(O) Sensor controller

PA-12

PA10-U

PA10-V/ VP

PA10-W/ WP

Multifunctional sensor controller

▣Features

- ●12 kinds of various operation modes selected by DIP switches
- ●High speed input response
- ●Flip−flop function for level control
- ●Multifunctional unit with timer mode
- ●DIN rail mounting and mountable without the rail
- ●Wide range of power supply(100−240VAC 50/60Hz)

Please read "Caution for your safety" in operation manual before using.

▣Ordering information

PA10 — **U** □

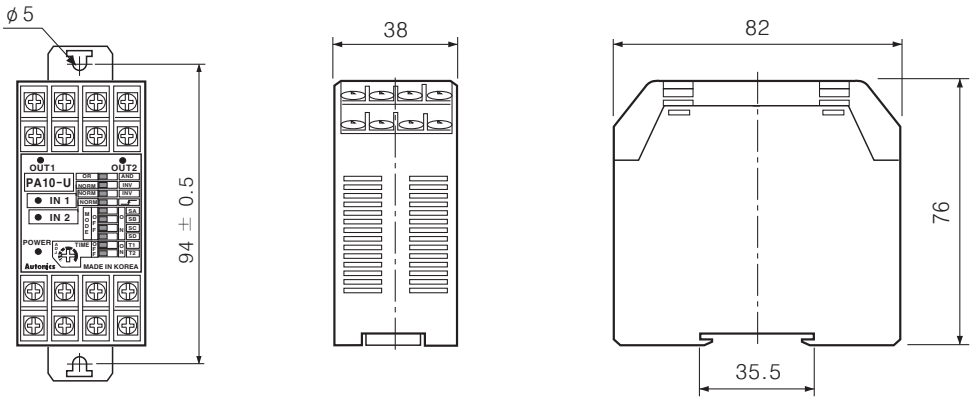
Input	Blank	NPN input
	P	PNP input
Function	U	High function controller
	V	General purpose controller
	W	2−channel controller
Item	PA10	Power Amplifier

▣Specifications

Model		PA10-U	PA10-V	PA10-VP	PA10-W	PA10-WP
Power supply		100−240VAC 50/60Hz				
Allowable operation voltage		90 to 110% of rated voltage				
Power consumption		100VAC 50/60Hz : Approx. 7VA, 240VAC 50/60Hz : Approx. 10VA(Condotion: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. IN1, IN2 individual operation.	
		NPN input type	**NPN input type**	**PNP input type**	**NPN input type**	**PNP input type**
Input type		●**PA10-U**[No−voltage input]Impedance at short−circuit:Max. 680Ω, Residual voltage at short−circuit:Max. 0.8V, Impedance at open:Min. 100kΩ ●**PA10-V/PA10-W**[No−voltage input]]Impedance at short−circuit:Max. 300Ω, Residual voltage at short−circuit:Max. 2V, Impedance at open:Min. 100kΩ ●**PA10-VP/PA10-WP**[Voltage input]]Input impedance:5.6kΩ, "H" level voltage:5−30VDC, "L" level voltage:0−2VDC				
Output	Contact output	OUT : 250VAC 3A(resistive load)			OUT1, OUT2 : 250VAC 3A(resistive load)	
	Solid−state output	O • C OUT1/O • C OUT2 : NPN open collector output Max. 30VDC 100mA	O • C OUT : NPN open collector output Max. 30VDC 100mA		————	
Response time		Input : Min. 2μs, Relay contact output : Min. 10ms, Transistor output : Min. 0.5μs(When it is encoder mode)				
Timer function	• ON−Delay • OFF−Delay • Flicker • Flicker One−shot • High−Speed Detection • Low−Speed Detection • One−Shot Delay Selectable(0.01 to 0.1/ 0.1 to 1/1 to 10/ 10 to 100 sec.)	Have	————			
	• NORMAL • FLIP−FLOP • ENCODER(Mode 9 to 11)	None	————			
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)				
Ambient temperature		−10 to 55℃(at non−freezing status)				
Storage temperature		−25 to 60℃(at non−freezing status)				
Ambient humidity		35 to 85%RH				
Unit weight		Approx. 150g			Approx. 160g	

※If the load is connected over 200mA at the sensor output, it may cause malfunction.

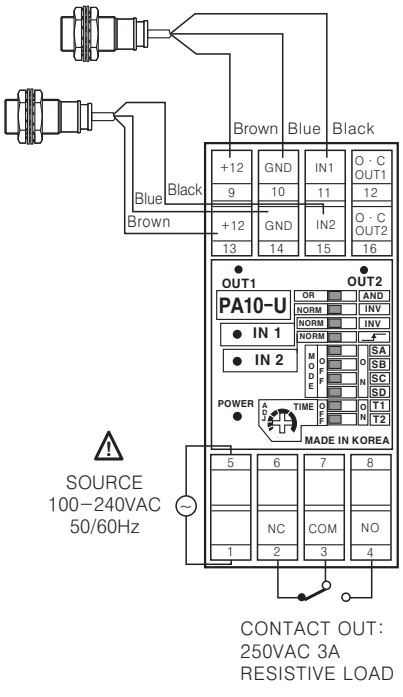
▣Dimensions



(Unit:mm)

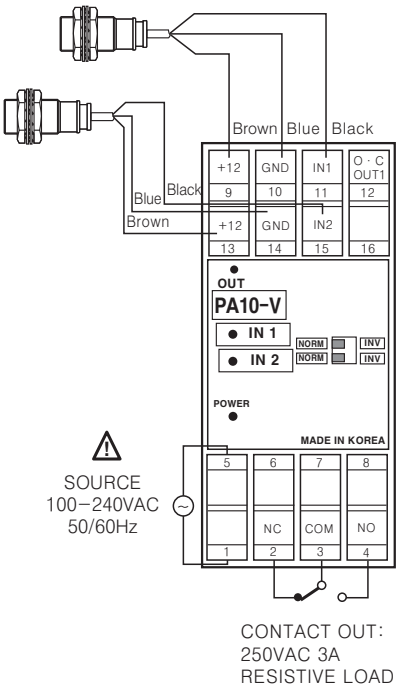
▣Connections

●PA10-U



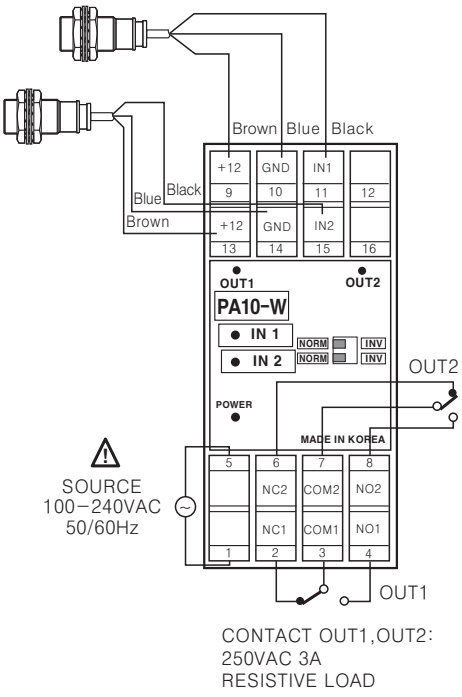
CONTACT OUT:
250VAC 3A
RESISTIVE LOAD

●PA10-V/PA10-VP



CONTACT OUT:
250VAC 3A
RESISTIVE LOAD

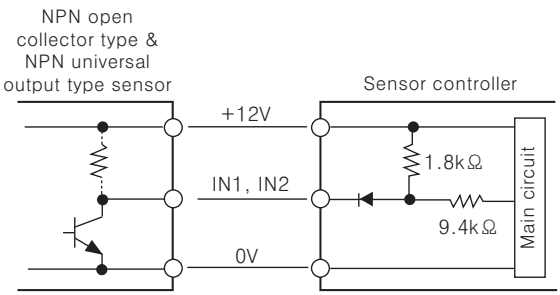
●PA10-W/PA10-WP



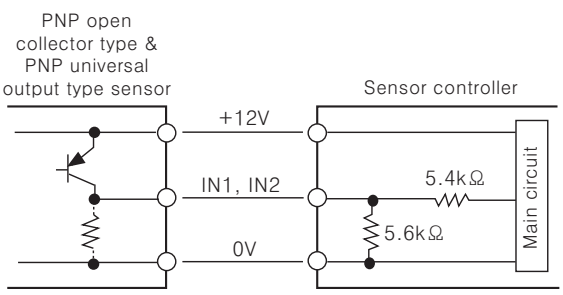
CONTACT OUT1,OUT2:
250VAC 3A
RESISTIVE LOAD

▣Input connctions

●PA10-U / PA10-V / PA10-W

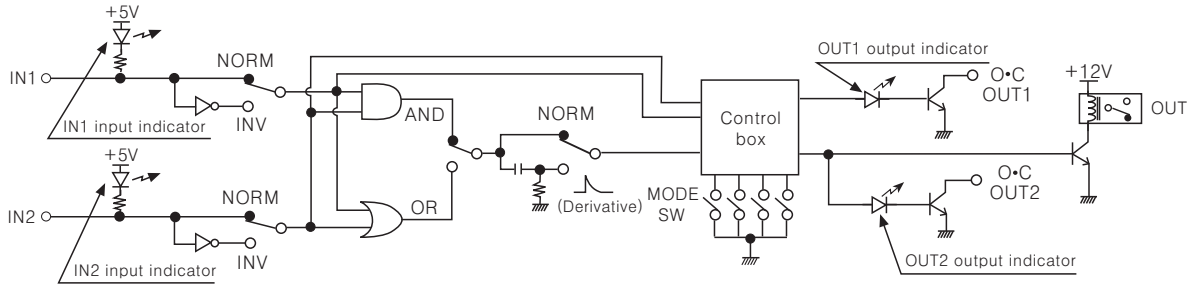


●PA10-VP / PA10-WP

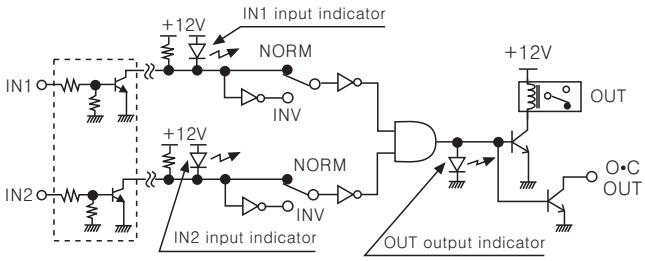


▣Function diagram

●PA10-U

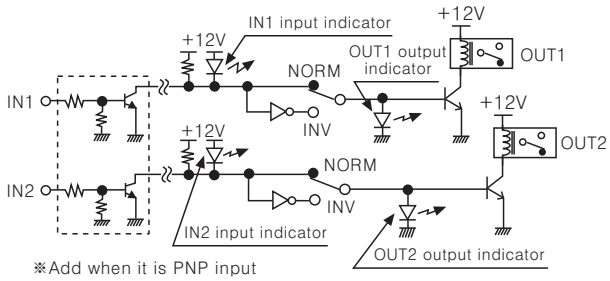


●PA10-V ●PA10-VP



※Add when it is PNP input

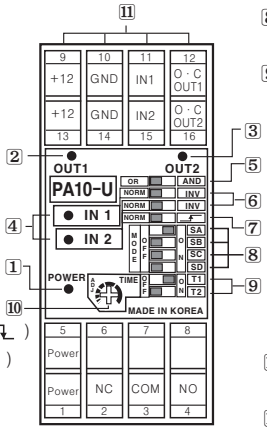
●PA10-W ●PA10-WP



※Add when it is PNP input

▣Front panel indentification

●PA10-U



1 **Power indicator** :
LED is turned on when AC power applied

2 **Output1 indicator** : Indicates output operation

3 **Output2 indicator** : Indicates output operation

4 **Sensor input indicator** :
Indicates sensor input signal
(LED is turned on when sensor input is Low)

5 **AND/OR selection switch** :
Select "AND" or "OR" for IN1, IN2 Input

6 **Selection switch of sensor input signal** :
NORM | INV (Reverse function of input signal)
●NORM : LED is turned on when input signal is low. (⌐)
●INV : LED is turned on when input signal is high. (⌐)

7 **Derivative action selection of IN2 input signal (OR/AND 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. (※Refer to O-7, ▣Application of derivative operation.)

8 **Selection switch for operation mode** :
See <▣ Operation mode> in next page.

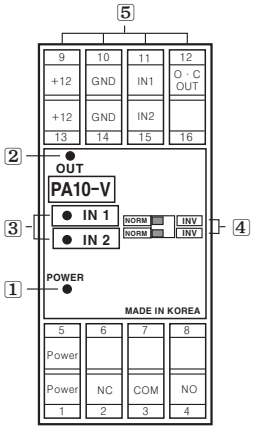
9 **Selection switch of time range and max. input frequency** : It is the switch to select time range (1~7 mode) or allowable input frequency(9~11 mode).

●Time range : Approx. 0.01 ~ 0.1sec.
Max. input frequency : 100kHz
●Time range : Approx. 0.1 ~ 1sec.
Max. input frequency : 10kHz
●Time range : Approx. 1 ~ 10sec.
Max. input frequency : 1kHz
●Time range : Approx. 10 ~ 100sec.
Max. input frequency : 100Hz

10 **Timer adjuster** :
Adjust time as same as the range of No. 9 function.

11 **Terminal block**

●PA10-V/PA10-VP



1 **Power indicator** : LED is turned on when AC power applied

2 **Output indicator** : Indicates output operation

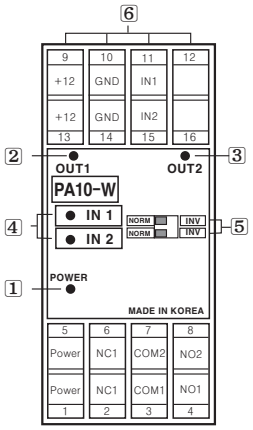
3 **Sensor input indicator** :
●PA10-V : Indicates sensor input signal(LED turns on when sensor input is Low)
●PA10-VP : Indicates sensor input signal(LED turns on when sensor input is High)

4 **Selection switch of sensor input signal**
●NORM : LED is turned on when input signal is low.
●INV : LED is turned on when input signal is high.

5 **Terminal block**

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

●PA10-W/PA10-WP



1 **Power indicator** : LED is turned on when AC power applied

2 **Output1 indicator** : Indicates output operation

3 **Output2 indicator** : Indicates output operation

4 **Sensor input indicator** :
●PA10-W : Indicates sensor input signal(LED is turned on when sensor input is Low)
●PA10-WP : Indicates sensor input signal(LED is turned on when sensor input is High)

5 **Selection switch of sensor input signal**
●NORM : LED is turned on when input signal is low.
●INV : LED is turned on when input signal is high.

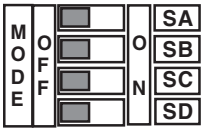
6 **Terminal block**

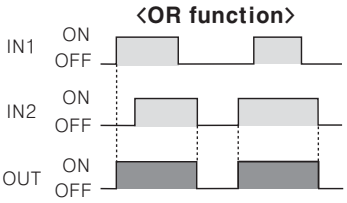
※Selectable NORM/INV. Selection function for IN1, IN2 individual operation.

▣Operation mode(PA10-U)

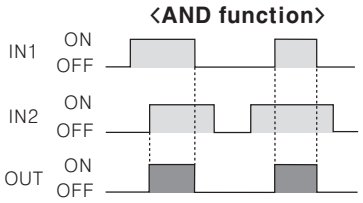
●MODE 0 Normal mode

OUT operates according to input signal, regardless of timer.





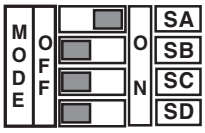
※Output will be ON when either IN1 or IN2 is ON.

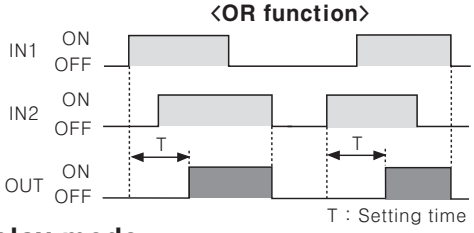


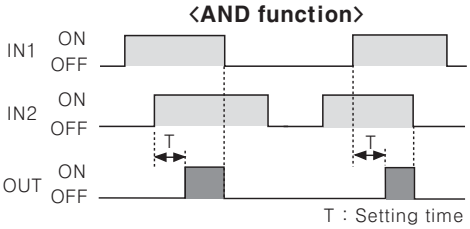
※Output will be ON when both IN1 and IN2 are ON.

●MODE 1 ON-Delay mode

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

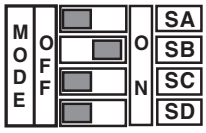


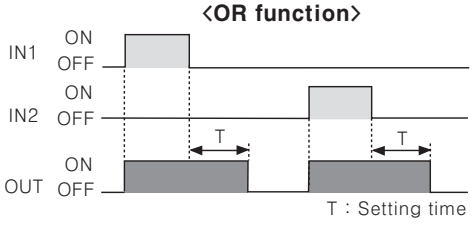


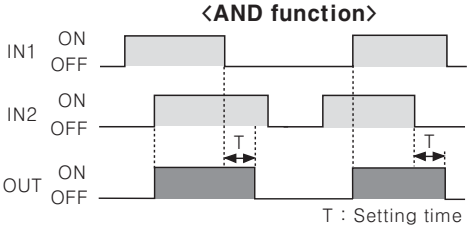


●MODE 2 OFF-Delay mode

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

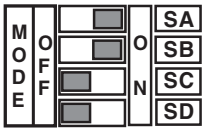


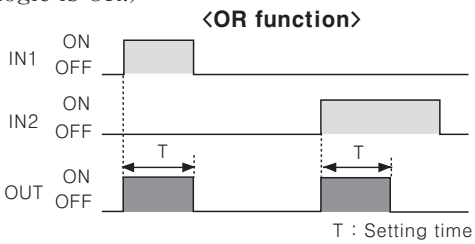


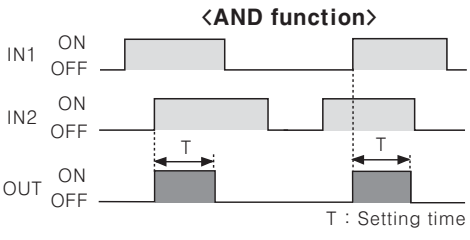


●MODE 3 ONE-Shot delay mode

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

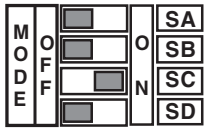




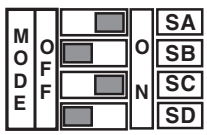


●MODE 4, 5 Flicker mode / Flicker one-shot mode

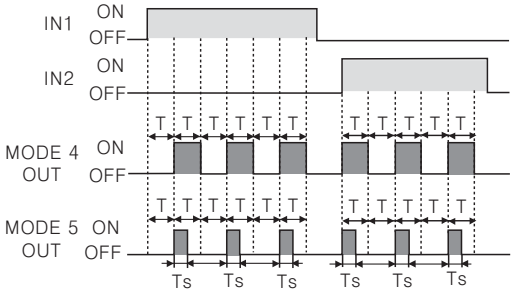
OUT will be ON after delayed as setting time for IN1 input then it is flashing and OUT will be flashing after setting time from ON. But, in case of one-shot mode, output time(Ts) will selected by NORM.
(: Ts = Approx. 10ms, NORM : Ts = Approx. 100ms)



(MODE 4)



(MODE 5)



※T : Setting time, Ts : One-Shot output time

Note) ON/OFF ratio of flicker output is 1:1.

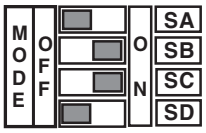
Note) In case of flicker mode, it is not different between OR and AND and NORM .

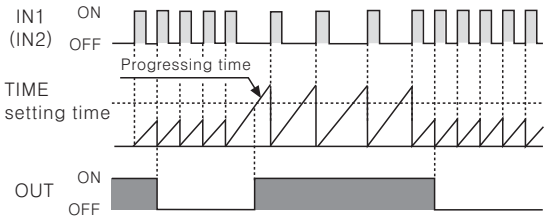
Note) In case of one-shot mode, it is not different between OR and AND .

▣Operation mode(PA10-U)

●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.

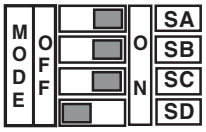


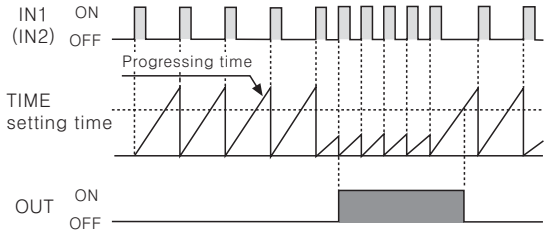


Note) Above is when input logic is OR and it will be the same by using IN2 input signal terminal instead of IN1.
Note) When use MODE 6 as above, be sure that OUT will be work at the same time with power supply.

●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 switches(MODE 1 to MODE 7)

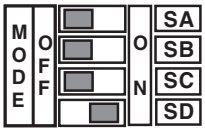
Set the time by time switches(T1, T2) and front time adjuster(ADJ).

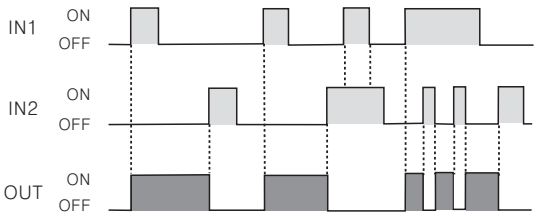
Mode / Item / TIME SWITCH	MODE 1 to MODE 7	MODE 6 to MODE 7
	Setting time range	Input frequency range (※rpm)
OFF ON T1 T2	0.01 to 0.1sec.	100 to 10Hz (6,000 to 600rpm)
OFF ON T1 T2	0.1 to 1sec.	10 to 1Hz (600 to 60rpm)
OFF ON T1 T2	1 to 10sec.	1 to 0.1Hz (60 to 6rpm)
OFF ON T1 T2	10 to 100sec.	0.1 to 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 prior to all input signal.
Note) Both OR AND and NORM switches are allowed to use.
Note) There is no Timer function in Flip-Flop Mode, therefore use this unit with time switches(T1, T2) are OFF.

▣Operation mode(PA10-U)

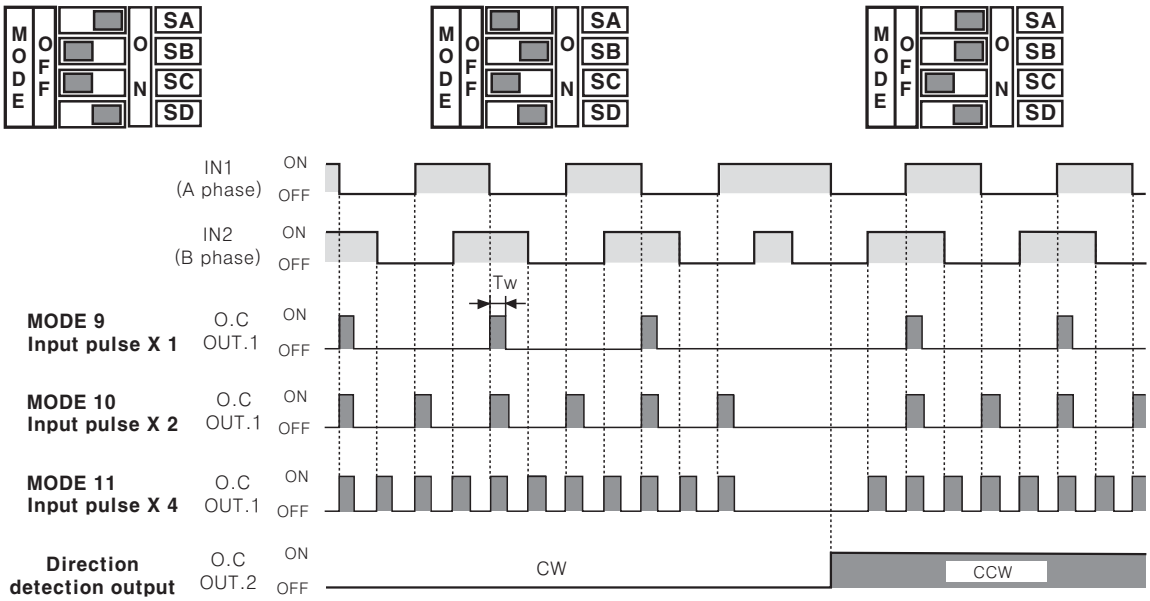
◎Encoder mode (MODE 9 to MODE 11)

1) There should be 90° phase difference between IN1 and IN2 for input terminal.
2) Please connect A phase output of encoder to IN1 and B phase output of encoder to IN2, when use NPN open collector or totem pole output type of encoder with PA10-U. In this case, detection signal(O.C OUT2) output of PA10-U will be OFF when turning encoder to CW direction.
3) There are output function of pulse(O.C OUT1) has been multiplied(×1, ×2, ×4 times) against input signal and Direction detection output(O.C OUT2) function which detects direction of encoder revolution in Encoder mode.
4) Be cautious about input speed(cps) of connected equipment due to pulse width of O.C OUT1 is short.
5) OR / AND, NORM / NORM / INV Selection switches can be set at any position.

●MODE 9 Encoder (Input pulse × 1time)

●MODE 10 Encoder (Input pulse × 2times)

●MODE 11 Encoder (Input pulse × 4times)



※Note) Tw(pulse width) can be changed according to max. input frequency.

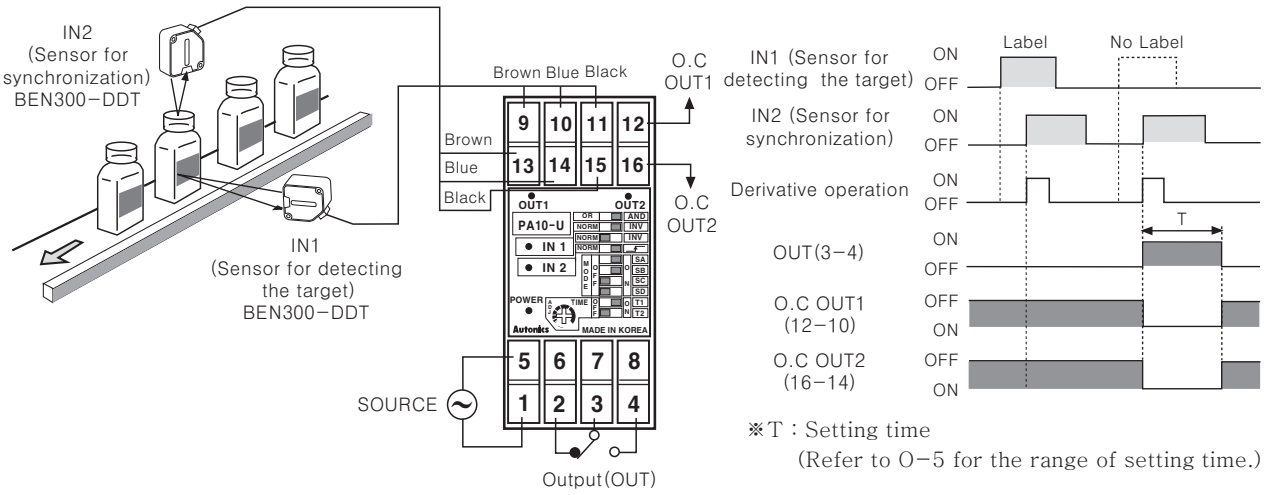
◎Time switches in encoder mode

Time switch is to convert output pulse width(Tw).

Time switch	Max. input frequency	Output pulse width(Tw)	Input speed of connected equipment(cps)
OFF ON T1 T2	100kHz	Approx. 0.5μs	Min. 2000kHz(2,000kcps)
OFF ON T1 T2	10kHz	Approx. 5μs	Min. 200kHz(200kcps)
OFF ON T1 T2	1kHz	Approx. 50μs	Min. 20kHz(20kcps)
OFF ON T1 T2	100Hz	Approx. 500μs	Min. 2kHz(2kcps)

▣Application of derivative operation

◎Detect label of glass bottle



※T : Setting time
(Refer to O-5 for the range of setting time.)

●Operation

When IN2 is ON after IN1 is ON, OUT will not operate. But if there is no label on bottle, OUT will operate with IN2 is ON only. OUT will be returned after setting time.

Note)Please install the sensor(IN1) to be operated first.

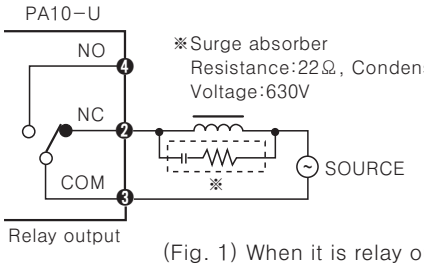
▣Proper usage

◎Load connections

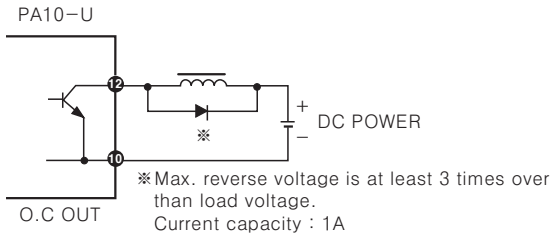
It is important to protect from surge or noise by installing a surge absorber across inductive loads (Motor, solenoid, etc).

In case the load is a DC relay, please install a diode across relay as shown below.

(Be careful of polarity.)



(Fig. 1) When it is relay output



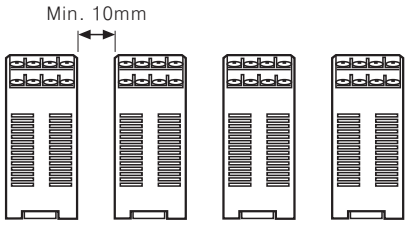
(Fig. 2)When it is NPN open collector

◎Input signal line

- ●Please make the cable line short from input sensor to this controller.
- ●Do not put input signal line with other power cable in the same conduit.
- ●When need to extend the input signal line, please use shielded cable.

◎Precaution for installation

When it is required to install more than two PA10, the space between two PA10 should be larger than 10mm in order for proper cooling.



◎Other precautions

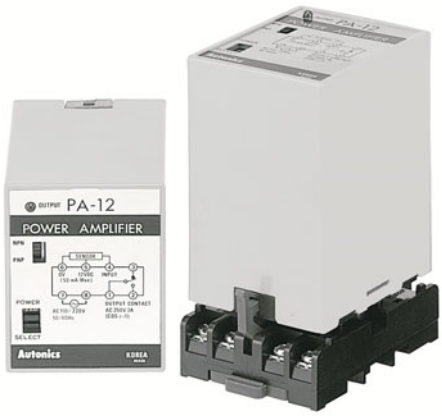
- ●Installation and dismantlement should be done with power off.
- ●Please check connections before wiring.
- ●Good ventilation must be considered to protect heating from inner components.
  (Ambient operating temperature is −10℃ to +50℃.)
- ●Do not supply over 100−240VAC.
- ●Do not install this controller at place where there are dust,steam, corrosive gas,water etc.
- ●AC power line must be separated from O.C output line or signal input line.
- ●This contoller has been designed to have high speed response for O.C output. If use micro switch or limit switch for signal input, chattering might be occurred at O.C output.

General purpose sensor controller

▣Features

- ●Selectable use of 110/220VAC
- ●Selectable use of NPN, PNP input
- ●Able to drive loads up to 3A, 250VAC with proximity sensor or photo sensor input
- ●Convenient to mount on socket by plug in type
- ●Output relay with both NO and NC contacts

⚠ **Please read "Caution for your safety" in operation manual before using.**



▣Ordering information

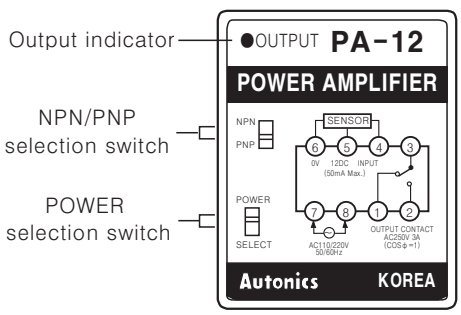
PA — **12**

Power supply	12	Selectable 110/220VAC 50/60Hz
Item	PA	Power Amplifier

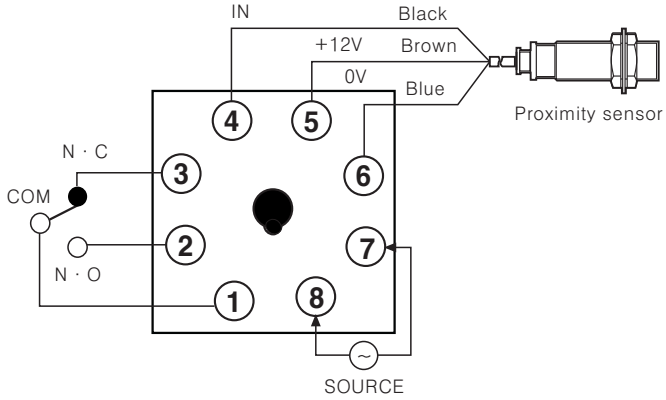
▣Specifications

Model		PA-12
Type		Selectable NPN/PNP
Power supply		Selectable 110/220VAC 50/60Hz
Power consumption		Approx. 4VA
Power for external sensor		12VDC 50mA
Input signal	P N P	High level : 7-12VDC, Low level : 0-5VDC
	N P N	Short-circuit impedance : Max. 1kΩ, Residual voltage : Max. 2VDC, Open-circuit impedance : Min. 100kΩ
Response time	Input	Min. 0.2ms
	Output	Min. 10ms
Input resistance		10kΩ
Control output	Contact composition	SPDT(1a1b)
	Contact capacity	250VAC 3A(For resistive load)
Ambient temperature		-10 to 50℃(at non-freezing status)
Ambient humidity		45 to 85%RH
Relay life cycle	Mechanical	Min. 10,000,000 times
	Electrical	Min. 100,000 times(250VAC 3A resistive load)
Unit weight		Approx. 269g

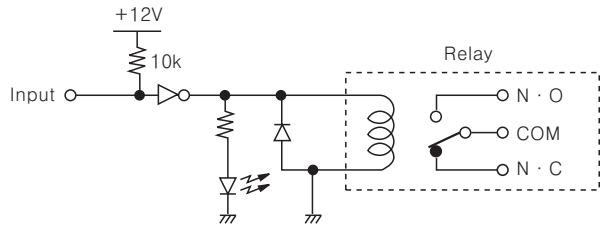
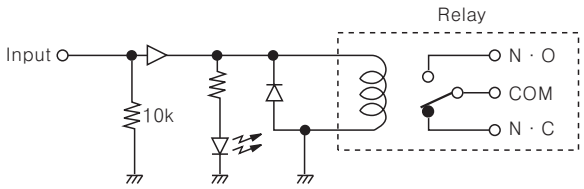
▣Front panel identification



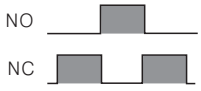
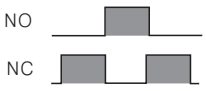
▣Connections



▣Function diagram

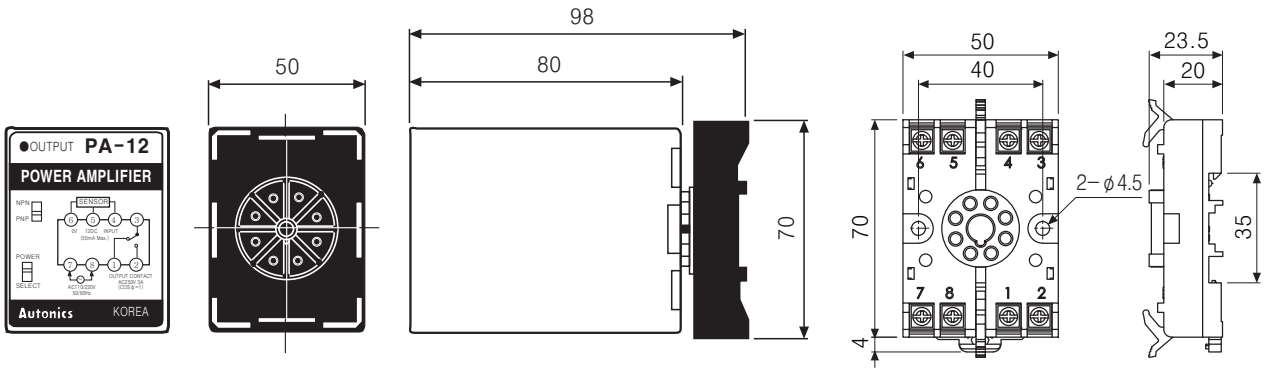
NPN circuit	PNP circuit
	

▣Operation mode

Input	NPN	PNP
Input level		
Relay output		
LED		

▣Dimensions

●8 Pin socket :PG-08(Sold separately)



(Unit:mm)

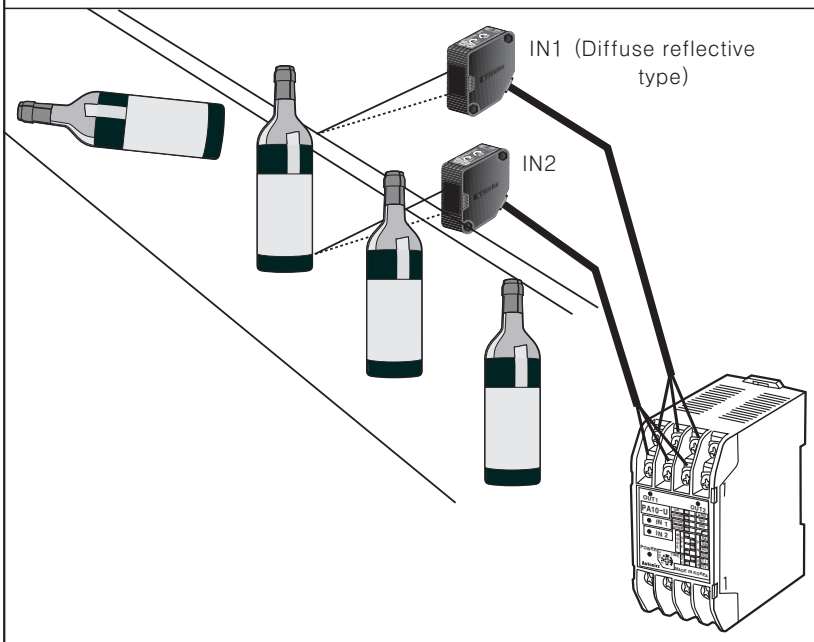
▣Proper usage

1. Power selection switch is set according to power voltage.
2. Please check connections before wiring.
3. Please be cautious not to short-circuit the 12VDC terminal at GND.
4. Do not install this unit at place where steam, dust, corrosive gas and water exist.

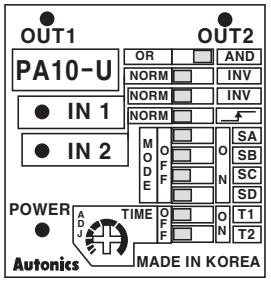
▣Application 1

◎When the bottle is fallen

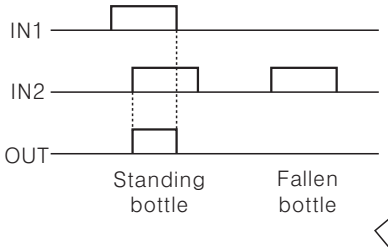
When the bottle is standing, IN1,IN2 are ON and when the bottle is fallen, IN2 is ON only.
Therefore, it detects the fallen bottle when IN1, IN2 are ON by using (AND) operation.



■Switch selection



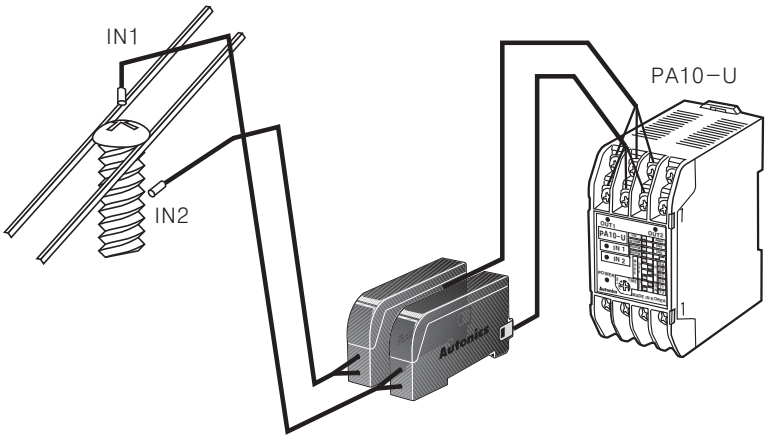
■Time charts

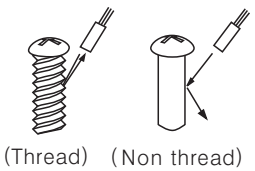


▣Application 2

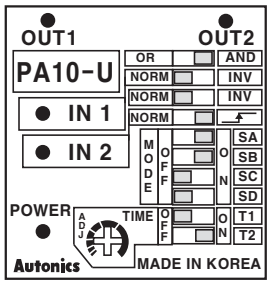
◎Detecting the thread of screw

- ●IN1 is for detecting the screw and IN2 is for detecting the thread of screw.
- ●IN1 and IN2 are ON, OUT will be ON then automatically returned after setting time(T). (One shot delay)
- ●IN1 should be operating faster than IN2 and IN2, IN1 should be operating at once.

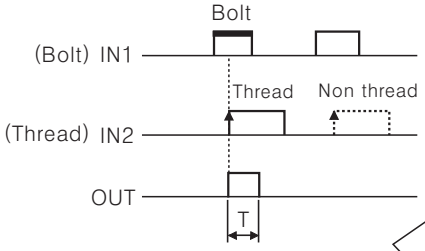




■Switch selection



■Time charts

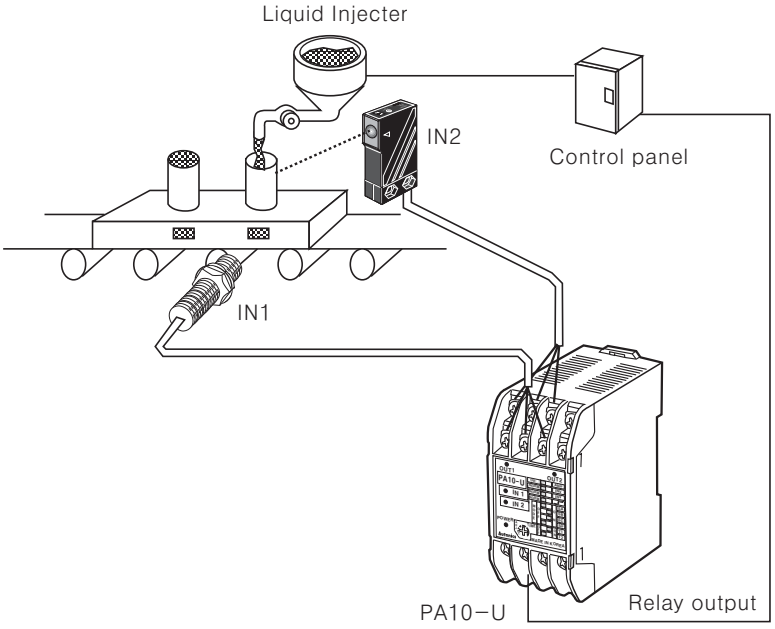


Application

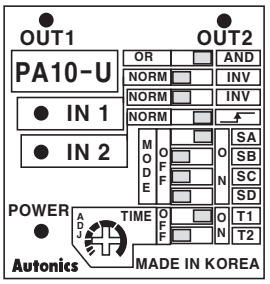
▣Application 3

◎Injecting constant volume of liquid

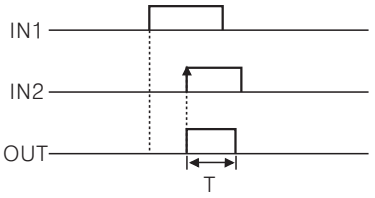
IN1 and IN2 are ON, OUT will be ON then automatically returned after setting time(T).
(One shot delay)



■Switch selection



■Time charts

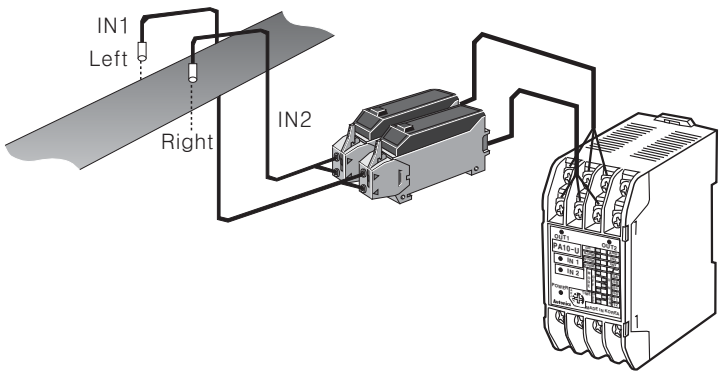


Inject liquid for setting time(T)

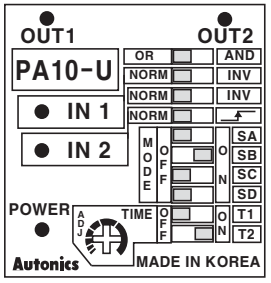
▣Application 4

◎Detecting location of sheet

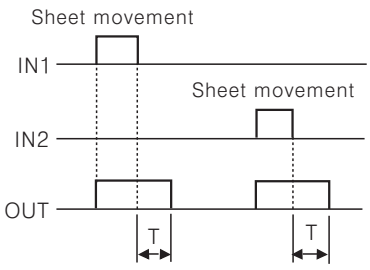
Install two sensors at both edges, when IN1 and IN2 are OFF, it is operating normally.
When one of them is ON, it detects that one side of sheet has moved and then output will be ON.
If IN1 and IN2 signal is ON then OFF, Output will be OFF after setting time(T).(OFF delay)



■Switch selection



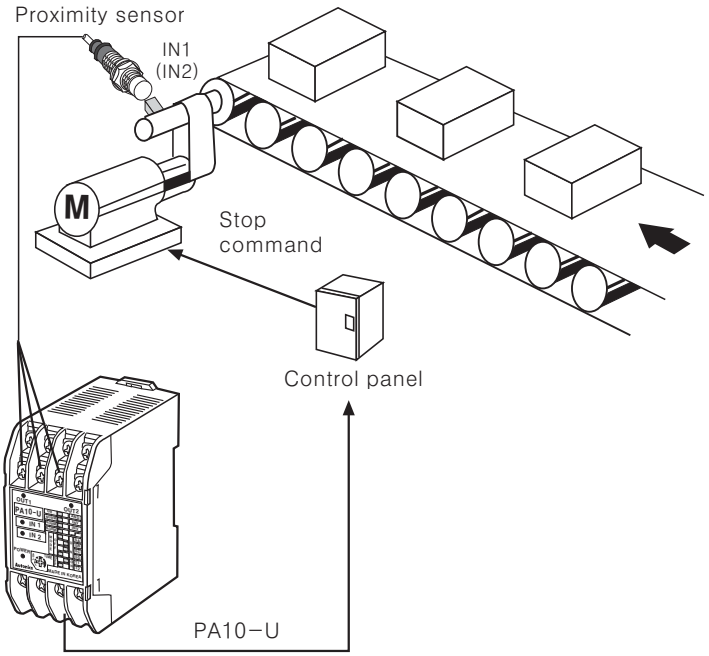
■Time charts



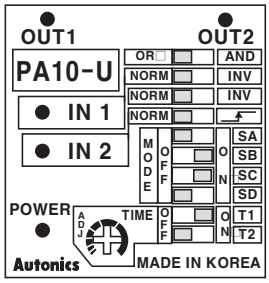
▣Application 5

◎Sensing a problem with the conveyor

The output will be ON when there is no input signal within setting time.(Low-speed detection mode)
Ex) When set as 3 sec. for T(Setting time)
When there is no input signal within 3sec., the output will be ON and it is able to stop the motor by this output.



■Switch selection



■Time charts