Autonics

Dual PID Control Temperature Controller TZ SERIES

INSTRUCTION MANUAL



Thank you for choosing our Autonics product. Please read the following safety considerations before use.

■ Safety Considerations

XPlease observe all safety considerations for safe and proper product operation to avoid hazards.

★★ symbol represents caution due to special circumstances in which hazards may occur.

★ Warning Failure to follow these instructions may result in serious injury or death.

▲ Caution Failure to follow these instructions may result in personal injury or product damage.

∧ Warning

- 1. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.) Failure to follow this instruction may result in fire, personal injury, or economic loss 2. Install on a device panel to use.
- Failure to follow this instruction may result in electric shock.
- Do not connect, repair, or inspect the unit while connected to a power source.
 Failure to follow this instruction may result in electric shock or fire.

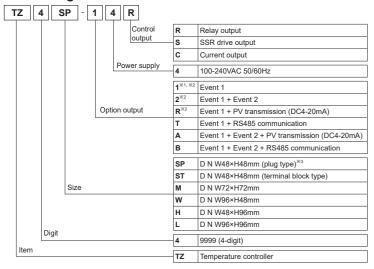
- Check 'Connections' before wiring.
 Failure to follow this instruction may result in fire.
 Do not disassemble or modify the unit.
- Failure to follow this instruction may result in electric shock or fire.

- 1. When connecting the power input and relay output, use AWG 20(0.50mm²) cable or over and tighten the terminal screw with a tightening torque of 1.0N·m.

 When connecting the sensor input and communication cable without dedicated cable, use AWG 28~16 cable and tighten the terminal screw with a tightening torque of 1.0N·m.
- Failure to follow this instruction may result in fire or malfunction due to contact failure.

 2. Use the unit within the rated specifications.
- Failure to follow this instruction may result in fire or product damage
- Use dry cloth to clean the unit, and do not use water or organic solvent.
 Failure to follow this instruction may result in electric shock or fire.
- 4. Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present. Failure to follow this instruction may result in fire or explosion.
- 5. Keep metal chip, dust, and wire residue from flowing into the unit. Failure to follow this instruction may result in fire or product damage

Ordering Information



- %The unit cannot be configured with any random combination from the above ordering information. Please refer to InSpecifications for possible configurations.
 %1: TZ4SP only supports Event 1 option output.
- X2: TZ4ST only supports Event 1, Event 1 + Event 2, and Event 1 + PV transmission (DC4-20mA) option
- output. 3: 11-pin sockets (PG-11, PS-11(N)) are sold separately.
- **XThe above specifications are subject to change and some model may be discontinued**
- × Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

Specifications TZ4SP TZ4ST TZ4M TZ4W TZ4H TZ4L Power supply 100-240VAC~ 50/60Hz Allowable voltage range 90 to 110% of rated power voltage Power consumption Max. 5VA (100-240VAC 50/60Hz) Max. 6VA (100-240VAC 50/60Hz) 7-segment LED (PV: red, SV: green) Character PV (W×H) 9.8×14.2mm 8.0×10.0mm 3 8×7.6mm 9.8×14.2mm 4 8×7 8mn SV (W×H) 8.0×10.0mm 8.0×10.0mm RTD DPt1000 JPt1000 3-wire (allowed resistance: max 50 per line) K (CA), J (IC), R (PR), E (CR), T (CC), S (PR), N (NN), W (TT) Input type TC Analog 1-5VDC--- 0-10VDC--- DC4-20mA Display accuracy F.S. ±0 3% or 3°C, greater value 250VAC~ 3A, 30VDC-- 3A, 1c Control SSR Max. 12VDC--- ±3V 30mA output DC4-20mA (load resistance max. 6000) Current EVENT1 250VAC~ 1A 1a Option output EVENT2 250VAC~ 1A 1a PV transmission DC4-20mA (load resistance max. 600Ω) RS485 communication Communication Control method ON/OFF, P. PI, PD, P DF, P DS control Alarm output hysteresis 1 to 100°C (0.1 to 100.0°C) variable

Proportional band (P) 0 0 to 100.0% 0 to 3,600 sec Integral time (I) 0 to 3,600 sec Derivative time (D) 1 to 120 sec Control period (T) 0 5 sec Sampling period LBA setting 1 to 999 sec Ramp setting Ramp Up, Ramp Down: 1 to 99 min each 2,000VAC 50/60Hz for 1 min (between input and power terminals Mechanical 0.75mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours Vibration 0.5mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min Mechanical: min. 10,000,000 operations, Electrical: min. 100,000 operations (250VAC 3A resistance load) Control output

Mechanical: min. 20,000,000 operations, Electrical: min. 500,000 operations (250VAC 1A resistance load) Insulation resistance Over 100MΩ (at 500VDC megger) Square shaped noise by noise simulator (pulse width 1µs) ±2kV R-phase, S-phase Noise immunity Approx. 10 years (non-volatile semiconductor memory type) Environ- Ambient temp. -10 to 50°C, storage: -20 to 60°C Ambient humi. 35 to 85%RH, storage: 35 to 85%RH

(**6 - FN**) us Approval
 Approx. 205g
 Approx. 218g
 Approx. 360g
 Approx. 365g

 (approx. 144g)
 (approx. 162g)
 (approx. 228g)
 (approx. 246g)
 Weight**1 X1: The weight includes packaging. The weight in parenthesis is for unit only XEnvironment resistance is rated at no freezing or condensation.

Input Type and Range

Input type		Decimal point	Display	Input range (°C)	Input range (°F)
	K (CA)	1	E E UH	-100 to 1300	-148 to 2372
	K (CA)	0.1	Y C R.L	-100.0 to 999.9	Not supported
	J (IC)	1	JI E.H	0 to 800	32 to 1472
	J (IC)	0.1	JI E.L	0.0 to 800.0	Not supported
	R (PR)	1	r Pr	0 to 1700	32 to 3092
Thermo	E (CR)	1	EEr.H	0 to 800	32 to 1472
couple	E (CR)	0.1	E[r.L	0.0 to 800.0	Not supported
	T (CC)	1	E C C.H	-200 to 400	-328 to 752
	T (CC)	0.1	FEET	-199.9 to 400.0	Not supported
	S (PR)	1	5 Pr	0 to 1700	32 to 3092
	N (NN)	1	Поп	0 to 1300	32 to 2372
	W (TT)	1	UEE	0 to 2300	32 to 4172
	JPt100Ω	1	JPE.H	0 to 500	32 to 932
RTD	JPt100Ω	0.1	JPE.L	-199.9 to 199.9	-199 9 to 391.8
KID	DPt100Ω	1	dPt.H	0 to 500	32 to 932
	DPt100Ω	0.1	dPE.L	-199.9 to 199.9	-199 9 to 391.8
	Voltage	0 - 10VDC	R I	-1999 to 9999	
Analog		1 - 5VDC	R 2	(display range will vary depending on the	
	Current	DC4 - 20mA	В 3	decimal point.)	

Configuring Input Type

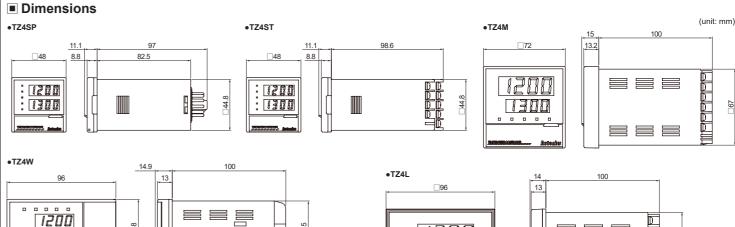
Please configure the internal switches before supplying power. After supplying power, configure the input type [n E] in parameter group 2 according to the input type

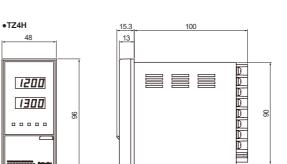
Input type		S/W 1	S/W 2
Thermocouple			-
RTD		1 1	mA V
Analog	Voltage (0-10VDC, 1-5VDC)	2 2	mA V
	Current (DC4-20mA)	2 2	mA V

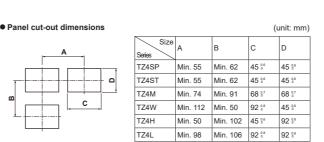
Press the front case then pull the case to detach the case from the body. Configure the internal switches as input type.

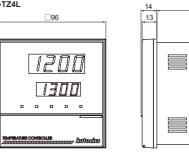


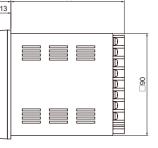
1300







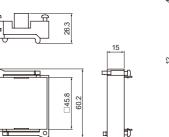


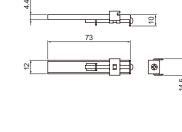




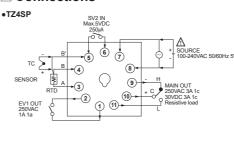






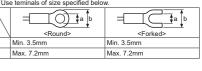


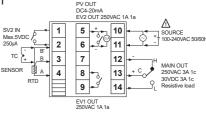
Connections



MAIN OUT					
SSR	Current				
9 0	9				
12VDC ±3V 30mA Max.	DC4-20mA Load 600Ω Max.				

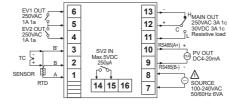


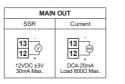


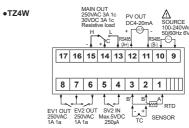


MAII	TUO
SSR	Current
12	12
12VDC ±3V 30mA Max.	DC4-20mA Load 600Ω Max.

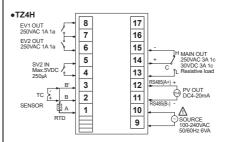
•T74M







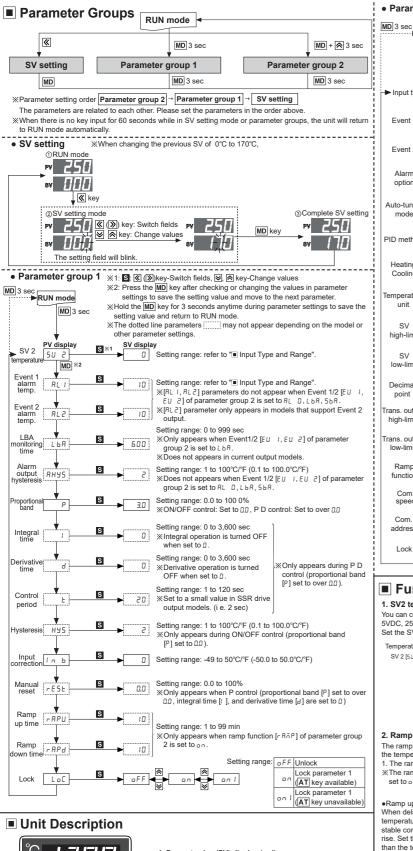
MAIN OUT			
SSR	Current		
15	15		
12VDC ±3V 30mA Max.	DC4-20mA Load 600Ω Max.		

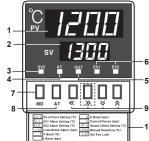


MAIN OUT			
SSR	Current		
15 VDC ±3V	15 mA		
30mA Max.	Load 600Ω Max.		



irrent
MA I-20mA 00Ω Max.





- 1. Present value (PV) display (red): RUN mode: displays the current value (PV) Setting mode: displays parameters
- 2. Set value (SV) display (green):
- RUN mode: displays the set value (SV)
- Setting mode: displays parameter setting values

 3. SV2 operation indicator: turns ON when SV2 is operating
- A. Auto-tuning indicator: turns ON when auto-tuning
 Control output operation indicator: turns ON when control output is ON. Does not operate when the input type is current
- 6. Event output indicator: turns ON when the according event output is ON.
- *The Event 2 output indicator does not operation in TZ4SP.
- 7. Mode key: enter parameter group, return to RUN mode, switch parameters, save setting values 8. Auto-tuning key: hold the key for 3 seconds to start auto-tuning. Hold the key for 5 seconds while autotuning to stop auto-tuning.
- ing keys: enter SV change mode, switch fields, change value (x) key in the dotted line is only available in TZ4M and TZ4L models)
- 10. Key adjustment order chart

NUN mode

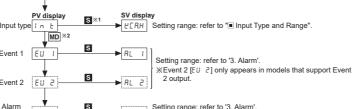
MD + 🙈

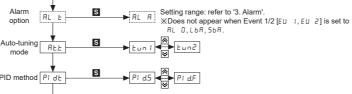
3 sec

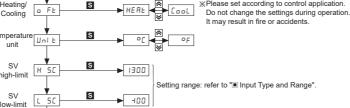
settings to save the setting value and move to the next parameter. X Hold the MD key for 3 seconds anytime during parameter settings to save the

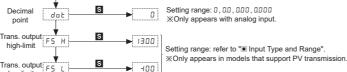
setting value and return to RUN mode. *The dotted line parameters : may not appear depending on the model or other parameter settings.

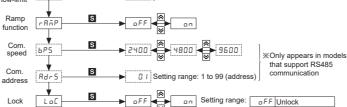
Please set according to control application







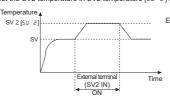




Functions

1. SV2 temperature

You can control an additional temperature value at a desired range by using SV2. Connect a contact signal (under 5VDC, 250µA) at the external terminal, to operate in the range where the signal turns ON. Set the SV2 temperature in SV2 temperature [5t/2] in parameter group 1.



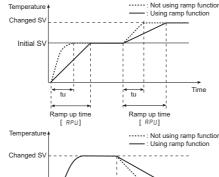
E.g.)The internal temperature of an electric oven may drop rapidly if the door is opened while the oven is maintaining a specific temperature. Set SV2 temperature [5// 2] to a higher value than SV, and input a signal to the external terminal (SV2 IN), to quickly raise the temperature.

on Lock parameter 2

2. Ramp

The ramp function can delay the rate of temperature rise/fall. If the SV value is changed during stabilized control the temperature of the controlled target will rise/fall during ramp up/down time [-#PU, -#Pd] of parameter group 1. The ramp function activates when the power is reset or when the SV value is changed during stable control. *The ramp up/down time [-RPI]. - RPI] appear only when the ramp function [-RBP] of parameter group 2 is

●Ramp up time [r ฅฅ๒] When delaying the rise of initial control temperature or changing the SV during stable control, you can delay temperature rise. Set the ramp up time [-RPU] longer than the temperature rise time (tu) when not using the ramp function.



 Ramp down time [- RPd] Delays declining temperature. Set the ramp down time [- RPd] longer than the temperature decline time (td) when not using the ramp function

Initial S td td Ramp down time 3. Alarm (Event)

S. Alarm (Event)

Alarm output can be configured by combining alarm operation and alarm options. Set the alarm operation in event 1/2 [EU 1, EU2] of parameter group 2, and set the alarm options in alarm option[AL E].

1Nalarm operation

Mode Name		Alarm operation		Description
AL D	-	-		Alarm output not used.
AL I	Deviation high-limit alarm	Δ SV PV		If the deviation of PV and SV are higher than the high-limit deviation, the alarm output turns ON.
AL 2	Deviation low-limit alarm	ON ↑H↓ △ PV 90°C Low-limit dev	OFF SV 100°C iation: 10°C	If the deviation of PV and SV are higher than the low-limit deviation, the alarm output turns ON.
AL 3	Deviation high-limit /low-limit alarm	ON H OFI DV SV 90°C 100° High-limit/low-limit	PV C 110°C	If the deviation of PV and SV are higher than the high-limit deviation or low-limit deviation, the alarm output turns ON.
ЯL Ч	Deviation high-limit /low-limit reverse alarm	OFF H ON PV SV 90°C 100° High-limit/low-limit	PV C 110°C	If the deviation of PV and SV are higher than the high-limit deviation or low-limit deviation, the alarm output turns OFF.
AL 5	Absolute value high-limit alarm	OFF H ON A PV 90°C 100°C Absolute value alarm: 90°C	OFF HON SV PV 100°C 110°C Absolute value alarm: 110°C	Alarm output turns ON when PV is higher than the absolute value.
AL 6	Absolute value low-limit alarm	ON H OFF A PV SV 90°C 100°C Absolute value alarm: 90°C	ON TH OFF SV PV 100°C 110°C Absolute value alarm: 110°C	Alarm output turns ON when PV is lower than the absolute value.
56A	Sensor break	_		Alarm output turns ON when sensor disconnection is detected.
LЬЯ	Loop break	_		Alarm output turns ON when loop break is detected.

2)Ala	2)Alarm options					
Mode		Name	Description			
AL	Я	Standard alarm	Alarm output turns ON upon alarm condition, and alarm output turns OFF when condition is cleared.			
RL	Ь	Alarm latch	Alarm output turns ON and maintains ON upon alarm condition.			
AL	Ε	Standby sequence	The first alarm condition is ignored. It will operate as standard alarm from the second alarm condition. If it is under alarm condition when power is supplied, it will ignore the condition and operate as standard alarm from the next alarm condition.			
AL	d	Alarm latch and standby sequence	t will operate as both alarm latch and standby sequence upon alarm condition. If it is under alarm condition when power is supplied, it will ignore the condition and operate as alarm latch from the next alarm condition.			

3) Sensor break alarm Alarm output turns ON when sensor is not connected or loses its connection during temperature control. Set disconnection can be tested by connecting buzzers or other devices to the alarm output contact. Sensor bre alarm output operates through EV1 OUT or EV2 OUT contacts. Alarm output is disengaged after resetting the

oower. 4) Loop break Alarm (LBA)

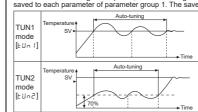
1) Loop break Marm (LBA)
Joagnose control loop and transmit alarm output through temperature change of control target. During leating(cooling) control, the alarm output turns ON if the PV does not rise/drop by a specific amount (approx. 2°C) suring LBA monitoring period [£ hB] while control output amount is at 100%(0%).

Xif the thermal response of the control target is slow, the LBA monitoring period [£ hB] of parameter group 1

should be set longer.

KLBA only operates when the control output amount is 100%(0%) so it cannot be used in current output models. If the alarm output turns ON after the sensor has been disconnected, the alarm output will not turn OFF even after reconnecting the sensor. To disengage the alarm output, the temperature controller power must be reset

4. Auto-tuning
Auto-tuning allows the temperature controller to detect the thermal characteristics and response rates of the
control target. It then calculates the P D time constant and sets the value to allow fast response rates and high
accuracy. Hold the ATI key for 3 seconds during RUN mode to start auto-tuning. The auto-tuning indicator will
blink. When auto-tuning is completed, the auto-tuning indicator will durin off and the PID time constant will be
saved to each parameter of parameter group 1. The saved parameters can be adjusted as desired.



To manually stop auto-tuning, hold the AT key for 5 seconds. When auto-tuning is stopped, the controlle maintains the P D value before auto-tuning.

TZ Series supports 2 auto-tuning modes IZ Series supports 2 auto-tuning modes.

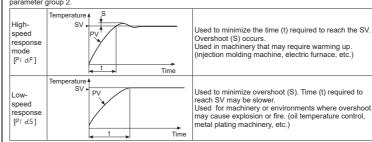
Select TUN1 mode or TUN2 mode [Ł@n 1,Ł@n²] from auto-tuning mode [RELE] of parameter group 2.

**Run auto-tuning during initial setup of the temperature controller.

**If the thermal characteristics of the control target device has changed after extended usage, re-run auto tuning.

auto-tuning.

5. Dual PID control
The response rate of the PID control can be selected depending on the characteristics of the control target. Select high-speed response mode or low-speed response mode $[P1\ dF,P1\ dS]$ from PID method $[P1\ dF]$ of



6. Input correction [i n b]
Used to correct deviation from external devices such as temperature controllers.

E.g., If the actual temperature is 80°C but the display value is 78°C, set the input correction [! n b] value to 2 and it will display 80°C as the display value. Configuring manual reset [r E5½] according to control results.

and it will display 80°C as the display value.

7. Manual reset [-E5Ł]
When using proportional control (P control), the time of temperature rising time and falling time may differ depending on factors such as the heat capacity of the control device or the heater. A certain amount of deviation occurs even under stable conditions.

This deviation is referred to as offset, and can be configured/corrected using manual reset [-E5Ł].

When PV and SV are equal, the reset value is 50.0%. If the PV is lower than the SV during stable control, set the value to over 50 0%, and if the PV is higher than the SV, set the value to under 50 0%

Reset value set at under 50 0% Offset Offset eset value set at over 50 0%

■ RS485 Communication

Applicable for models that support RS485 communication. Please refer to ■ Ordering Information'

t is used to transmit PV or SV, and/or set the SV. EIA RS485 Applied standard Start bit 31 units (address: 1 to 99) Data bit 8-bit fixed Communication method 2-wire half duplex Parity bit Synchronization method Asynchronous Stop bit

■ Comprehensive Device Management Program[DAQMaster]

omorning processes.				
tem	Minimum specifications			
System	IBM PC compatible computer with Pentium III or above			
Operations	Windows 98/NT/XP/Vista/7/8/10			
/lemory	256MB+			
lard disk	1GB+ of available hard disk space			
/GA	Resolution: 1024×768 or higher			
Others	RS232C serial port (9-pin), USB port			

Troubleshooting

Communication distance Within 1 2km

Symptoms	Troubleshooting			
oPEn is displayed on the PV display during operation	Disconnect the power and check the input connection. If the input is connected, disconnect the input wiring from the temperature controller and short the + and - terminals. Power the temperature controller and check if it displays the room temperature. If it does not display the room temperature and continues to display $oPEn$, the controller is broken. Please contact our technical support. (Input type is thermocouple)			
Load (heater, etc.) does not operate during operation	Check the state of the control output indicator on the front panel. If the indicator is not working, check parameter settings. If the indicator is working, disconnect the wiring from the output terminal of the temperature controller and check the output (replay contact, SSR drive, current)			
Err (error) is displayed on the PV display during operation	Indicates damage to internal chip by strong noise (2kVAC). Please contact our technical support. Locate the source of the noise and devise countermeasures.			

Error Dispaly

Display	Description	Troubleshooting
oPEn	Blinks when input is disconnected.	Check input status.
нннн	Blinks when the measured input value is higher than the temperature range.	Adjust the value to within
LLLL	Blinks when the measured input value is lower than the temperature range.	the temperature range.

■ Factory Default

Parameter group 1

	•				
Parameter	Default	Parameter	Default	Parameter	Default
5U 2	0	ρ	3.0	In b	0
AL I	10	1	0	r E S E	0.0
AL2	10	Ь	0	r RPU	10
LBA	600	Ł	20	rRPd	10
AH95	2	H95	5	LoC	oFF

Parameter group 2

Parameter	Default	Parameter	Default	Parameter	Default				
in E	FCUH	o FE	HERL	F5 L	400				
EU I	AL I	Uni E	٥٤	rRñP	oFF				
EU 2	AL 2	H 5C	1300	ЬP5	2400				
AL E	AL A	L 5C	400	AdrS	0 1				
A L.L	Eun I	dot	0	LoC	oFF				
PI dE	PI d.5	F5 H	1300						

Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. Check the polarity of the terminals before wiring the temperature sensor.
For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
3. Keep away from high voltage lines or power lines to prevent inductive noise.
In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.

wire at input signal line.

Do not use near the equipment which generates strong magnetic force or high frequency noise. I. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the

power.

5. Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.

6. When changing the input sensor, turn off the power first before changing.

After changing the input sensor, specify internal switch and modify the value of the corresponding parameter.

Do not overlapping communication line and power line. Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect of external noise

Make a required space around the unit for radiation of heat.
 For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
 Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
 Do not wire to terminals which are not used.

 This unit may be used in the following environments.
 Olndoors (in the environment condition rated in 'Specifications') ②Altitude max. 2.000m

③Pollution degree 2

(a)Installation category I

Major Products

Photoelectric Sensors

Fiber Optic Sensors

Door Sensors

SSRs/Power Controllers

■ Door Sensors ■ Door Side Sensors

Sors/Power Controllers

Counters
Timers
Panel Meters
Tachometer/Pulse (Rate) Meters ■ Door Side Sensors
■ Area Sensors
■ Proximity Sensors
■ Pressure Sensors
■ Rotary Encoders
■ Connector/Sockets

■ Connector/Sockets ■ Sensor Controllers
■ Switching Mode Power Supplies
■ Control Switches/Lamps/Buzzers
■ I/O Terminal Blocks & Cables
■ Stepper Motors/Drivers/Motion Controllers
■ Graphic/Logic Panels
■ Field Network Devices
■ Laser Marking System (Fiber, CO₂, Nd: YAG)
■ Laser Welding/Cutting System

DRW170713AB