

# Autonics

## SENSOR CONTROLLER PA10 SERIES

### INSTRUCTION MANUAL



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

#### ■ Safety Considerations

- ※ Please observe all safety considerations for safe and proper product operation to avoid hazards.
- ※ Safety considerations are categorized as follows.
- 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.
- ※ The symbols used on the product and instruction manual represent the following
- ▲ symbol represents caution due to special circumstances in which hazards may occur.

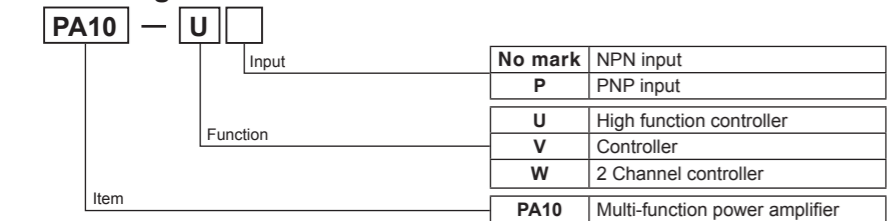
#### ▲ Warning

- 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.
- Install on a device panel or DIN rail to use.** Failure to follow this instruction may result in electric shock or fire.
- 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.

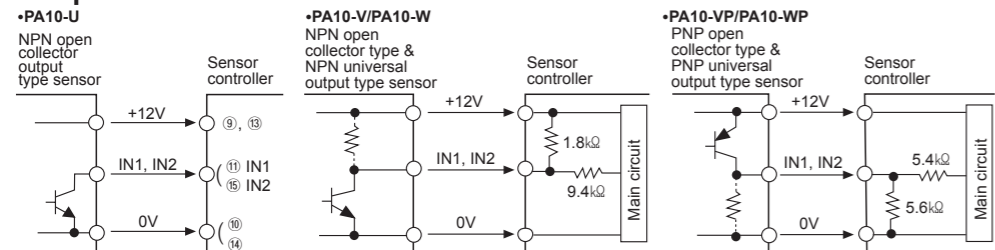
#### ▲ Caution

- When connecting the power/sensor input and relay output, use AWG 24 (0.20mm<sup>2</sup>) to AWG 15 (1.65mm<sup>2</sup>) cable or over and tighten the terminal screw with a tightening torque of 0.98 to 1.18N·m.** Use proper cables for the rated load current. Failure to follow this instruction may result in fire or malfunction due to contact failure.
- 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.
- 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.
- 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



#### ■ Input Connections



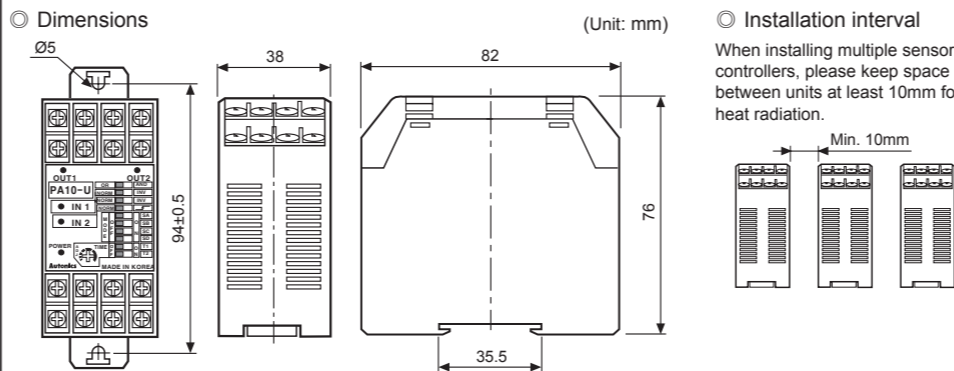
※ The above specifications are subject to change and some models may be discontinued without notice.  
※ Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

#### ■ Specifications

Model	PA10-U	PA10-V	PA10-VP	PA10-W	PA10-WP
Power supply	100-240VAC ~ 50/60Hz				
Allowable voltage range	90 to 110% of rated voltage				
Power consumption	Max. 10VA (condition: 12VDC/200mA resistive load)				
Power for external sensor	12VDC ± 10% approx. 200mA				
Input (IN1, IN2)	Selectable NORM/INV. Selectable OR/AND operation for IN1, IN2 input. Selection function for IN2 derivative action.		Selectable NORM/INV. Operation for IN1, IN2 AND.		Selectable NORM/INV. Selection function for IN1, IN2 individual operation.
	NPN input type	NPN input type	PNP input type	NPN input type	PNP input type
Input method	<b>PA10-U</b> [No-voltage input] Impedance at short-circuit: Max. 680Ω, Residual voltage at short-circuit: Max. 0.8V, Impedance at open: Min. 100kΩ				
	<b>PA10-V/PA10-W</b> [No-voltage input] Impedance at short-circuit: Max. 300Ω, Residual voltage at short-circuit: Max. 2V, Impedance at open: Min. 100kΩ				
	<b>PA10-VP/PA10-WP</b> [Voltage input] Input impedance: 5.6kΩ, "H" level voltage: 5-30VDC=, "L" level voltage: 0-2VDC				
Out-put	Contact output	OUT[250VAC ~ 3A(Resistive load)]			OUT1, OUT2 [250VAC ~ 3A(Resistive load)]
	Solid-state output	O · C OUT1, O · C OUT2			O · C OUT
Response time	NPN open collector output Max. 30VDC= Max. 100mA				
	Relay output : Max. 10ms, Transistor output : Max. 0.05ms				
Time setting function by each mode	Have	• ON-DELAY MODE • ONE-SHOT DELAY MODE • FLICKER ONE-SHOT MODE • HIGH-SPEED DETECTION MODE			• OFF-DELAY MODE • FLICKER MODE • LOW-SPEED DETECTION MODE • ON/OFF-DELAY MODE
		Non	• NORMAL MODE • FLIP-FLOP MODE • ENCODER(MODE 9 to 11)		
Relay life cycle	Mechanical	Min. 10,000,000 times			
	Electrical	Min. 100,000 times(250VAC 3A resistive load)			
Dielectric strength	2000VAC 50/60Hz for 1 minute				
Insulation resistance	Over 100MΩ(at 500VDC megger)				
Environment	Ambient temperature	-10 to 55°C [Storage: -25 to 60°C]			
	Ambient humidity	35 to 85%RH [Storage: 35 to 85%RH]			
Unit weight	Approx. 150g			Approx. 160g	

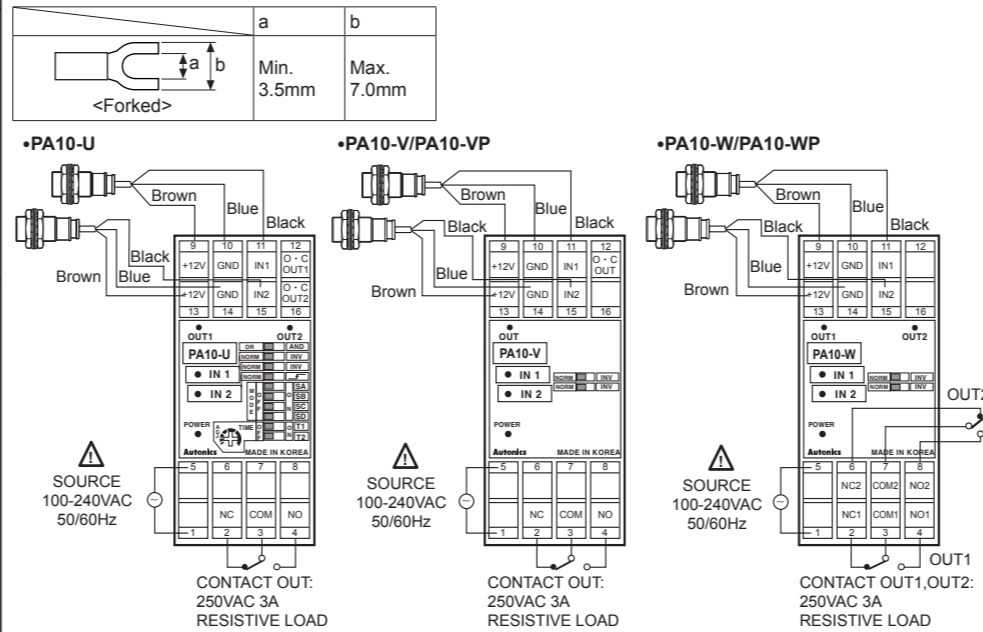
※ If the load is connected over 200mA at the sensor output, it may cause mechanical trouble.  
※ Environment resistance is rated at no freezing or condensation.

#### ■ Dimensions and Installation Interval



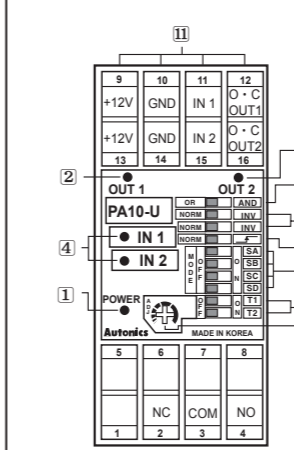
#### ■ Connections

※ Use terminals of size specified below.



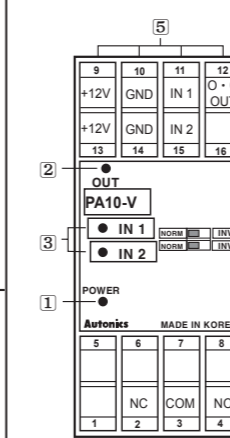
#### ■ Front Panel Identification

##### •PA10-U



- Power indicator** : LED turns on when AC power applied
- Output indicator 1** : Indication of output 1 operation status
- Output indicator 2** : Indication of output 2 operation status
- Sensor input indicator** : Indication of sensor input signal (LED turns on when sensor input is Low)
- AND/OR selection switch** : Select "AND" or "OR" for IN1, IN2 Input
- Selection switch of sensor input signal** :
  - NORM** (When input signal is low, it is valid signal. ( ))
  - INV** (When input signal is high, it is valid signal. ( ))
- Derivative action selection of IN2 input signal (AND/OR selection switch: AND)** :
  - NORM** (When IN2 input signal is operating as reverse turn function)
  - Derivative action of IN2 input signal.** ※ See "Derivation action applications"
- Selection switch for operation mode** : See "Operation mode" in next page.
- Selection switch of time range and max. input frequency** : It is the switch to select time range(1 to 7 mode) or allowable input frequency(9 to 11 mode).
  - Time range: Approx. 0.01 to 0.1sec, Max. input frequency: 100kHz
  - Time range: Approx. 0.1 to 1sec, Max. input frequency: 10kHz
  - Time range: Approx. 0.1 to 10sec, Max. input frequency: 1kHz
  - Time range: Approx. 10 to 100sec, Max. input frequency: 100Hz
- Timer volume** : Adjust time within the range which is set with 9.
- Terminal block**

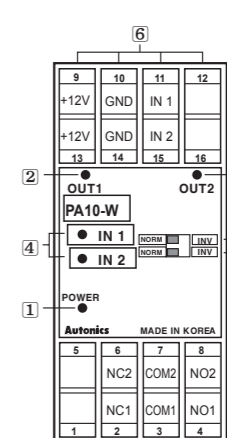
##### •PA10-V/PA10-WP



- Power indicator** : LED turns on when AC power applied.
- Output indicator** : Indication of output signal.
- Sensor input indicator** : Indication of sensor input signal.
  - PA10-V: LED turns on when sensor input is Low
  - PA10-WP: LED turns on when sensor input is High
- Selection switch of sensor input signal** :
  - NORM**: When sensor input signal is Low, it is valid signal.
  - INV**: When sensor input signal is High, it is valid signal.
- Terminal block**

※ When IN1, IN2 input signal is AND, OUT will work.

##### •PA10-W/PA10-WP

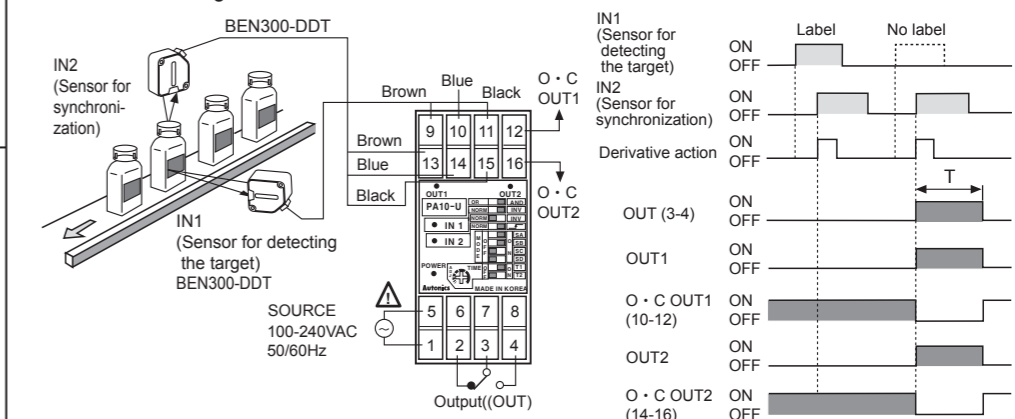


- Power indicator** : LED turns on when AC power applied
- Output 1 indicator** : Indication of output 1 operation status.
- Output 2 indicator** : Indication of output 2 operation status.
- Sensor input indicator** : Indication of sensor input signal.
  - PA10-W: LED turns on when sensor input is Low.
  - PA10-WP: LED turns on when sensor input is High.
- Selection switch of sensor input signal** :
  - NORM**: When sensor input signal is Low, it is valid signal.
  - INV**: When sensor input signal is High, it is valid signal.
- Terminal block**

※ IN1, IN2 operates individually.

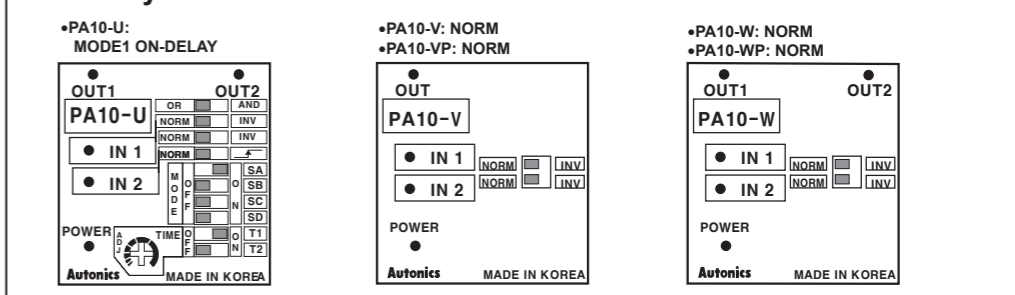
#### ■ Derivative Action Applications

○ Detect label of glass bottle



•Operation  
When IN1 is ON and IN2 is ON, OUT will not work.  
But when there is no label on bottle, OUT will work when IN2 is ON. OUT will be returned after setting time.  
Note)Condition of detecting label on glass bottle is to install with IN1 operating first.

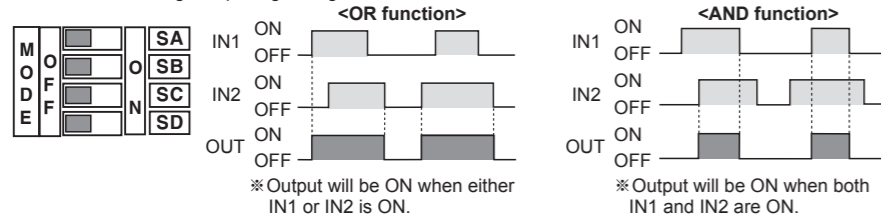
#### ■ Factory Default for S/W



## Operation Mode

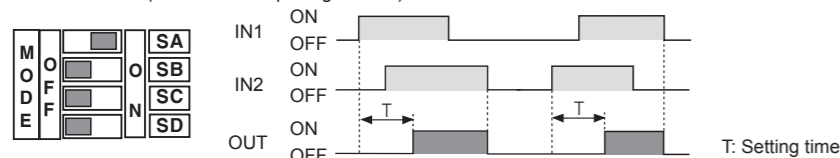
### MODE 0 NORMAL MODE

: OUT will work according to input signal regardless Timer.



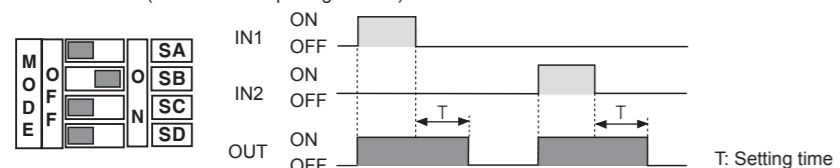
### MODE 1 ON-DELAY MODE

: OUT will be ON after setting time when one of IN1 and IN2 is ON. When IN1 and IN2 are OFF, OUT will be OFF. (This is when input logic is OR)



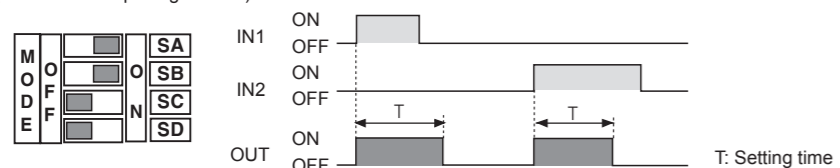
### MODE 2 OFF-DELAY MODE

: OUT will be ON at the same time when IN1 or IN2 is ON then OUT will be OFF after setting time when IN1 or IN2 is OFF. (This is when input logic is OR)



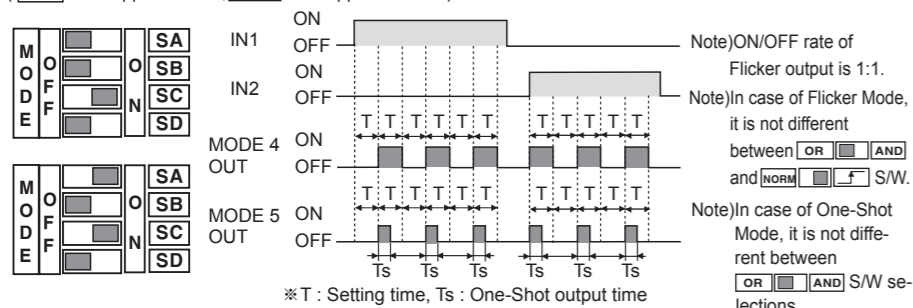
### MODE 3 ONE-SHOT DELAY MODE

: OUT will be ON at the same time when IN1 or IN2 is ON then OUT will be OFF after setting time. (This is when input logic is OR)



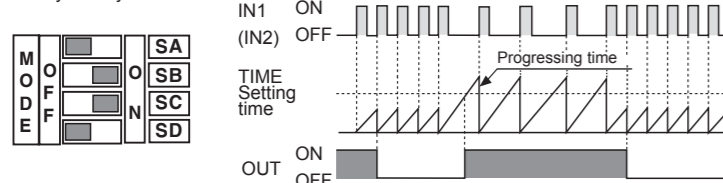
### MODE 4,5 FLICKER MODE / FLICKER ONE-SHOT MODE

: OUT will be ON after setting time for IN1 input then it is flickering and OUT will be flickering after setting time from ON and IN2 input is same. In case One-shot Mode, output time(Ts) will be selected by NORM S/W. (Ts= Approx. 10ms, NORM: Ts= Approx. 100ms)



### MODE 6 LOW-SPEED DETECTION MODE

: OUT will be ON when input signal (IN1) is longer than setting time by comparing it to the setting time by one cycle.

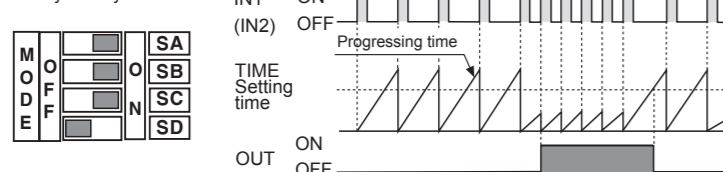


Note) Above is when input logic is OR and it will be the same by using IN2 input signal terminal instead of IN1.

Note) When use MODE 6 as above, be sure that OUT will be work at the same time with power supply.

### MODE 7 HIGH-SPEED DETECTION MODE

: OUT will be ON when input signal (IN1) is shorter than setting time by comparing it to the setting time by one cycle.



Note) Above is when input logic is OR and it will be the same by using IN2 input signal terminal instead of IN1.

## TIME S/W function(MODE 1 to MODE 7)

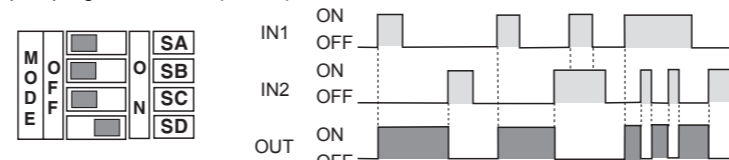
: Set the setting time by TIME S/W(T1, T2) and front TIME VOLUME(ADJ).

MODE	MODE 1 to MODE 7, MODE 12	MODE 6 to MODE 7
TIME S/W	Setting time range	Input frequency rpm
	0.01 to 0.1sec	100 to 10Hz 6,000 to 600rpm
	0.1 to 1sec	10 to 1Hz 600 to 60rpm
	1 to 10sec	1 to 0.1Hz 60 to 6rpm
	10 to 100sec	0.1 to 0.01Hz 6 to 0.6rpm

\* Range of operating rpm is 1 pulse per 1 revolution.  
\* When the pulse is increasing per 1 revolution, range of operating rpm is decreasing.

### MODE 8 Flip-Flop MODE [OUT LATCH operation]

: When IN1 signal is input then the Flip-Flop output will be ON(SET). When the IN2 signal is input, Flip-Flop Signal will be OFF(RESET).



Note) IN2 will be the first of input signal.

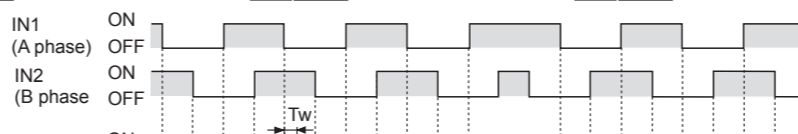
Note) It is not different between OR AND and NORM S/W.

Note) There is no Timer function in Flip-Flop Mode, therefore use this unit with Time S/W(T1, T2) as OFF.

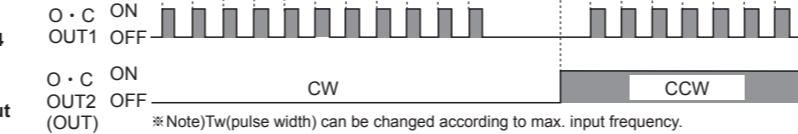
## ENCODER MODE(MODE 9 ~ MODE 11)

- There should be 90° phase difference between IN1 and IN2 for input terminal.
- Please connect A phase output of encoder to IN1 and B phase output of encoder to IN2, when use NPN open collector or Totempole output type of encoder with controller. In this case, turned to CW direction detection signal(O.C OUT2, OUT) output of controller will be OFF.
- There are output function of pulse(O.C OUT1) which has been multiplied(x1, x2, x4 times) against input signal and direction detection output(O.C OUT2, OUT) function which detects direction of encoder rotation in Encoder mode.
- Be sure to Input speed(cps) of connected equipment because pulse width of O.C OUT1 is short.
- OR AND NORM S/W Selection S/W can be set at any position.

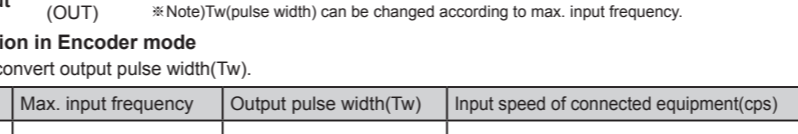
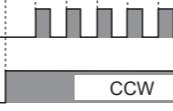
### MODE 9 ENCODER (Input pulse x1time)



### MODE 10 ENCODER (Input pulse x2times)



### MODE 11 ENCODER (Input pulse x4times)



## TIME S/W function in Encoder mode

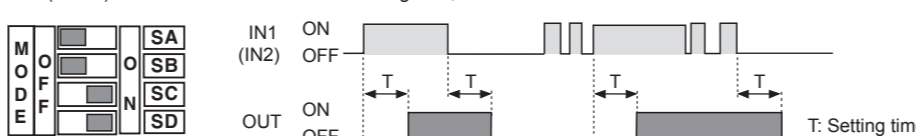
: TIME S/W is to convert output pulse width(Tw).

TIME S/W	Max. input frequency	Output pulse width(Tw)	Input speed of connected equipment(cps)
	100kHz	Approx. 0.5μs	Min. 2000kHz(2,000kcps)
	10kHz	Approx. 5μs	Min. 200kHz(200kcps)
	1kHz	Approx. 50μs	Min. 20kHz(20kcps)
	100Hz	Approx. 500μs	Min. 2kHz(2kcps)

### MODE 12 ON/OFF-DELAY MODE

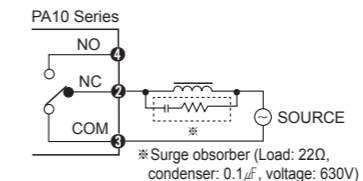
: OUT will be ON after setting time when IN1 (or IN2) is ON. When IN1 (or IN2) is OFF, OUT will be OFF after setting time. (This is when input logic is OR)

\* If IN1 (or IN2) ON/OFF time is shorter than setting time, OUT does not turn.

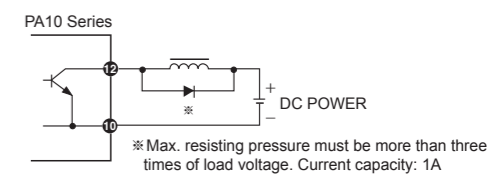


## Output

It is able to reduce noise generating if install surge absorber between inductive loads(Motor, Solenoid, etc) as Picture 1. When use DC Relay for load, please install a diode at relay coils as Picture 2. (Be sure to power polarity)



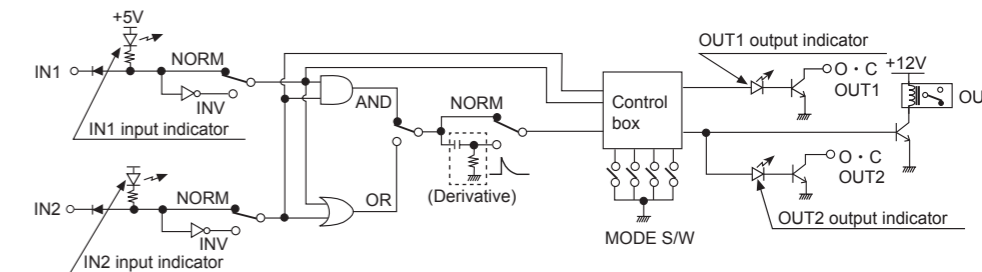
(Picture 1) Relay output



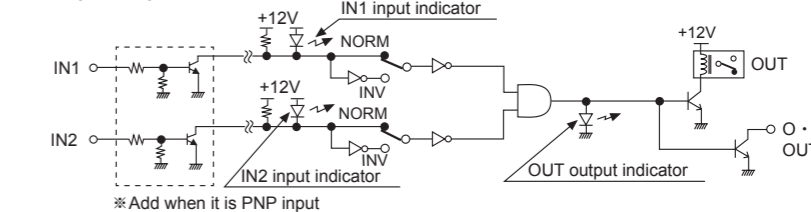
(Picture 2) NPN open collector output

## Function Diagram

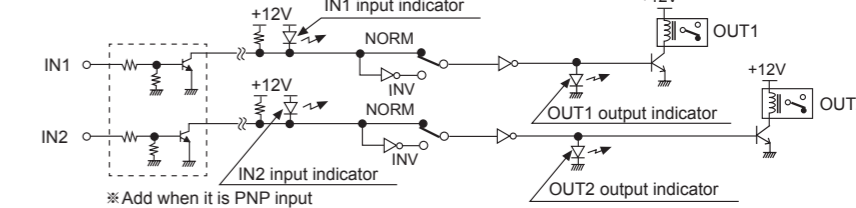
### PA10-U



### PA10-V/PA10-VP



### PA10-W/PA10-WP



## Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Use the product, 0.1 sec after supplying power.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- 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. Do not use near the equipment which generates strong magnetic force or high frequency noise.
- This unit may be used in the following environments.
  - ① Indoors (in the environment condition rated in 'Specifications')
  - ② Altitude max. 2,000m
  - ③ Pollution degree 2
  - ④ Installation category II

## Major Products

- Photoelectric Sensors
- Fiber Optic Sensors
- Door Sensors
- Door Side Sensors
- Area Sensors
- Proximity Sensors
- Pressure Sensors
- Rotary Encoders
- Connector/Sockets
- 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, Co<sub>2</sub>, Nd: YAG)
- Laser Welding/Cutting System
- Temperature Controllers
- Temperature/Humidity Transducers
- SSRs/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometer/Pulse (Rate) Meters
- Display Units
- Sensor Controllers

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