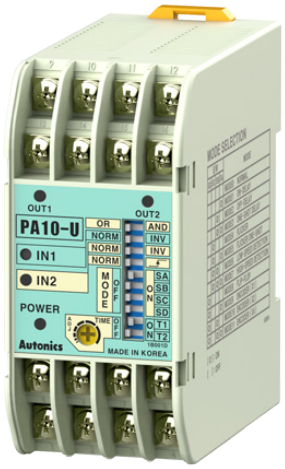
Sensor Controllers



PA10 Series

PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.
The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Features

- High-speed output response
- DIN rail or panel mount installation
- Various models
  - PA10-V : general-purpose controllers
  - PA10-W : 2-channel controllers
  - PA10-U : high performance controllers
- PA10-U features
  - 13 operation modes (DIP switches)
  - Flip-flop mode for level control
  - Timer operation mode
- Wide range power supply : 100 - 240 VAC~ 50 / 60 Hz

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

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

01. 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 personal injury, economic loss or fire.

02. Do not use the unit in the place where flammable / explosive / corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.
Failure to follow this instruction may result in explosion or fire.

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

04. Do not connect, repair, or inspect the unit while connected to a power source.
Failure to follow this instruction may result in fire or electric shock.

05. Check 'Connections' before wiring.
Failure to follow this instruction may result in fire.

06. Do not disassemble or modify the unit.
Failure to follow this instruction may result in fire or electric shock.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. When connecting the power / sensor input and relay output, use AWG 24 (0.20 mm²) to AWG 15 (1.65 mm²) cable and tighten the terminal screw with a tightening torque of 0.98 to 1.18 N m.
Failure to follow this instruction may result in fire or malfunction due to contact failure.

02. Use the unit within the rated specifications.
Failure to follow this instruction may result in fire or product damage.

03. Use a dry cloth to clean the unit, and do not use water or organic solvent.
Failure to follow this instruction may result in fire or electric shock.

04. Keep the product away from metal chip, dust, and wire residue which flow into the unit.
Failure to follow this instruction may result in fire or product damage.

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.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000 m
  - Pollution degree 2
  - Installation category II

EAC

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

PA 10 - ❶ ❷

❶ Function
U: High-function
V: General
W: 2 CH

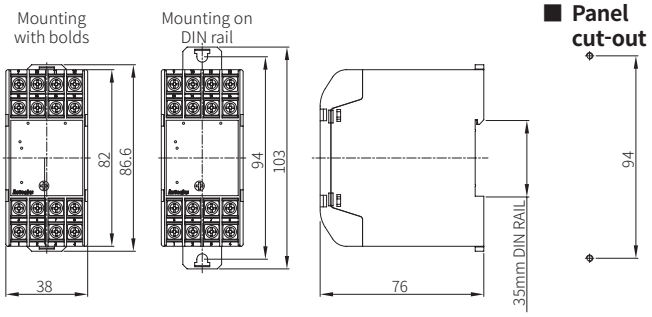
❷ Input
No mark: NPN input
P: PNP input

Product Components

- Product
- Instruction manual

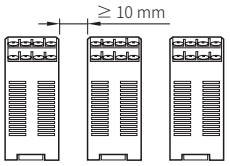
Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.



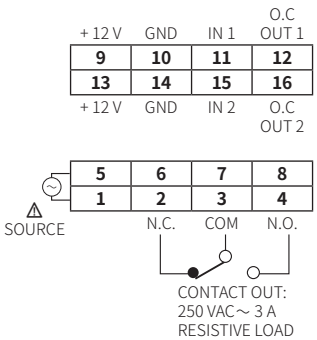
Cautions during Installation

When installing multiple sensor controllers, keep space between units at least 10 mm for heat radiation.

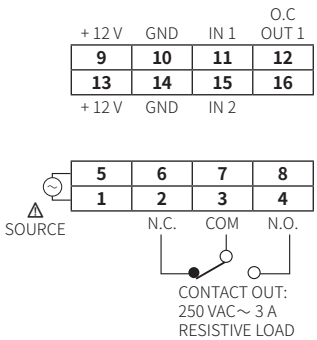


Connections

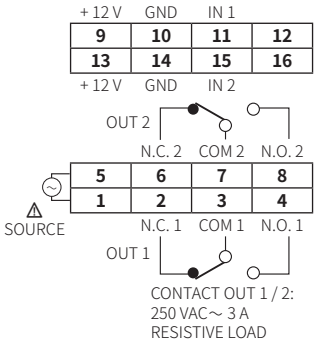
PA10-U



PA10-V□

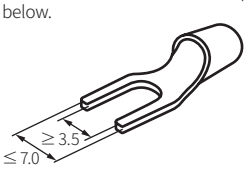


PA10-W□



Cautions during Wiring

- Unit: mm, Use terminals of size specified below.

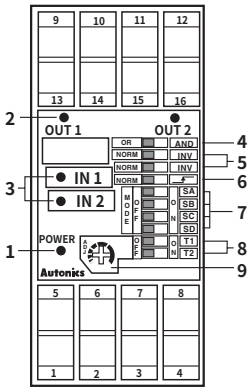


Specifications

Model	PA10-U	PA10-V□	PA10-W□
Power supply	100 - 240 VAC~ ± 10 % 50 / 60 Hz		
Power consumption	≤ 10 VA (12 VDC⎓ / 200 mA load)		
Sensor supply power	12 VDC⎓ ± 10 % ≈ 200 mA [01]		
Input logic	AND, OR (switch)	AND	Individual
Input method	NPN input	NPN / PNP input model	
No-voltage input	Short-circuit impedance: ≤ 680 Ω Short-circuit residual voltage: ≤ 0.8 V Open-circuit impedance: ≥ 100 kΩ	Short-circuit impedance: ≤ 300 Ω Short-circuit residual voltage: ≤ 2 V Open-circuit impedance: ≥ 100 kΩ	
Voltage input	-	Input impedance: 5.6 kΩ [H]: 5 - 30 VDC⎓ [L]: 0 - 2 VDC⎓	
Output	O.C OUT1 / 2	O.C OUT1	OUT1, OUT2
Contact output	250 VAC~ 3 A resistance load		
Solid-state output	NPN open collector output ≤ 30 VDC⎓, ≤ 100 mA		-
Output response time	Relay output: ≤ 10 ms, Transistor output: ≤ 0.05 ms		
Function	Operation mode (1 to 12, DIP switch)	-	-
Relay life cycle	Mechanical: Min. 10,000,000 times Electrical: Min. 100,000 times (250 VAC~ 3 A resistance load)		
Dielectric strength	2000 VAC~ 50 / 60 Hz for 1 min		
Insulation resistance	≥ 100 MΩ (500 VDC⎓ megger)		
Ambient temperature	-10 to 55 °C, storage: -25 to 60 °C (no freezing or condensation)		
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)		
Approval	EAC		
Unit weight	≈ 150 g		≈ 160 g

01) If the load is connected over 200 mA at the sensor output, it may cause mechanical trouble.

Unit Descriptions



1. Power indicator
2. Output 1 / 2 indicator
3. Sensor input 1 / 2 indicator
Turns ON when sensor input signal is low.
4. Input logic switch
Input logic (AND / OR) selection
5. Sensor input signal switch
NORM: When input signal is low, valid signal ( ).
INV: When input signal is high, valid signal ( )
6. IN 2 AND logic operation switch
NORM : IN 2 input signal reverse turn function
: IN 2 input signal derivative action
7. Operation mode setting switch
8. Timer / Frequency selection switch
Switch functions are different varied by operation mode setting.
9. Timer time setting volume

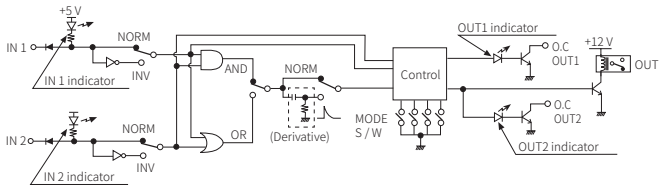
- Based on PA10-U.
  In case of PA10-V / W□ model, indicators and sensor input signal switch are only available.

Factory default

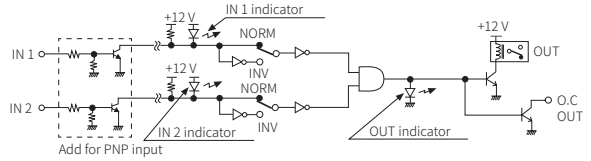
Switch	PA10-U	PA10-V□	PA10-W□
Input logic switch	OR	-	-
Sensor input signal switch	NORM	NORM	NORM
IN2 AND logic operation switch	NORM	-	-
Operation mode setting switch	MODE 1	-	-
Timer / Frequency selection switch	OFF / OFF	-	-

Function Diagram

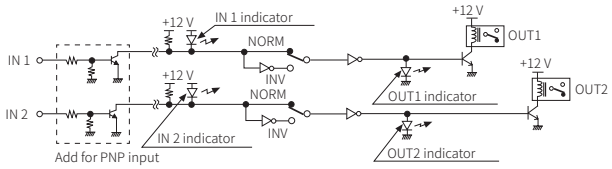
■ PA10-U



■ PA10-V□



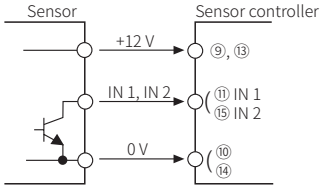
■ PA10-W□



Input Connection

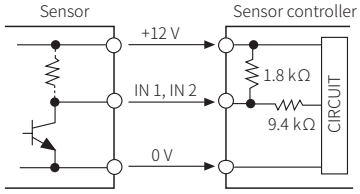
■ PA10-U

• Sensor: NPN open collector output



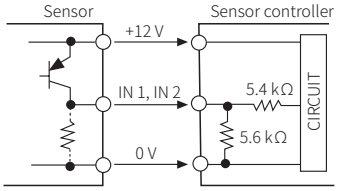
■ PA10-V / PA10-W

• Sensor: NPN open collector output & NPN universal output



■ PA10-VP / PA10-WP

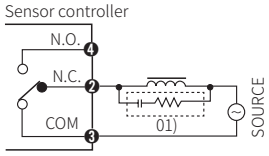
• Sensor: PNP open collector output & PNP universal output



Output Connection

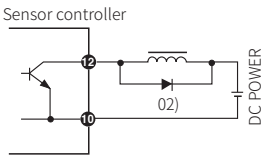
It is able to reduce noise generating if install surge absorber between inductive loads (Motor, Solenoid, etc) as [Figure 1].
When use DC Relay for load, please install a diode at relay coils as [Figure 2]. (Be sure to power polarity)

[Figure 1] Relay output



01) Surge absorber: resistance 22 Ω, condensor 0.1 μF, voltage 600 V

[Figure 2] NPN open collector output

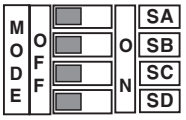


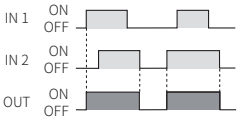
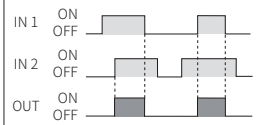
02) Max. resisting pressure must be more than three times of load voltage.
Current capacity: 1 A

[PA10-U] Operation Mode

■ Mode 0: Normal

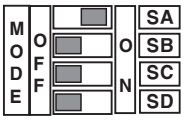
OUT will work according to input signal regardless timer.

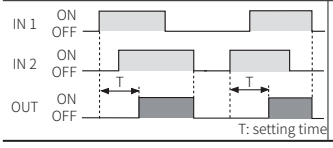
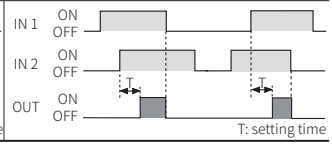


Normal: input logic OR	Normal: input logic AND
	
Output will be ON when either IN 1 or IN 2 is ON.	Output will be ON when both IN 1 and IN 2 are ON.

■ Mode 1: ON-Delay

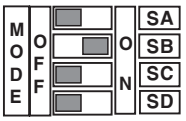
OUT will be ON after setting time when one of IN 1 and IN 2 is ON. When IN 1 and IN 2 are OFF, OUT will be OFF. (based when input logic is OR)

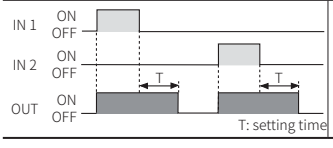
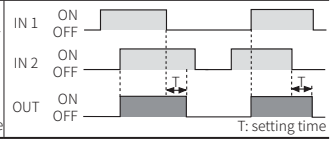


ON-Delay: input logic OR	ON-Delay: input logic AND
	
T: setting time	T: setting time

■ Mode 2: OFF-Delay

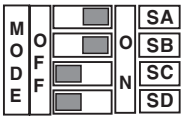
OUT will be ON at the same time when IN 1 or IN 2 is ON then OUT will be OFF after setting time when IN 1 or IN 2 is OFF. (based when input logic is OR)

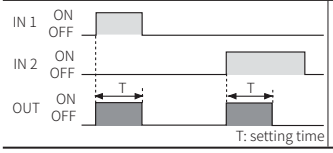
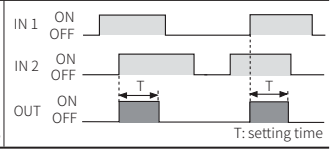


OFF-Delay: input logic OR	OFF-Delay: input logic AND
	
T: setting time	T: setting time

■ Mode 3: One-Shot Delay

OUT will be ON at the same time when IN 1 or IN 2 is ON then OUT will be OFF after setting time. (based when input logic is OR)



One-Shot Delay: input logic OR	One-Shot Delay: input logic AND
	
T: setting time	T: setting time

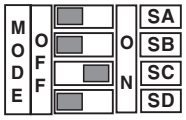
■ Mode 4: Flicker / Mode 5: Flicker One-Shot

OUT will be ON after setting time for IN 1 input then it is flickering and OUT will be flickering after setting time from ON and IN 2 input is same. (ON/OFF rate of Flicker output is 1:1.)

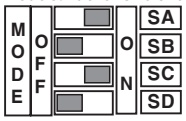
In case of Mode 4, it is regardless of input logic switch and IN 2 AND logic operation switch setting.

In case of Mode 5, IN 2 AND logic operation switch is available to set one-shot output time (Ts).
(NORM: ≈ 100 ms, ↑: ≈ 10 ms)
It is regardless of input logic switch setting.

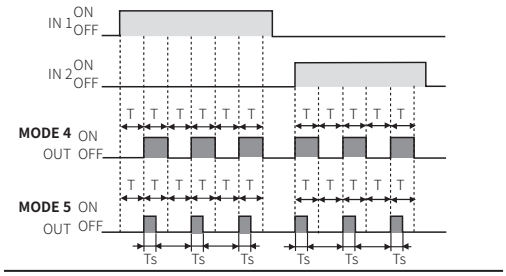
Mode 4: Flicker



Mode 5: Flicker One-shot

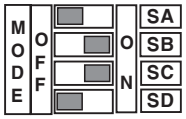


Flicker / Flicker One-Shot

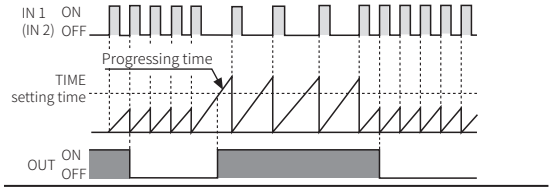


■ Mode 6: Low Speed Detection

OUT will be ON when input signal (IN 1) is longer than setting time by comparing it to to the setting time by one cycle. It will be the same by using IN 2 input signal terminal instead of IN 1. (based when input logic is OR)
Be sure that OUT will be work at the same time with power supply.

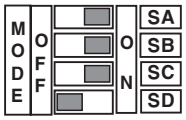


Low Speed Detection: input logic OR

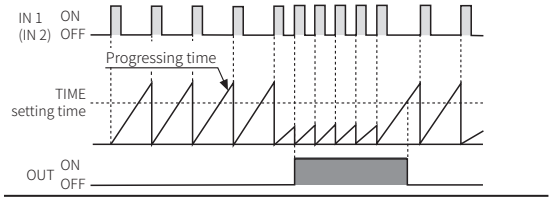


■ Mode 7: High Speed Detection

OUT will be ON when input signal (IN 1) is shorter than setting time by comparing it to to the setting time by one cycle. It will be the same by using IN 2 input signal terminal instead of IN 1. (based when input logic is OR)

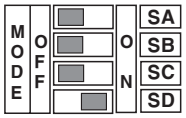


High Speed Detection: input logic OR

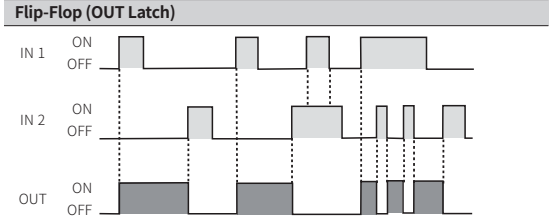


■ Mode 8: Flip-Flop (OUT Latch)

When IN 1 signal is input then the Flip-Flop output will be ON (SET). When the IN 2 signal is input, Flip-Flop Signal will be OFF (RESET). (regardless timer)
IN 2 will be the first of input signal.
It is regardless of input logic switch and IN 2 AND logic operation switch setting.
There is no timer function, set TIME switch (T1, T2) as OFF.



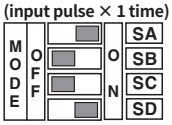
Flip-Flop (OUT Latch)



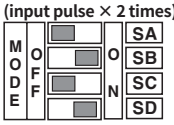
■ Mode 9: Encoder (input pulse × 1 time) / Mode 10: Encoder (input pulse × 2 times) / Mode 11: Encoder (input pulse × 4 times)

- There should be 90° phase difference between IN 1 and IN 2 for input terminal.
- Connect A phase output of encoder to IN 1 and B phase output of encoder to IN 2, when use NPN open collector or totem pole output type of encoder with controller.
- When turning to CW direction and 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 (×1, ×2, ×4 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.
- It is regardless of input logic switch, sensor input signal switch, and IN 2 AND logic operation switch setting.
- Tw (pulse width) can be changed according to max. input frequency.

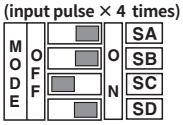
Mode 9: Encoder (input pulse × 1 time)



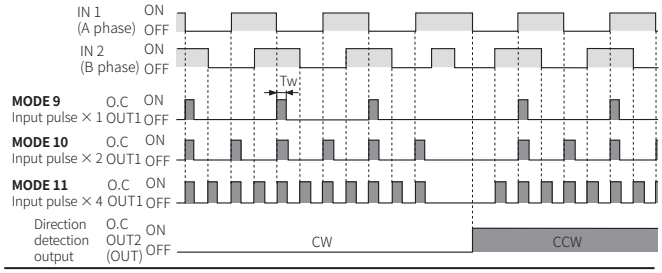
Mode 10: Encoder (input pulse × 2 times)



Mode 11: Encoder (input pulse × 4 times)

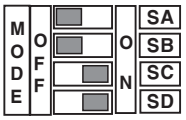


Encoder (input pulse × 1 / 2 / 4 times)

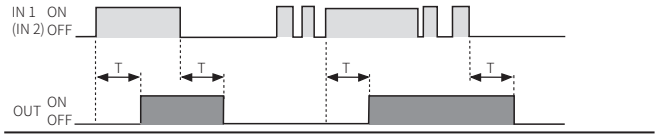


■ Mode 12: ON / OFF-Delay

OUT will be ON after setting time when IN 1 (or IN 2) is ON. When IN 1 (or IN 2) is OFF, OUT will be OFF after setting time. (based when input logic is OR)
If IN 1 (or IN 2) ON/OFF time is shorter than setting time, OUT does not turn.



ON / OFF-Delay: input logic OR



[PA10-U] Timer / Frequency Selection Switch

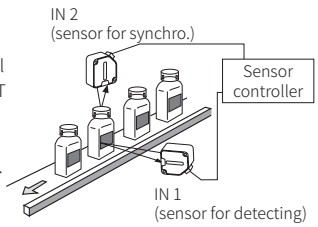
Operation mode \ Setting					
Mode 1 to 7 / 12	Setting time range [01]	0.01 to 0.1 sec	0.1 to 1 sec	1 to 10 sec	10 to 100 sec
Mode 6 to 7	Input frequency	100 to 10 Hz	10 to 1 Hz	1 to 0.1 Hz	0.1 to 0.01 Hz
	Operating rpm [02]	6000 to 600 rpm	600 to 60 rpm	60 to 6 rpm	6 to 0.6 rpm
Mode 8	Not available	Set	Do NOT set		
Mode 9 to 11	Max. input frequency	100 kHz	10 kHz	1 kHz	100 Hz
	Output pulse width (Tw)	≈ 0.5 µs	≈ 5 µs	≈ 50 µs	≈ 500 µs
	Input speed (cps) of connected device	≥ 2000 kHz (2000 kcps)	≥ 200 kHz (200 kcps)	≥ 20 kHz (20 kcps)	≥ 2 kHz (2 kcps)

01) Set the setting time by TIME S/W (T1, T2) and front timer time setting volume.
02) Range of operating rpm is 1 pulse per 1 revolution. When the pulse is increasing per 1 revolution, range of operating rpm is decreasing.

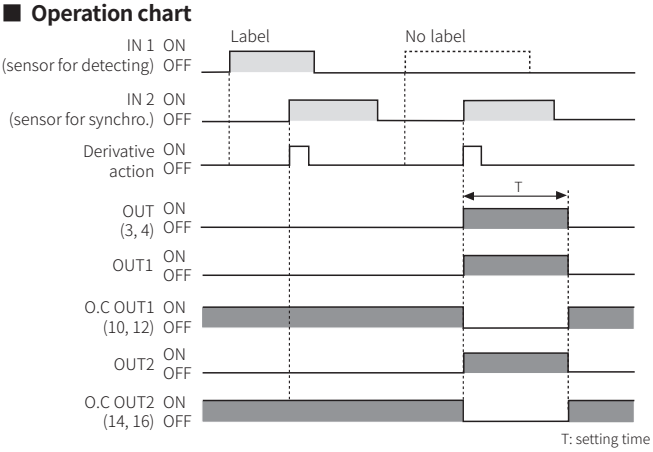
[PA10-U] Example of Derivative Action

When IN 1 (sensor for detecting target) is ON and IN 2 (sensor for synchronization) is ON, OUT will not work. But when there is no label on bottle, OUT will work when IN 2 is ON. OUT will be returned after setting time.

- Condition of detecting label on glass bottle is to install a sensor with IN 1 operating first.



■ Operation chart



T: setting time