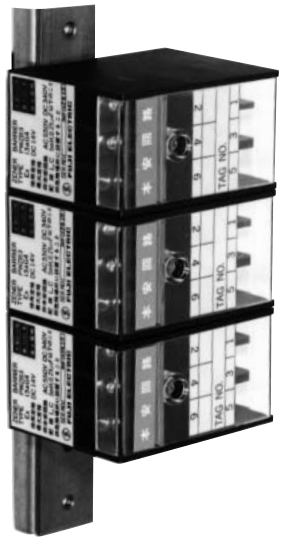
ZENER BARRIER

DATA SHEET PWZ

The ZENER BARRIER is a safety barrier for operating an electronic instrumentation system as an intrinsically safe explosion-proof system in processes subjected to explosive gases or vapor. Various types are available for transmitter, electro-pneumatic final controlling element, thermocouple and resistance bulb, and can be combined with the field instrument mounted in a hazardous area to operate the measuring instrument as an intrinsically safe explosion proof system.



FEATURES

1. High safety explosion-proof zener barrier

- This barrier has been designed according to the latest explosion-proofing principles and it complies with the inspection standards of the Research Institute of Industrial Safety, Ministry of Labor, of the Japanese Government. IEC recommendations and VDE standards have been taken into due consideration in design and manufacture.
- The voltage limiter circuit (zener diode) and thick film fuse are fully incorporated, and the voltage limiter circuit is triplicated. Thus, safety and reliability of the system have been improved by far.
- The thick film fuse offers a high safety maintenance rating of 550V AC.
- The hybrid IC circuit forms a small and compact system, and meets the creeping distance and other standard values. The system can be easily mounted on the instrument panel. Cable connections and separation of both intrinsically safe and non-intrinsically safe circuits is assured.
- In order to prevent handling error, various failproof devices. (such as bright blue indication of intrinsically safe terminals, use of contact prevention cover, doubling of bus bar mounting screws, asymmetric design, color identification according to models, etc.) are incorporated.
- The classification of hazardous areas (division 0) and grouping of explosive gases (i3nG5) are wider than with other explosion-proof structures.

2. High reliability barrier

- The structure and circuits are simple with fewer parts than an insulation barrier or repeater amplifier barrier, and feature high reliability.
- Since all processes from product development to manufacturing are performed by intracompany techniques and facilities, system quality is fully guaranteed with adoption of reliable design techniques such as FMECA, etc., complete manufacturing and testing facilities, manufacturing quality control system, etc.
- The manufacturing techniques, manufacturing test facilities, and quality control system for thick film fuse and hybrid IC have been inspected and approved by the Industrial Safety Institute of the Japanese Government.
- The system also assures high reliability with the use of strictly selected parts high derating design, reduced soldering due to use of a hybrid IC, deterioration resistance by thick film fuse, improved vibration resistance, etc.

3. Improved system design

- Since the safety maintenance rating is as high as 550VAC, receiving instruments can be optionally selected and the system easily can be connected to a computer control system.
- Various types of barrier assemblies are prepared and easily selected according to the measuring instruments combined.
- Since this system uses a small-sized relaying terminal board structure, the instrument panel can be easily designed and connected.

4. Maintenance and checks facilitated

- Check terminals are provided for checks on doubled current limiting circuit functions.

SPECIFICATIONS

Explosion-proofing Specifications

Type of explosion-protection and grouping of explosive gases: Intrinsic safety JIS i3nG5
(i3aG5 for ZLA, ZLC)
(i3aG5 used for electro-pneumatic final controlling element and i3aG4 for multi-point temperature converter.)

Max. safety rating:
550V AC and 340V DC

Installation: Zener barrier is fastened by two M4 screws onto copper bus bar in a non-hazardous area. Class 1 (10Ωor less) bus bar grounding is required.

Measuring instrument combined:
The measuring instrument to be connected to the intrinsically safe circuit is subject to inspection. (See Table 1). (The same inspection certificate as there for the zener barrier should be attached without fail)
The measuring instruments on the non-intrinsically safe circuit, are not subject to inspection, and those having a voltage of less than max. safety rating can be optionally connected.

Ambient temperature of combined measuring instrument: The transmitter and electro-pneumatic final controlling element installed in the hazardous area must be used at an ambient temperature lower than the following;

Instrument	Ambient temperature
FC transmitter	60°C or less
Abgriff transmitter	50°C or less
Electro-pneumatic final controlling element	60°C or less
Multi-point temperature converter	60°C or less

Modification of combined measuring instrument:
The combined measuring instrument installed in the hazardous area cannot be modified. (Unit exchange is possible).

Wiring LC: Use within inspection conditions (See Table 2).

General Specifications

Ambient temperature:
-10 to 50℃

Storage temperature:
-25 to 85℃

Ambient humidity:
Less than 90%RH

Optional accuracy:
Better than ±0.1%

External dimensions (H × W × D):
30 × 70 × 55mm

Mass {weight}: Approx. 250g

Case: Glass fiber resin case(black)

Terminals: Connected by crimp terminals with M4 screws and insulation sleeve.
Terminals on intrinsically safe explosion-proof circuit side are indicated in bright blue.

Cover: Transparent plastic cover for protection of terminals

Operating conditions for measurement:
Circuit resistance, circuit voltage, common mode, etc. are limited. (See Table 2)

Table 1. Types and ,code symbols for combined measuring instruments and inspection certificate number

Type	Code symbols	Combined measuring instruments	Color idemtification	Inspection certificate No.
For transmitter (4 to 20mA, 2-wire system)	PWZB10A1	FC transmitter*1 field indicator	Bule	30745
		Abgriff transmitter, field indicator		29077
FFI multi-point temperature converter	PWZB11A1	Multi-point temperature converter (FRL) + Pt resistance bulb	Bule	42150
		Multi-point temperature converter (FRL) + Thermocouple		42151
For electro-pneumatic final control element (4 to 20mA, 2-wire system)	PWZB20A1	Electro-pneumatic converter *2 posisioner *3	Green	41022
For thermocouple	PWZB30A1	Thermometer (FTA, FTB, FTC, FTD)	Red	20983
For contact input *4		Contact*4		21857
For resistance bulb (3-wire system)	PWZB4 A1	Thermometer (FTF)	Orange	20984

Notes:

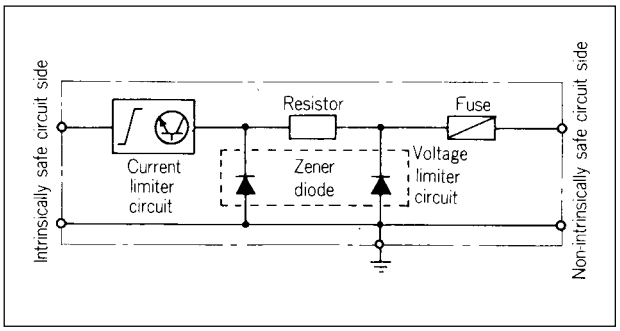
*1 Excluding emf transmitter (FRA) and flow transmitter (FJQ). FC transmitter modification No. is type 2.

*2 Electro-pneumatic converter modification No. is type 4.

*3 Positioner modification No. is type 5.

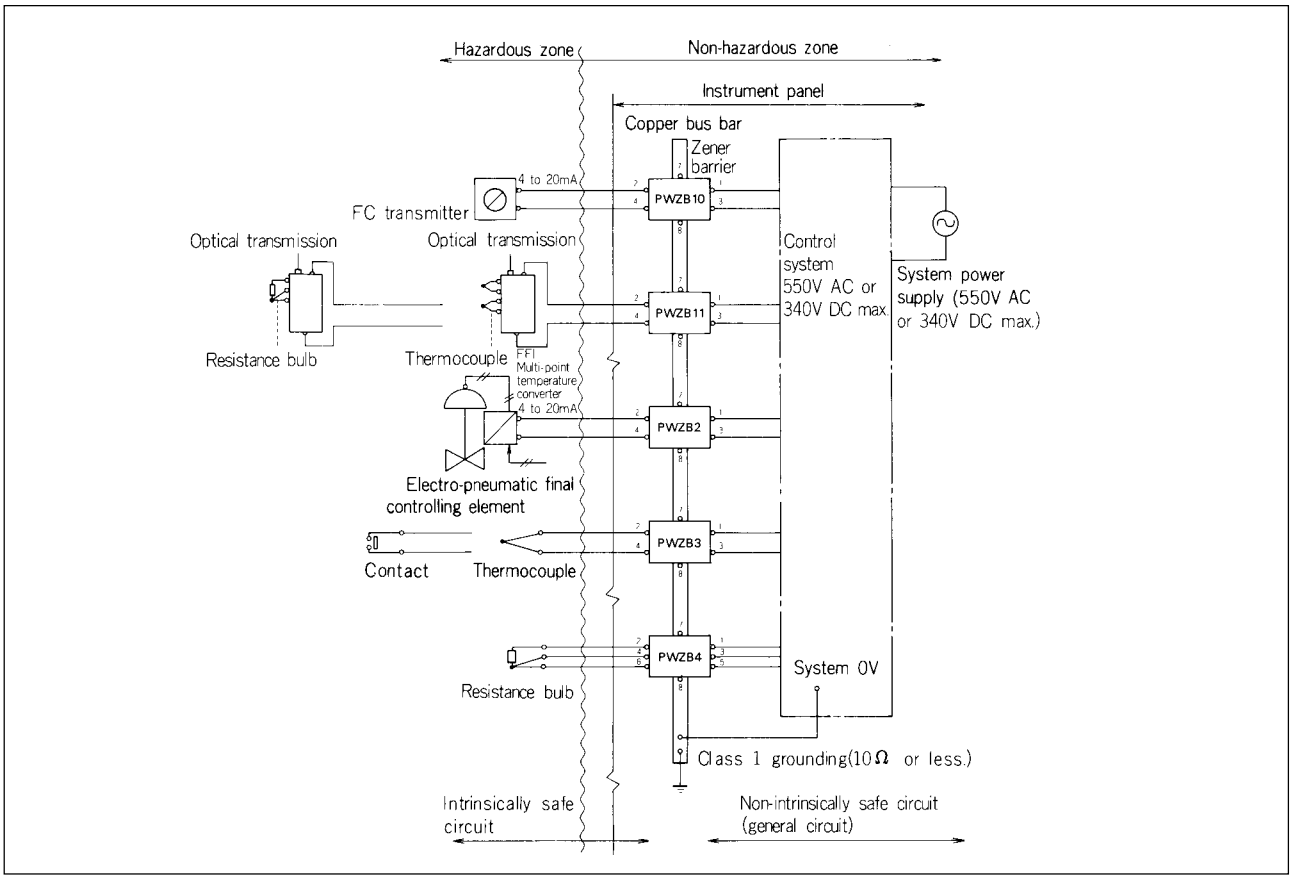
*4 For contacts located in a hazadous area, an inspection certificate prate must be attached to a contact not equipped with a power supply. Also, when an acetylene atmosphere exsts in a hasardous area, ensure contacts do not include bare copper or copper alloy.
On the receiving signal side of the zener barrier, it is necessary to use an exclusive intrinsically safe auxiliary relay (PWR).

OPERATING PRINCIPLES



- The zener barrier consists of three safety maintenance elements: (I) current limiter circuit, (II) voltage limiter circuit, and (III) fuse for voltage limiter circuit protection.
- Wiring resistance of each element increases during normal operation, and does not affect any measurement.
- The current limiter circuit is an intrinsically safe circuit which limits the current to an intrinsically safe level even if a short-circuit, ground, or other fault occurs.
- The voltage limiter circuit suppresses the voltage to less than the zener voltage to maintain the intrinsically safe functions even if a dangerous voltage exceeding the working voltage value or less than the rated max. safety voltage is applied to the nonintrinsically safe circuit due to a fault.
- The fuse protects the zener diode from self-heating and burn out thus losing its voltage limiting function. Cut-off time Tf of the fuse and fusing time Tz of the zener diode are in cooperation with each other as described below.
  Tz > 10Tf
- The zener barrier consists of a circuit containing three safety maintenance elements sealed in a case having a relaying terminal board structure.
  The intrinsically safe circuit terminals and the nonintrinsically safe circuit terminals are isolated from each other so that they are not shorted to one another thus losing their functions.
  The grounding terminal is grounded to the bus bar which is also grounded with a sufficiently low grounding resistance.
  The zener barrier includes four barriers according to applications.
- The current limiter circuit generally uses resistors. Part of the 4 to 20mA current limiter circuit consists of a hybrid IC doubled to enhance its reliability.
- The voltage limiter circuit consisting of a zener diode or ordinary diode is triplicated to assure safety and reliability.
- The newly developed thick film fuse has a high safety rating of 550V AC or 340V DC, and resists vibrations and deterioration by corrosion. It features high reliability from the viewpoint of explosion-proofing and measurement.

SYSTEM COMPOSITION DIAGRAM



Remarks: (1) The intrinsically safe circuit must satisfy the conditions for explosion-proofing given in Table 2.
(2) Refer to the separate manual for intrinsically safe explosion-proof wiring and work inside the instrument panel.

Table 2 Operating conditions for measurement and explosion-proofing

Item	Model	PWZB10A1 FC transmitter	PWZB10A1 Abgriff transmitter	PWZB11A1	PWZB20A1	PWZB30A1	PWZB40A1
Terminal No.	Intrinsically safe terminal	2, 4		2, 4	2, 4	2, 4	2, 4, 6
	Non-intrinsically safe terminal	1, 3		1, 3	1, 3	1, 3	1, 3, 5
	Grounding terminal	7, 8		7, 8	7, 8	7, 8	7, 8
	Check terminal	6		6	6	–	–
Working conditions for measurement	Rated working voltage	25.8V±0.5 DC (across 1 and 7, 8)		25.8V±0.5 DC (across 1 and 7, 8)	14V DC or less (across 1 and 3)	14V DC or less (across 1 and 3)	0.4V DC or less (across 1 and 3, 1 and 5, 3 and 5)
	Total resistance value	175Ω/20mA (across 1 and 2) 129Ω±4.5Ω (across 3 and 4)		175Ω/20mA (across 1 and 2) 129Ω±4.5Ω (across 3 and 4)	175Ω/20mA (across 1 and 2) 89Ω±3.5Ω (across 3 and 4)	449Ω±14.5Ω (across 1 and 2, 3 and 4)	59Ω±2.5Ω (across 1 and 2, 3 and 4, 5 and 6)
	Max allowable external wiring resistance	52Ω		52Ω	40Ω	By receiving instrument (approx. 100Ω)	By receiving instrument (approx. 50Ω/wire)
	Max allowable common mode voltage	0.5V AC rms		0.5V AC rms	0.5V AC rms	10V AC rms	0.1V AC rms
Working conditions for explosion-proofing	Max. safety rating	550V AC 340V DC		550V AC 340V DC	550V AC 340V DC	550V AC 340V DC	550V AC 340V DC
	Max allowable external wiring capacitance	0.022μF or less	0.22μF or less	0.022μF or less	0.09μF or less	0.25μF or less	Not limited
	Max allowable external wiring inductance*	1mH or less	1mH or less	1mH or less	0.5mH or less	5mH or less	Not limited
Remarks	Reference for wiring distance according to working conitions (approx. distance)	CWS ($1.25mm^2$) 125m	CWS ($1.25mm^2$) 110m	CWS ($1.25mm^2$) 125m	CWS ($1.25mm^2$) 250m	100m, although this depends upon compensating conductors. 2.5km with contact input	2.5km
		CEVS ($1.25mm^2$) 250m	CEVS ($1.25mm^2$) 220m	CEVS ($1.25mm^2$) 250m	CEVS ($1.25mm^2$) 500m		
		* Only one field indicator (FXG) or one transmitter with built-in indicator can be used. ☆ When the field indicator is used ployed, internal resistance of 12Ω should be subtracted,			* Only one positioner or converter (ZLA, ZLC) can be employed.		

Remarks (1) The reference for wiring distance differs according to the type of explosive gases, ambient conditions, presence or absence of shield, wiring diameter, etc. The above table gives values with regard to i3nG5. Consult Fuji if there is any question.

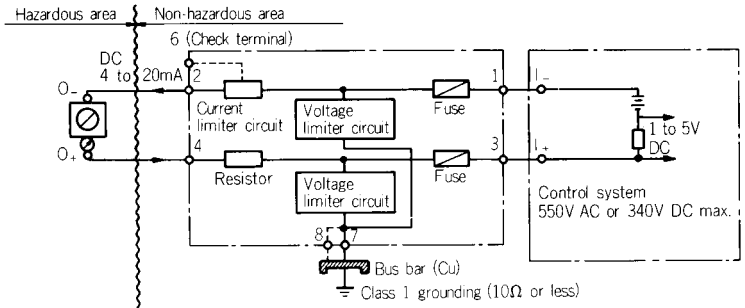
(2) The maximum allowable common mode voltage depends on the charateristies of the voltage regulating circuit. Be careful not to exceed this value.

CODE SYMBOLS

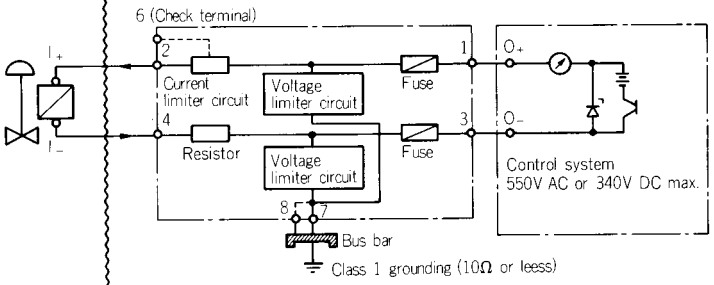
1	2	3	4	5	6	7	8	Description
P	W	Z				A	1	
								Classification
			B10					For transmitter (4 to 20mA, 2-wire system)
			B11					For FFI multi-point temprature converter
			B20					For electro-pneumatic final controlling element (4 to 20mA, 2-wire system)
			B30					For thermocouple, contact input
			B40					For resistance bulb (100°C or more) and ST transmitter
			B42					For resistance bulb (50°C or more and 100°C or less)

CONNECTIONS DIAGRAMS

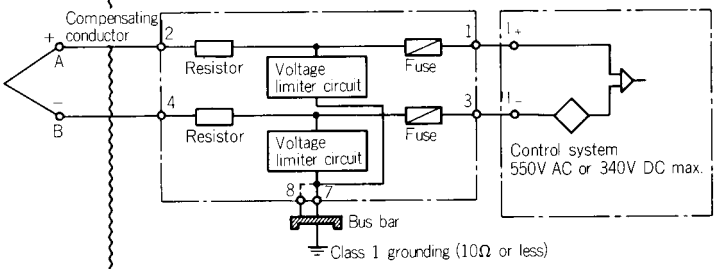
1. Zener barrier for transmitter (PWZB10A1)



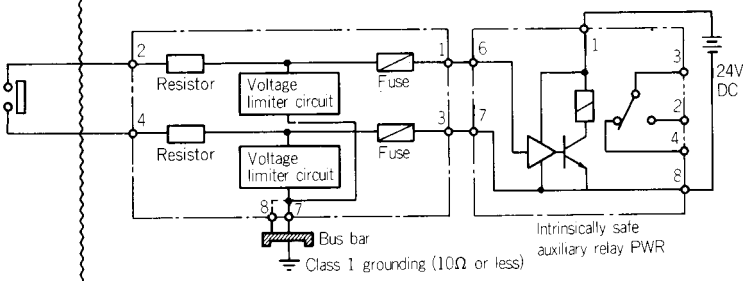
2. Zener barrier for electro-pneumatic converter and positioner (PWZB20A1)



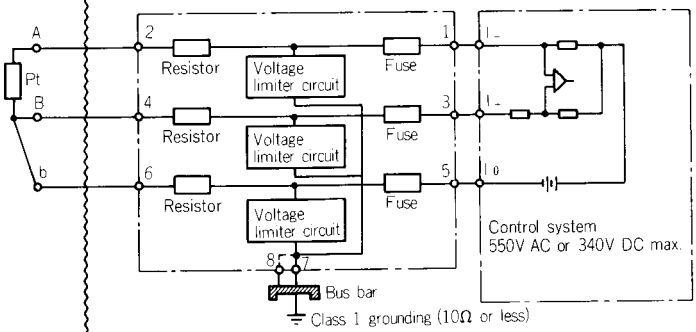
3. Zener barrier for thermocouple (PWZB30A1)



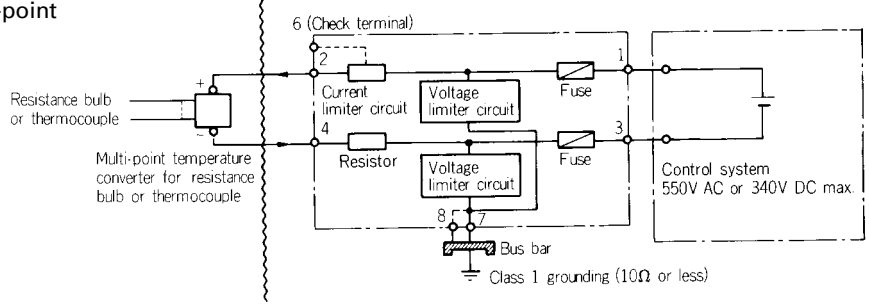
4. Zener barrier for contact input (PWZB30A1)



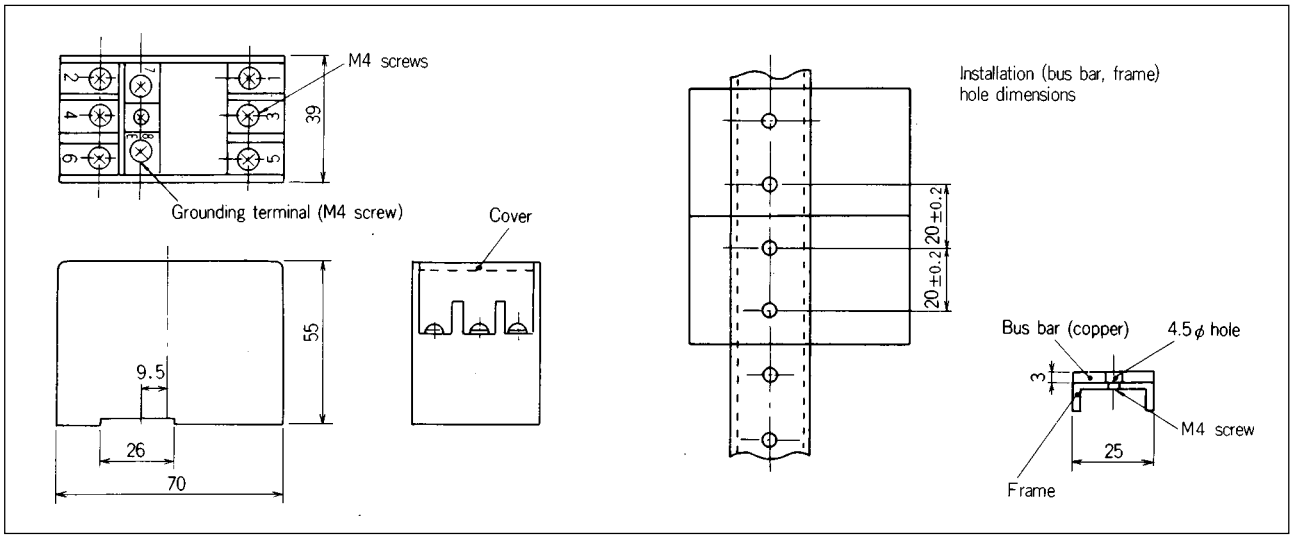
5. Zener barrier for resistance bulb and ST input (PWZB40A1)



6. Zener barrier for FFI multi-point temperature converter (PWZB11A1)



OUTLINE DIAGRAM (Unit : mm)



SCOPE OF DELIVERY

Zener barrier

RELATED DEVICES

Combined measuring instruments

ORDERING INFORMATION

1. Product name
2. Code symbols

Note: Asterisked (*)items: Non standard.

⚠ Caution on Safety

*Before using this product, be sure to read its instruction manual in advance.

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