circuit current (I_m) $\geq 100\ \text{mA}$ Maximum allowable IS-circuit power (P_m) $\geq 0.25\ \text{W}$	1. Intrinsic safety ratings Maximum allowable IS-circuit voltage (U_i) $\geq 10\ \text{V DC}$ Maximum allowable IS-circuit current (I_i) $\geq 100\ \text{mA}$ Maximum allowable IS-circuit power (P_i) $\geq 0.25\ \text{W}$
2. Explosion class and ignition temperature of applicable gases Explosion class: 1, 2, 3a Ignition temperature: G1 to G5	2. Protection concepts and gas group Protection concepts: ia, ib Gas group: IIA, IIB, IIC
3. Entity relationships between internal inductance/capacitance and external IS circuit wiring inductance/capacitance (L_w and C_w) Internal inductance $\leq 2.2\ \text{mH} - L_w$ Internal capacitance $\leq 1.0\ \mu\text{F} - C_w$	

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- 5) The generic receiver instrument connected to an IS barrier must ensure that its input power supply voltage and internal circuit voltages do not exceed $250\ \text{V AC}$, 50 or $60\ \text{Hz}$, or $250\ \text{V DC}$, under normal or abnormal conditions.
- 6) The BARD-600 is supplied as a substitute for the following model certified for protection concepts and apparatus group:
Model BARD-200 barrier (Certificate No. 28121; Technology Institution of Industrial Safety, Japan; for protection concepts and apparatus group)

3.2 BARD-700

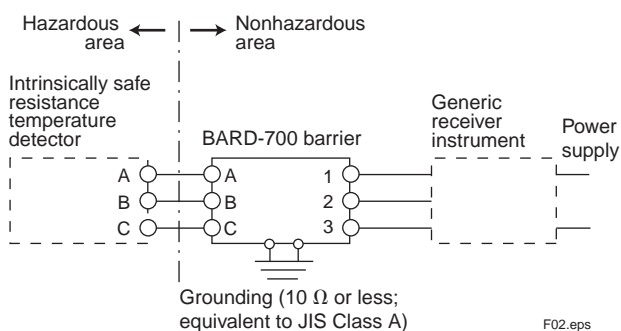
Intrinsic Safety Specifications

Explosion-protected Construction Grade	Protection Concepts and Apparatus (Gas) Group
Grade: i3aG5	Concepts and group: [Ex ia] IIC
Working temperature range: -10° to 50°C	Working temperature range: -10° to 50°C
Ratings: <i>Terminals A/B/C-to-grounding terminal:</i> $V_{MAX} = 7.2\ \text{V}$ $I_{CC} = 174\ \text{mA}$ $P_{MAX} = 0.3132\ \text{W}$ <i>Terminals A/B-to-C, B/C-to-A, and C/A-to-B:</i> $V_{MAX} = 14.4\ \text{V}$ $I_{CC} = 77\ \text{mA}$ $P_{MAX} = 0.2772\ \text{W}$ $C_{EXT} = 0.37\ \mu\text{F}$ $L_{EXT} = 0.5\ \text{mH}$ $V_M = 250\ \text{V AC, 50/60 Hz or 250 V DC}$	Ratings: <i>Terminals A/B/C to grounding terminal:</i> $U_o = 7.2\ \text{V}$ $I_o = 174\ \text{mA}$ $P_o = 0.3132\ \text{W}$ <i>Terminals A/B-to-C, B/C-to-A, and C/A-to-B:</i> $U_o = 14.4\ \text{V}$ $I_o = 77\ \text{mA}$ $P_o = 0.2772\ \text{W}$ $C_o = 0.37\ \mu\text{F}$ $L_o = 0.5\ \text{mH}$ $U_m = 250\ \text{V AC, 50/60 Hz or 250 V DC}$

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Precautions

- 1) A BARD-700 intrinsic safety (IS) barrier must be used in such a configuration as shown below.



- 2) IS barriers must be installed in a nonhazardous (safe) area.
- 3) IS barriers must be grounded independently to the high integrity ground point at a grounding resistance of $10\ \Omega$ or less (equivalent to Japanese Industrial Standard Class A).
- 4) The IS device connected to an IS barrier (a resistance temperature detector for a BARD-700) must have obtained type certification solely, not as a particular combination, and meet the following criteria.

Explosion-protected Construction Grade	Protection Concepts and Apparatus Group
1. Intrinsic safety ratings <i>Terminals A/B/C-to-grounding terminal:</i> Maximum allowable IS-circuit voltage (V_m) ≥ 7.2 V DC Maximum allowable IS-circuit current (I_m) ≥ 174 mA Maximum allowable IS-circuit power (P_m) ≥ 0.3132 W <i>Terminals A/B-to-C, B/C-to-A, and C/A-to-B:</i> Maximum allowable IS-circuit voltage (V_m) ≥ 14.4 V DC Maximum allowable IS-circuit current (I_m) ≥ 77 mA Maximum allowable IS-circuit power (P_m) ≥ 0.2772 W	1. Intrinsic safety ratings <i>Terminals A/B/C-to-grounding terminal:</i> Maximum allowable IS-circuit voltage (U_i) ≥ 7.2 V DC Maximum allowable IS-circuit current (I_i) ≥ 174 mA Maximum allowable IS-circuit power (P_i) ≥ 0.3132 W <i>Terminals A/B-to-C, B/C-to-A, and C/A-to-B:</i> Maximum allowable IS-circuit voltage (U_i) ≥ 14.4 V DC Maximum allowable IS-circuit current (I_i) ≥ 77 mA Maximum allowable IS-circuit power (P_i) ≥ 0.2772 W
2. Explosion class and ignition temperature of applicable gases Explosion class: 1, 2, 3a Ignition temperature: G1 to G5	2. Protection concepts and gas group Protection concepts: ia, ib Gas group: IIA, IIB, IIC
3. Entity relationships between internal inductance/capacitance and external IS circuit wiring inductance/capacitance (L_w and C_w) Internal inductance ≤ 0.5 mH – L_w Internal capacitance ≤ 0.37 μ F – C_w	

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- 5) The generic receiver instrument connected to an IS barrier must ensure that its input power supply voltage and internal circuit voltages do not exceed 250 V AC, 50 or 60 Hz, or 250 V DC, under normal or abnormal conditions.
- 6) The BARD-700 is supplied as a substitute for the following model certified for protection concepts and apparatus group:
 Model BARD-300 barrier (Certificate No. 28122; Technology Institution of Industrial Safety, Japan; for protection concepts and apparatus group)

3.3 BARD-800

Intrinsic Safety Specifications

Explosion-protected construction grade: i3aG5

Working temperature range: -10° to 50° C

Ratings:

$$V_{MAX} = 31.5 \text{ V}$$

$$I_{CC} = 29.2 \text{ mA}$$

$$P_{MAX} = 0.92 \text{ W}$$

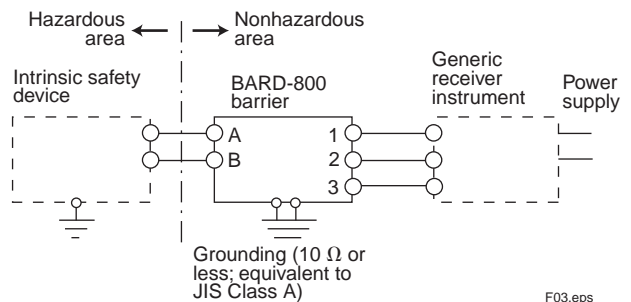
$$C_{EXT} = 42 \text{ nF}$$

$$L_{EXT} = 4.2 \text{ mH}$$

$$V_M = 250 \text{ V AC, 50/60 Hz or 250 V DC}$$

Precautions

- 1) A BARD-800 intrinsic safety (IS) barrier must be used in such a configuration as shown below.



- 2) IS barriers must be installed in a nonhazardous (safe) area.
- 3) IS barriers must be grounded independently to the high integrity ground point at a grounding resistance of 10Ω or less (equivalent to Japanese Industrial Standard Class A).
- 4) The IS device connected to an IS barrier must have obtained type certification solely, not as a particular combination, and meet the following criteria.
 1. **Intrinsic safety ratings**
 Maximum allowable IS-circuit voltage (V_m) ≥ 31.5 V DC
 Maximum allowable IS-circuit current (I_m) ≥ 29.2 mA
 Maximum allowable IS-circuit power (P_m) ≥ 0.92 W
 2. **Explosion class and ignition temperature of applicable gases**
 Explosion class: 1, 2, 3a
 Ignition temperature: G1 to G5
 3. **Entity relationships between internal inductance/capacitance and external IS circuit wiring inductance/capacitance (L_w and C_w)**
 Internal inductance ≤ 4.2 mH – L_w
 Internal capacitance ≤ 42 nF – C_w
- 5) The generic receiver instrument connected to an IS barrier must ensure that its input power supply voltage and internal circuit voltages do not exceed 250 V AC, 50 or 60 Hz, or 250 V DC, under normal or abnormal conditions.

3.4 BARD-810

Intrinsic Safety Specifications

Protection concepts and apparatus (gas) group:
[Ex ia] IIC

Working temperature range: -10° to 50°C

Ratings:

$$U_o = 27.1 \text{ V}$$

$$I_o = 93 \text{ mA}$$

$$P_o = 0.631 \text{ W}$$

$$C_o = 89 \text{ nF}$$

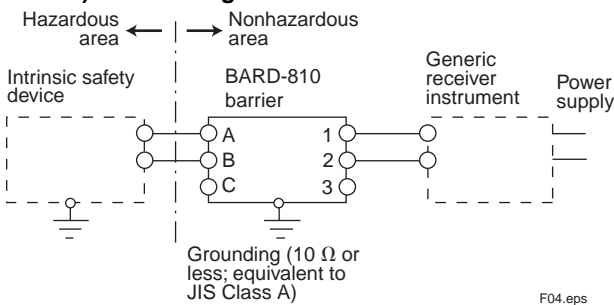
$$L_o = 4.1 \text{ mH}$$

$$U_m = 250 \text{ V AC, 50/60 Hz, or 250 V DC}$$

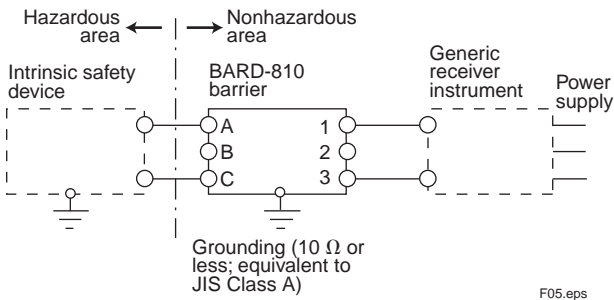
Precautions

- 1) A BARD-810 intrinsic safety (IS) barrier must be used in either of the configurations shown below.

A) Connecting IS Device to Terminals A and B



B) Connecting IS Device to Terminals A and C



- 2) IS barriers must be installed in a nonhazardous (safe) area.
- 3) IS barriers must be grounded independently to the high integrity ground point at the grounding resistance of 10Ω (or less (equivalent to Japanese Industrial Standard Class A)).
- 4) The IS device connected to an IS barrier must have obtained type certification solely, not as a particular combination, and meet the following criteria.

1. Intrinsic safety ratings

Maximum allowable IS-circuit voltage (U_i) \geq

27.1 V DC

Maximum allowable IS-circuit current (I_i) \geq

93 mA

Maximum allowable IS-circuit power (P_i) \geq

631 mW

2. Protection concepts and gas group

Protection concepts: ia, ib

Gas group: IIA, IIB, IIC

3. Entity relationships between internal inductance/capacitance and external IS circuit wiring inductance/capacitance (L_w and C_w)

Internal inductance $\leq 4.1 \text{ mH} - L_w$

Internal capacitance $\leq 89 \text{ nF} - C_w$

- 5) The generic receiver instrument connected to an IS barrier must ensure that its input power supply voltage and internal circuit voltages do not exceed 250 V AC, 50 or 60 Hz, or 250 V DC, under normal or abnormal conditions.

3.5 BARD-820

Intrinsic Safety Specifications

Protection concepts and apparatus (gas) group:
[Ex ia] IIC

Working temperature range: -10° to 50°C

Ratings:

$$U_o = 25.2 \text{ V DC}$$

$$I_o = 93 \text{ mA}$$

$$P_o = 0.58 \text{ W}$$

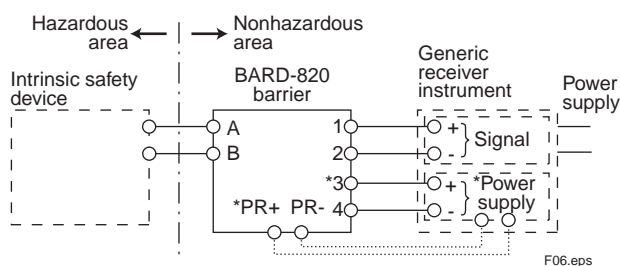
$$C_o = 0.107 \text{ } \mu\text{F}$$

$$L_o = 4.2 \text{ mH}$$

$$U_m = 250 \text{ V AC, 50/60 Hz, or 250 V DC}$$

Precautions

- 1) A BARD-820 intrinsic safety (IS) barrier must be used in such a configuration as shown below.



* When using BARD-940 or -950 to supply power to the IS device through the BARD-820, terminals 3 and 4 are not used, but PR+ and PR- (feed from the power rail) are used in place.

- 2) IS barriers must be installed in a nonhazardous (safe) area.
- 3) The IS device connected to an IS barrier must have obtained type certification solely, not as a particular combination, and meet the following criteria.
 1. **Intrinsic safety ratings**
 - Maximum allowable IS-circuit voltage (U_i) \geq 25.2 V DC
 - Maximum allowable IS-circuit current (I_i) \geq 93 mA
 - Maximum allowable IS-circuit power (P_i) \geq 0.58 mW
 2. **Protection concepts and gas group**
 - Protection concepts: ia, ib
 - Gas group: IIA, IIB, IIC
 3. **Entity relationships between internal inductance/capacitance and external IS circuit wiring inductance/capacitance (L_w and C_w)**
 - Internal inductance \leq 4.2 mH – L_w
 - Internal capacitance \leq 0.107 μ F – C_w
- 4) The generic receiver instrument connected to an IS barrier must ensure that its input power supply voltage and internal circuit voltages do not exceed 250 V AC, 50 or 60 Hz, or 250 V DC, under normal or abnormal conditions.

3.6 BARD-830

Intrinsic Safety Specifications

Protection concepts and apparatus (gas) group:
[Ex ia] IIC

Working temperature range: -10° to 50°C

Ratings:

$$U_o = 25.2 \text{ V DC}$$

$$I_o = 93 \text{ mA}$$

$$P_o = 0.58 \text{ W}$$

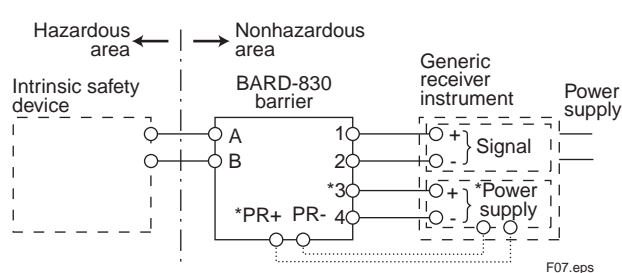
$$C_o = 0.107 \text{ } \mu\text{F}$$

$$L_o = 4.2 \text{ mH}$$

$$U_m = 250 \text{ V AC, 50/60 Hz, or 250 V DC}$$

Precautions

- 1) A BARD-820 intrinsic safety (IS) barrier must be used in either of the configurations shown below.



* When using BARD-940 or -950 to supply power to the IS device through the BARD-820, terminals 3 and 4 are not used, but PR+ and PR- (feed from the power rail) are used in place.

- 2) IS barriers must be installed in a nonhazardous (safe) area.
- 3) The IS device connected to an IS barrier must have obtained type certification solely, not as a particular combination, and meet the following criteria.
 1. **Intrinsic safety ratings**
 - Maximum allowable IS-circuit voltage (U_i) \geq 25.2 V DC
 - Maximum allowable IS-circuit current (I_i) \geq 93 mA
 - Maximum allowable IS-circuit power (P_i) \geq 0.58 mW
 2. **Protection concepts and gas group**
 - Protection concepts: ia, ib
 - Gas group: IIA, IIB, IIC
 3. **Entity relationships between internal inductance/capacitance and external IS circuit wiring inductance/capacitance (L_w and C_w)**
 - Internal inductance \leq 4.2 mH – L_w
 - Internal capacitance \leq 0.107 μ F – C_w
- 4) The generic receiver instrument connected to an IS barrier must ensure that its input power supply voltage and internal circuit voltages do not exceed 250 V AC, 50 or 60 Hz, or 250 V DC, under normal or abnormal conditions.

4. Installation and Wiring

4.1 Mounting and Removal

A BARD barrier should be installed inside an indoor rack or onto a panel wall, and mounted directly onto a standard 35-mm wide DIN rail (DIN EN 50022), or onto a panel wall or DIN rail with the accompanying bracket.



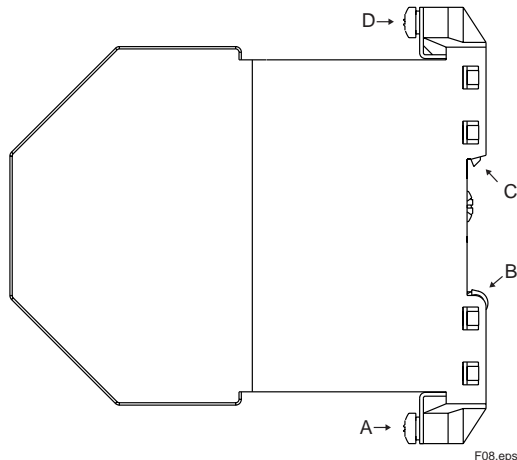
No effort is required for mounting and removal if you follow the correct procedures. Make sure you do not apply excess force as doing so may damage or break the product or bracket.

4.1.1 BARD-600, -700, -800, or -810

● Mounting

An attachment, which can be found at the rear of the barrier as shown in the figure below, is designed to clamp between B and C, the tabs of a 35-mm wide DIN rail or the fitting of the accompanying bracket. Use a DIN rail made of approximately 1.2 mm thick iron plate (aluminum not allowed).

- 1) Hook the pointed part (C) of the attachment on one side of the front fitting of the accompanying bracket or on a tab of the DIN rail.
- 2) Push in the barrier on the round part (B) of the attachment until you feel it click into place.



● Removal

- 1) Insert the tip of a flat blade screwdriver with a 4 to 5 mm wide tip from the side into the rear of the barrier near screw A (you will be able to see a screwdriver symbol).
- 2) Tilt the screwdriver to the side of the barrier, and the rear attachment will slide and the round part B should be released from the bracket or DIN rail. Pull to remove the barrier.

4.1.2 BARD-820 or -830

● Mounting

Bring the barrier near the bracket or DIN rail, and while keeping the barrier perpendicular to the bracket or DIN rail, push the barrier until you feel it click into place.

● Removal

- (1) Insert the tip of a flat blade screwdriver with a 4 to 5 mm wide tip between the red stopper at the rear of the intrinsically safe terminals and the barrier. Draw out the stopper by approximately 5 mm. In the same way, draw out the stopper on the other side.
- (2) Pull to remove the barrier in a direction perpendicular to the bracket or DIN rail.

4.2 Wiring

The following precautions should be stringently observed for the wiring of intrinsic safety devices to prevent the system's intrinsic safety from being compromised by an effect of electric or magnetic energy from other electric devices and wiring.

4.2.1 Precautions for Wiring

- (1) Separate intrinsically safe circuit wiring from the other wiring to avoid a short.
- (2) Secure a sufficient distance between the runs of the intrinsically safe circuit wires and those of other wires, or use shielded cables for the intrinsically safe circuit wiring, in order to prevent electrostatic or electromagnetic induction by other wires.
- (3) For intrinsically safe circuit wiring, use wires with a light-blue covering of insulation or wrap light-blue tape around the outside of both ends of each wire so that the wires can be clearly distinguished from non-intrinsically safe circuit wires. For the BARD-820 and -830, use light-blue terminal blocks on the side of the intrinsically safe circuit.

4.2.2 Recommended Wires/Cables and Terminal Lugs

For wiring between an intrinsic safety device and a BARD barrier, it is recommended to use one of the following cables containing a twisted-pair(s) of cores with a cross-sectional area of 0.5 mm² or larger (maximum applicable wire size is 2.5 mm²) and with a twist pitch of 150 mm or less for prevention of induction. Clamp a ring-tongue terminal lug for M4 terminal at both ends of each wire.

- (1) Polyethylene-insulated vinyl-sheath cable (JIS C3604)
- (2) Vinyl-insulated vinyl-sheath cable for control (JIS C3401)
- (3) Cable for low-voltage instrumentation (Japanese Cable Makers' Association Standard [JCS] 364)
- (4) Thermocouple extension wires (for BARD-600; JCS 365)
- (5) For grounding, use a 12 AWG insulated wire (4 mm²) or thicker.
- (6) Examples of recommended terminal lugs: Models TMEV 1.25-4 and TMEV 2-4 from Nichifu Co., Ltd., Japan

4.2.3 Wiring Methods

Perform wiring for a BARD barrier in accordance with the terminal arrangements shown in Figure 4.1. For connections to the receiver instrument and intrinsic safety device, follow the instructions in the respective documentation.

When BARD-600, -700, -800, and -810 barriers are mounted directly onto a DIN rail without use of brackets, grounding the DIN rail will ground all of them.

The terminal blocks on the BARD-820 and -830 are detachable. You can conveniently detach them to perform wiring and then reattach them. When detaching them, pull them straight up off the barrier. When reattaching them, push them straight down onto the barrier.



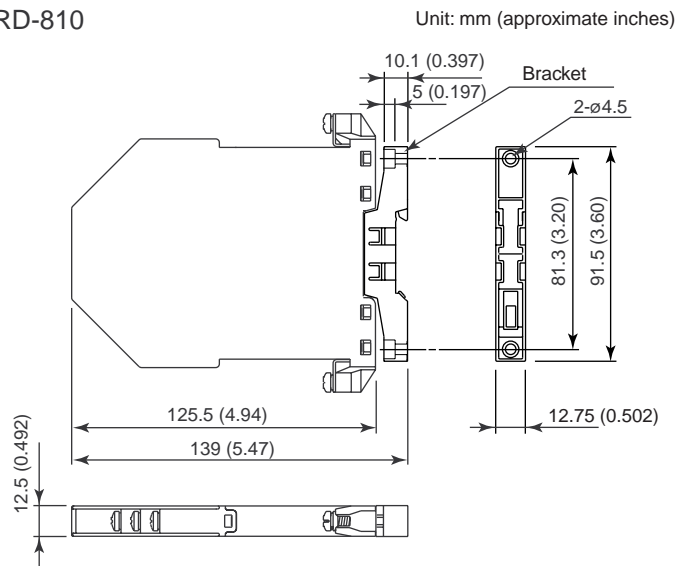
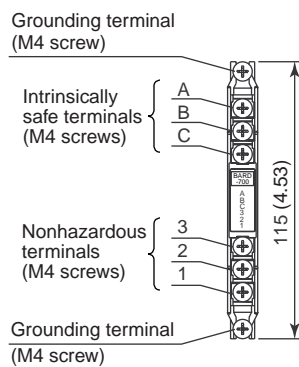
CAUTION

Whenever you attach terminal blocks for nonhazardous terminals, follow the order below. When detaching, follow the reverse order.

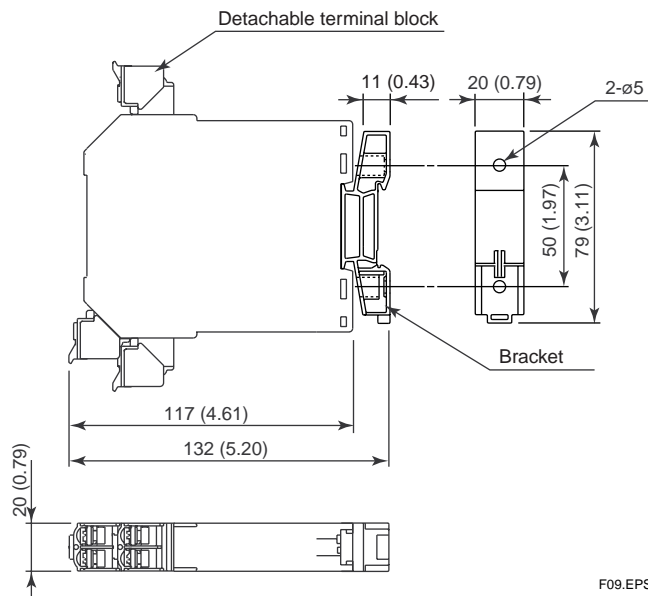
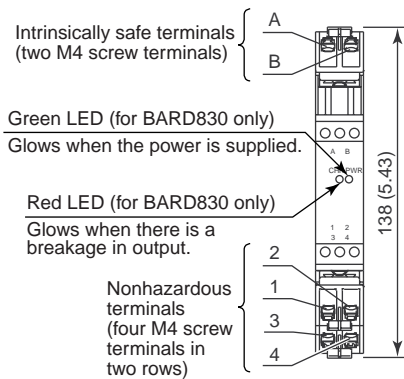
- (1) Attaching terminal blocks 1 and 2
- (2) Attaching terminal blocks 3 and 4

Whenever detaching or attaching a terminal block, ensure that all the attached terminals are fixed securely.

● BARD-600, BARD-700, BARD-800, BARD-810



● BARD-820, BARD-830



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● Terminal Assignments

	Terminal Symbol	BARD-600	BARD-700*1	BARD-800 (for transmitter, etc.)	BARD-800 (for control element)	BARD-810 (for control)	BARD-810 (for monitoring)
Intrinsically safe terminals	A B C	+] -] Input	A] B] B] Input	+] -] Input	+] -] Output	+] -] Input	+] -] Input
Nonhazardous terminals	1 2 3	+] -] Output	A] B] B] Output	+] -] Output *2	+] -] Input	+] -] Output	+] -] Output

	Terminal Symbol	BARD-820*3	BARD-830
Intrinsically safe terminals	A B	+] -] Input	+] -] Output
Nonhazardous terminals	1 2 3 4	+] -] Output L+] L-] Power supply	+] -] Input L+] L-] Power supply

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- *1: In the BARD-700, the resistance between terminals A and 1 and that between terminals C and 3 are balanced. Be careful when connecting the receiver instrument.
- *2: Terminal 3 may also need to be used for some device connected, such as the SDBT distributor, or the EA1, EA2, or EA3 signal conditioner card. For details, see the documentation for the receiver instrument used.
- *3: When connecting a BARD-820 to a receiver instrument having a feature to supply power to the connected field device, such as a power distributor, perform wiring in such a way that the distributor's internal DC power supply is not used and the barrier is connected to both ends of the receiver instrument's internal 250-Ω resistor.

5. Specifications of Barriers

Table 5.1 Zener Barriers

Item		BARD-600	BARD-700	BARD-800	BARD-810	
Type		Zener barrier	Zener barrier	Zener barrier	Zener barrier	
Use		Thermocouple	RTD	4 to 20 mA DC signal	4 to 20 mA DC control signal	4 to 20 mA DC monitoring signal
Leakage current		10 μA at 6.5 V	1 μA at 2.5 V	10 μA at 28 V	10 μA at 25.5 V	
Internal resistance	Per wire	216.5 ±5.6 Ω	130 ±3 Ω	—	—	
	Difference (between wires)	—	±60 mΩ Max. ±30 ppm/°C			
Internal voltage drop		—	—	138 Ω × I _o + 0.9 V 4.16 V at 23.6 mA	311 Ω 7.34 V at 23.6 mA 6.72 V at 21.6 mA	(311 Ω + 36 Ω)I _o + 0.9 V 9.09 V at 23.6 mA 8.40 V at 21.6 mA
Maximum impressed voltage		9 V	6.5 V	31.0 V	26.6 V	
Rated current of internal fuse		50 mA	100 mA	50 mA	50 mA	
Working temperature range		-10° to 50°C				
Storage temperature range		-40° to 90°C				
Humidity range		5 to 95% RH (no condensation)				

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Table 5.2 Isolated Barriers

Item		BARD-820	BARD-830
Type		Isolated barrier	
Use		4 to 20 mA DC signal from transmitter with communication functions	4 to 20 mA DC signal to control element
Nonhazardous signal	Signal range	4 to 20 mA DC	4 to 20 mA DC
	Overrange	0 to 24 mA DC	0 to 22 mA DC
	Load resistance	0 to 1 k Ω	—
Intrinsically safe signal	Signal range	4 to 20 mA DC	4 to 20 mA DC
	Overrange	0 to 24 mA DC	0 to 22 mA DC
	Load resistance	—	0 to 750 Ω (at 0 to 20 mA DC) 0 to 700 Ω (at 0 to 21.6 mA DC)
Output signal ripples		± 50 μ A rms	
Output resistance		—	6 M Ω or larger
Input/output accuracy (at 23°C)		0.0625% of span (± 10 μ A)	
Effect of temperature variations		25 ppm/°C (± 0.4 μ A/°C)	
Response		10 μ s (10 to 90%)	100 μ s (10 to 90%)
Power supply voltage		Max. 16.4 V DC at 20 mA Min. 16.1 V DC at 24 mA	
Input voltage drop		—	2 V or less at 20 mA
Applicable communication type		Yokogawa BRAIN communication	
Output breakage detection		—	19 V or larger
Working power supply voltage		20 to 35 V DC	
Maximum power consumption (at 20 mA DC output, 250 Ω load)		94 mA at 20 V DC	67 mA at 20 V DC
		78 mA at 24 V DC	57 mA at 24 V DC
		56 mA at 35 V DC	46 mA at 35 V DC
Withstanding voltage	Input-to-output	1,500 V AC for 1 minute	1,500 V AC for 1 minute
	Input-to-power supply	1,500 V AC for 1 minute	40 V DC for 1 minute
	Output-to-power supply	40 V DC for 1 minute	1,500 V AC for 1 minute
Working temperature range		-10° to 50°C	
Storage temperature range		-40° to 90°C	
Humidity range		5 to 95% RH (no condensation)	

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6. Maintenance and Inspection

6.1 Test of No-load Voltage of Intrinsically Safe Terminals (for BARD-600/700/800/810)

(1) BARD-600

In accordance with Table 6.1, apply a 20 mA DC current to each specified pair of power supply terminals from a constant-DC current generator in turn and check that the voltage between the corresponding terminals meets the criterion, from 5 to 10 V DC. (**G** in the table indicates the ground terminal.)

Table 6.1 Points of Testing and Criterion

No.	Applied Power Supply		No-load Voltage		
	Connection Terminals		Connection Terminals		Voltage
	+	-	+	-	
1	1	G	A	G	5 to 10 V DC
2	G	1	G	A	
3	2	G	B	G	
4	G	2	G	B	
5	1	2	A	B	
6	2	1	B	A	

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(2) BARD-700

In accordance with Table 6.2, apply a 40 mA DC current to each specified pair of power supply terminals from a constant-DC current generator in turn and check that the voltage between the corresponding terminals meets the criterion, from 2 to 7.2 V DC. (**G** in the table indicates the ground terminal.)

Table 6.2 Points of Testing and Criterion

No.	Applied Power Supply		No-load Voltage		
	Connection Terminals		Connection Terminals		Voltage
	+	-	+	-	
1	1	G	A	G	2 to 7.2 V DC
2	G	1	G	A	
3	2	G	B	G	
4	G	2	G	B	
5	3	G	C	G	
6	G	3	G	C	

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(3) BARD-800

In accordance with Table 6.3, apply a 20 mA DC current to each specified pair of power supply terminals from a constant-DC current generator in turn and check that the voltage between the corresponding terminals meets the corresponding criterion.

Table 6.3 Points of Testing and Criterion

No.	Applied Power Supply		No-load Voltage			
	Connection Terminals		Current	Connection Terminals		Voltage
	+	-		+	-	
1	1	3	20 mA DC	A	C	25 to 31.5 V DC
2	B	C		2	3	11 to 17 V DC

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(4) BARD-810

In accordance with Table 6.4, apply a 20 mA DC current to each specified pair of power supply terminals from a constant-DC current generator in turn and check that the voltage between the corresponding terminals meets the criterion, from 20 to 27.1 V DC.

Table 6.4 Points of Testing and Criterion

No.	Applied Power Supply		No-load Voltage			
	Connection Terminals		Current	Connection Terminals		Voltage
	+	-		+	-	
1	1	2	20 mA DC	A	B	20 to 27.1 V DC
2	C	B		3	2	

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6.2 Test of Internal Resistance (for BARD-600/700/810)**(1) BARD-600**

Measure the resistances between terminals 1 and A, and between 2 and B with the measuring current at 20 mA DC or less and check that both are within $216.5 \pm 5.6 \Omega$.

(2) BARD-700

Measure the resistances between terminals 1 and A, and between 2 and B with the measuring current at 40 mA DC or less and check that both are within $130 \pm 3 \Omega$.

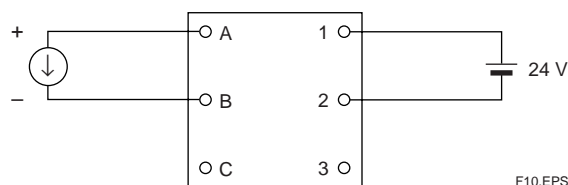
Also measure the resistance between terminals 3 and C and check that the difference in resistance between terminals 1–A and 3–C is not greater than 60 m Ω .

(3) BARD-810

Measure the resistances between terminals 1 and A with the measuring current at 20 mA DC or less and check that it is within $305 \pm 6 \Omega$.

6.3 Test of Internal Voltage Drop (for BARD-800/810)**(1) BARD-800**

As shown in the diagram below, connect a 24-V DC power supply to terminals 1–2, and a 23.6-mA constant-DC current generator to terminals B–A. Measure the voltages between terminals 1 and A and between B and 2, and check that the sum is within the correct range from 3.5 to 4.16 V DC.



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(2) BARD-810

Connect a 23.6-mA constant-DC current generator to terminals C–3, measure the voltage between terminals C and 3, and check that it is within the correct range from 1 to 1.75 V DC.

6.4 Test of Short-circuit Current (for BARD-800)

Connect a 24-V DC power supply to terminals 1–2, and a load resistor of 100 Ω or less to terminals A–B, and check that the current flowing through the load resistance is within the correct range from 25 to 29.2 mA DC.

6.5 Test of Input-output Characteristics (for BARD-820/830)**(1) BARD-820**

Connect a 26-V DC power supply to the power supply terminals and a load resistor of 250 Ω to the output terminals. Vary the input signal level from 0% to 25%, 50%, 75%, and 100% of the span and check that the error in the output level is always within $\pm 0.0625\%$ of the span ($\pm 10 \mu\text{A}$).

(2) BARD-830

Connect a 24-V DC power supply to the power supply terminals and a load resistor of 400 Ω to the output terminals. Vary the input signal level from 0% to 25%, 50%, 75%, and 100% of the span and check that the error in the output level is always within $\pm 0.0625\%$ of the span ($\pm 10 \mu\text{A}$).

6.6 Replacement Procedure

To replace a BARD barrier, disconnect the wiring for the BARD (or detach terminal blocks for a BARD-820 or -830), remove the BARD from the bracket or DIN rail, and mount the new one.

Revision Record

Edition	Date	Description
1st	July 2002	New Publication
2nd	March 2005	Correct errors in Terminal Assignments.

T13. EPS