

**Autonics**

# SENSOR CONTROLLER PA10 SERIES

M A N U A L



Thank you very much for selecting Autonics products.  
For your safety, please read the following before using.

## Caution for your safety

\*Please keep these instructions and review them before using this unit.

\*Please observe the cautions that follow;

**Warning** Serious injury may result if instructions are not followed.

**Caution** Product may be damaged, or injury may result if instructions are not followed.

\*The following is an explanation of the symbols used in the operation manual.

**Caution:** Injury or danger may occur under special conditions.

## Warning

1. In case of using this unit with machineries(Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it is required to install fail-safe device.

It may result in serious damage, fire or human injury.

2. This unit must be mounted on panel or rail.

It may give an electric shock.

3. Do not repair or checkup when power on.

It may give an electric shock.

4. Do not disassemble and modify this unit. If needs, please contact us.

It may give an electric shock and cause a fire.

## Caution

1. This unit shall not be used outdoors.

It might shorten the life cycle of the product or give an electric shock.

2. When wire connection, 20 AWG(0.50mm<sup>2</sup>) should be used and screw bolt on terminal block with 0.74N · m to 0.90N · m strength.

It may result in malfunction or fire due to contact failure.

3. Please observe the rated specifications.

It might shorten the life cycle of the product and cause a fire.

4. Do not use the load beyond rated switching capacity of Relay contact.

It may cause insulation failure, contact melt, contact failure, relay broken, fire etc.

5. In cleaning the unit, do not use water or an organic solvents.

It might cause an electric shock or fire that will result in damage to the product.

6. Do not use this unit at place where there are flammable or explosive gas, humidity, direct ray of the sun, radiant heat, vibration, impact etc.

It may cause explosion.

7. Do not inflow dust or wire dregs into inside of this unit.

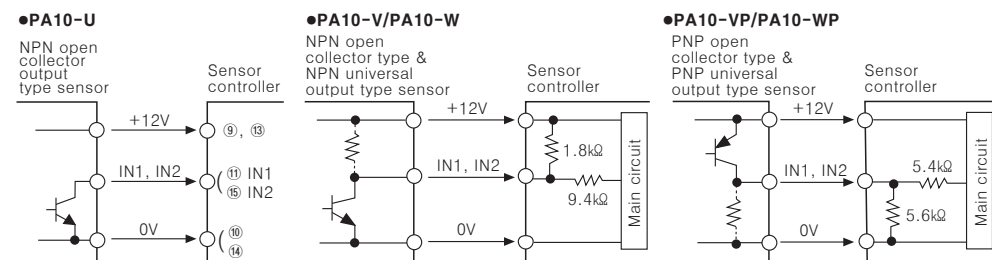
It may cause a fire or mechanical trouble.

## Ordering information

PA 10 - U

PA	10	-	U
			NPN input
			PNP input
			High function controller
			Controller
			2 Channel controller
			Multi-function
			Power Amplifier

## Input connections

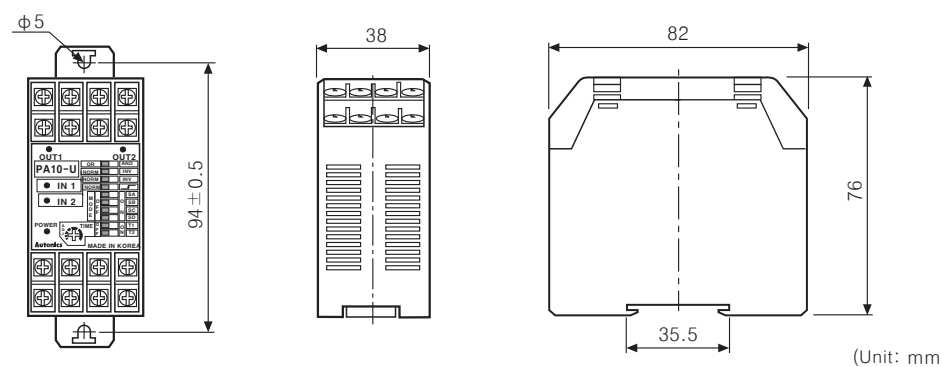


\*The above specifications are subject to change and some models may be discontinued without notice.

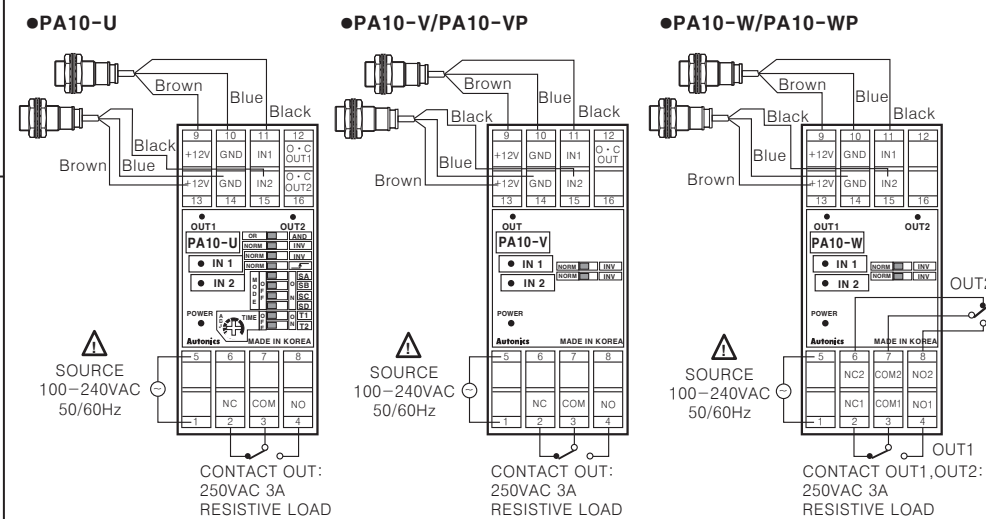
## Specifications

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	100VAC 50/60Hz : Approx. 7VA(Condition:12VDC/200mA), 240VAC 50/60Hz : Approx. 10VA				
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				
	Contact output	OUT[250VAC 3A(Resistive load)]		OUT1, OUT2 [250VAC 3A(Resistive load)]	
Output	Solid-state output		O · C OUT1, O · C OUT2		O · C OUT
	NPN open collector output		Max. 30VDC Max. 100mA		-
Response time	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	Min. 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		

## Dimensions

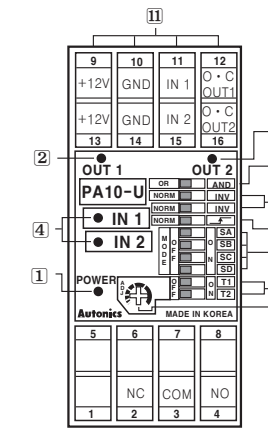


## Connections



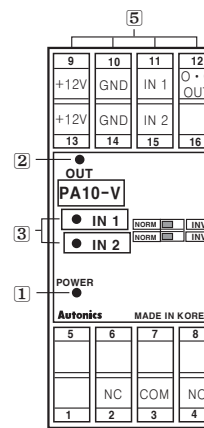
## Front panel identification

### 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** (Input signal reverse turn function)
    - NORM : When input signal is low, it is valid signal. (L)
    - INV : When input signal is high, it is valid signal. (H)
- Derivative action selection of IN2 input signal (AND/OR selection switch: AND)** :
  - NORM** (When input signal is high, it is effective signal)
    - NORM : 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 as same as the range of NO.9 function.
- Terminal block**

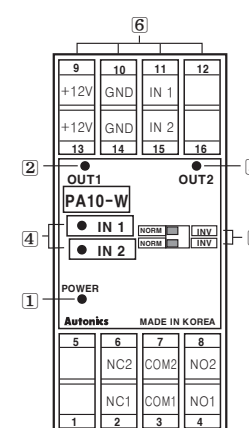
### PA10-V/PA10-WP



- 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

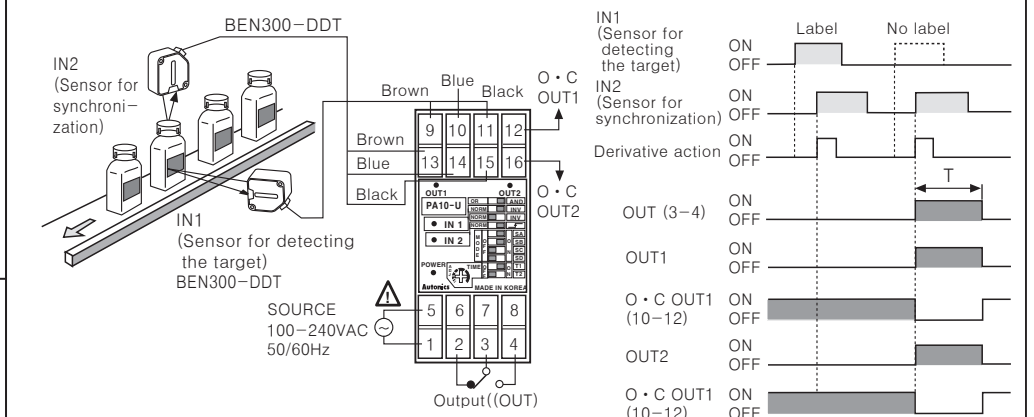


- Power indicator** : LED turns on when AC power applied
- Output 1 indicator** : Indication of output 1 operation status.
- Output 2 indicator** : Indication of output 2 operation status.
- Sensor input indicator** : Indication of sensor input signal.
  - PA10-W : LED turns on when sensor input is Low.
  - 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.

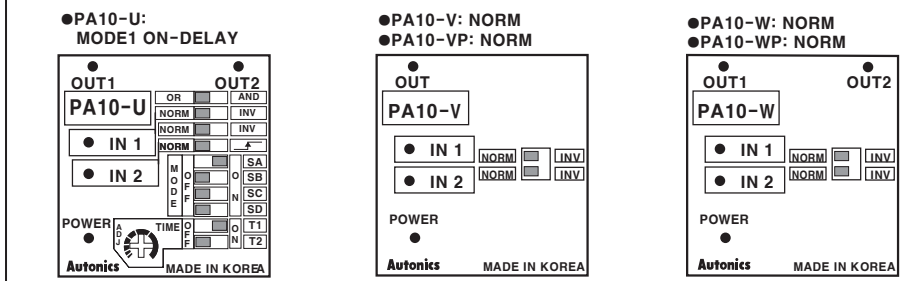
## Derivative action applications

○ 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.

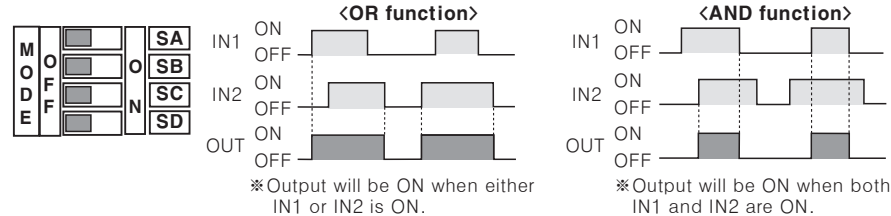
## Factory default for S/W



## Operation mode

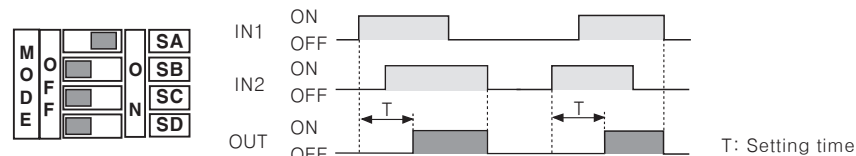
### MODE 0 NORMAL MODE

: OUT will work according to input signal regardless Timer.



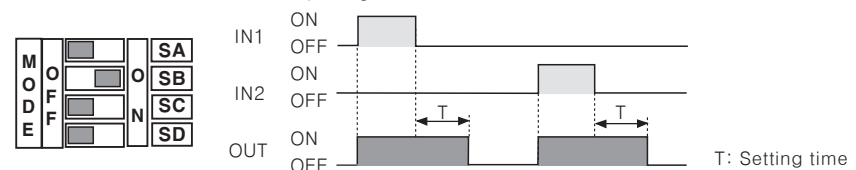
### MODE 1 ON-DELAY MODE

: 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)



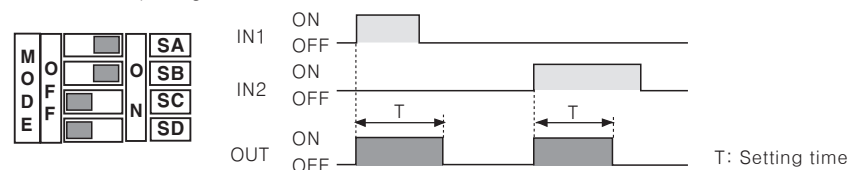
### MODE 2 OFF-DELAY MODE

: 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)



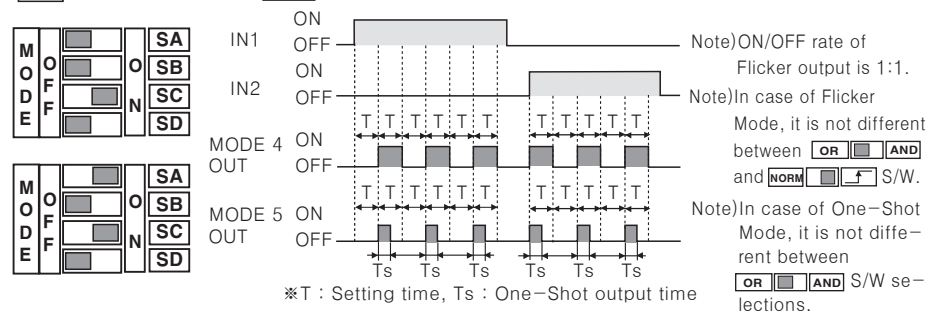
### MODE 3 ONE-SHOT DELAY MODE

: 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)



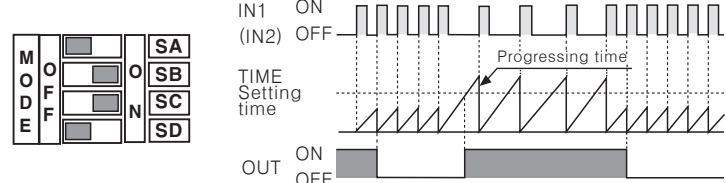
### MODE 4.5 FLICKER MODE / FLICKER ONE-SHOT MODE

: 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 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.

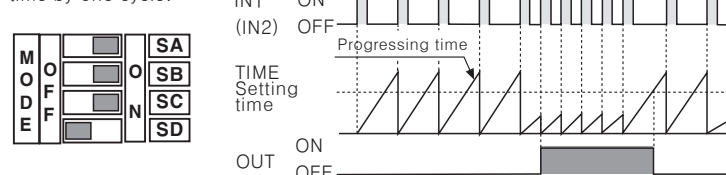


Note) Above is when input logic is OR and it will be the same by using IN2 input signal terminal instead of IN1.

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)

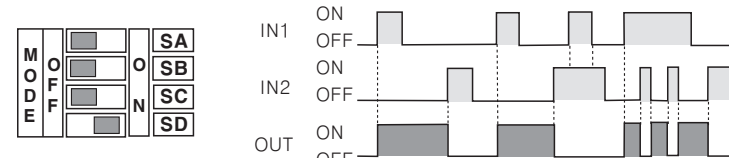
: Set the setting time by TIME S/W(T1, T2) and front TIME VOLUME(ADJ).

MODE	MODE 1 to MODE 7, MODE 12	MODE 6 to MODE 7
TIME S/W	Setting time range	Input frequency
OFF	0.01 to 0.1sec	100 to 10Hz
ON	0.1 to 1sec	10 to 1Hz
OFF	1 to 10sec	1 to 0.1Hz
ON	10 to 100sec	0.1 to 0.01Hz

\*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) It is not different between OR and 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.

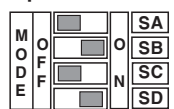
## ENCODER MODE(MODE 9 ~ MODE 11)

- 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 IN NORM INV Selection S/W can be set at any position.

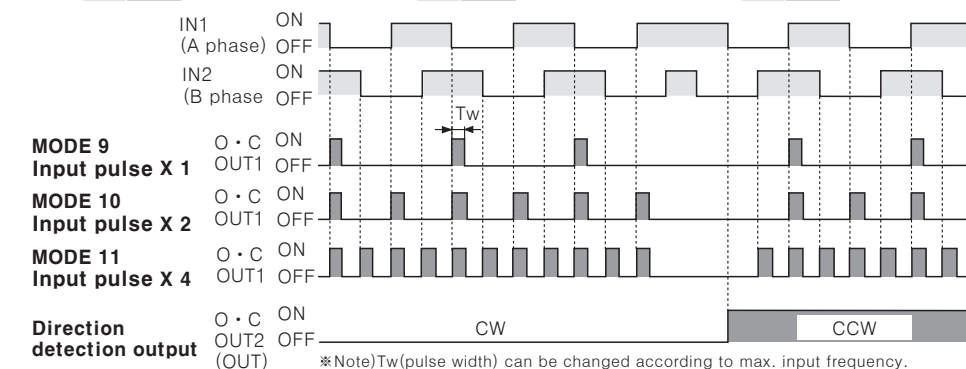
### MODE 9 ENCODER (Input pulse x 1time)



### MODE 10 ENCODER (Input pulse x 2times)



### MODE 11 ENCODER (Input pulse x 4times)



## TIME S/W function in Encoder mode

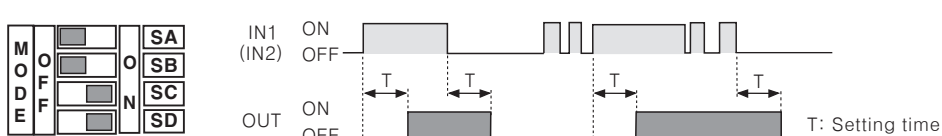
: TIME S/W is to convert output pulse width(Tw).

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

### MODE 12 ON/OFF-DELAY MODE

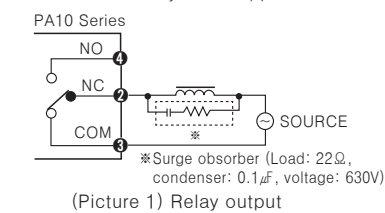
: OUT will be ON after setting time when IN1 (or IN2) is ON. When IN1 (or IN2) is OFF, OUT will be OFF after setting time. (This is when input logic is OR)

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

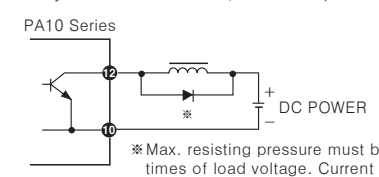


## Output

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)



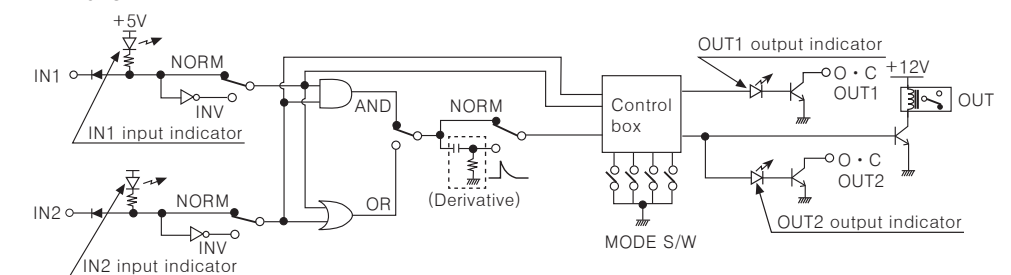
(Picture 1) Relay output



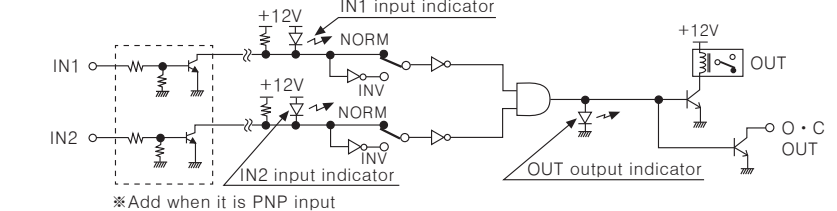
(Picture 2) NPN open collector output

## Function diagram

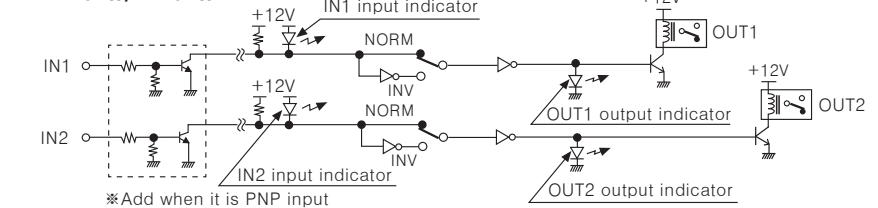
### PA10-U



### PA10-V/PA10-VP



### PA10-W/PA10-WP



## Caution for using

- Power
  - The inner circuit voltage starts to rise up for the first 100ms after power on, the input may not work at this time. And also the inner circuit voltage drops down for the last 500ms after power off, the input may not work at this time.
  - Please use the power within the rated power and apply or cut the power at once to prevent from chattering.
- Input signal line
  - Shorten the cable distance between the sensor and this product.
  - Please shielded wire for input signal needed to be long.
  - Please wire input signal line separated from power line.
- When test dielectric voltage and insulation resistance of the control panel with this unit installed.
  - Please isolate this unit from the circuit of control panel.
  - Please make all terminals of this unit short-circuited.
- Do not use this unit at below places.
  - Place where there are severe vibration or impact.
  - Place where strong alkalis or acids are used.
  - Place where there are direct ray of the sun
  - Place where strong magnetic field or electric noise are generated.
- Installation environment
  - It shall be used indoor
  - Altitude Max. 2000m
  - Pollution Degree 2
  - Installation Category II.

## Major products

- Photoelectric sensors
- Fiber optic sensors
- Door sensors
- Door side sensors
- Area sensors
- Proximity sensors
- Pressure sensors
- Rotary encoders
- Connector/Socket
- Temperature controllers
- Temperature/Humidity transducers
- SSR/Power controllers
- Counters
- Timers
- Panel meters
- Tachometer/Pulse(Rate) meters
- Display units
- 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, CO<sub>2</sub>, Nd:YAG)
- Laser welding/soldering system

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