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 requires installing fail-safe device, or contact us for information on type required.**
   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, when it requires. 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, No.20AWG(0.50mm²) 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 specification rating.**
   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** ☐

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

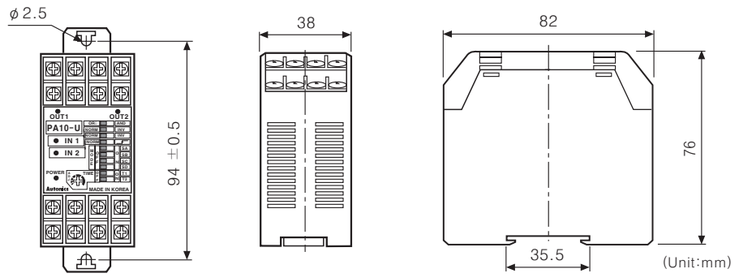
※The above specification are changeable without notice anytime.

▣ Specifications

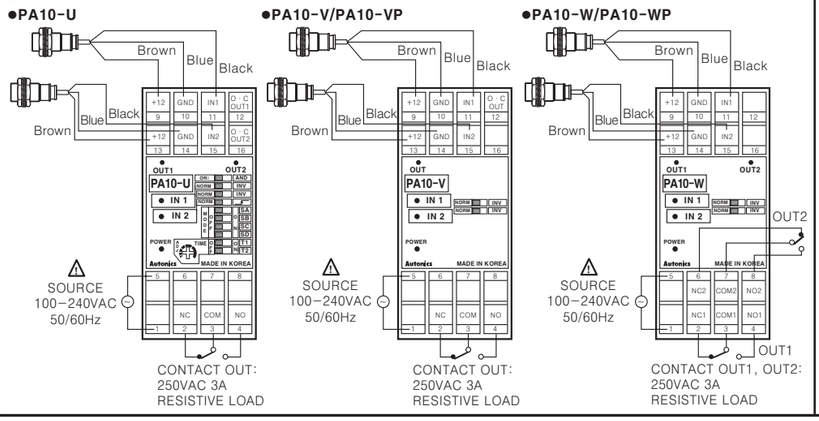
Model	PA10-U	PA10-V	PA10-VP	PA10-W	PA10-WP
Power supply	100-240VAC 50/60Hz				
Allowable voltage range	90 to 110% of rated voltage				
Power consumption	100VAC 50/60Hz : Approx. 7VA(Condition:12VDC/200mA), 240VAC 50/60Hz : Approx. 10VA				
Power for external sensor	12VDC ±10% max. 200mA				
Input(IN1)(IN2)	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	**●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)]	
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 ※**Only for PA10-U** : Have	●ON-DELAY MODE ●OFF-DELAY MODE ●ONE-SHOT DELAY MODE ●FLICKER MODE ●FLICKER ONE-SHOT MODE ●LOW-SPEED DETECTION MODE ●HIGH-SPEED DETECTION MODE				
Time setting function by each mode ※**Only for PA10-U** : Non	●NORMAL MODE ●FLIP-FLOP MODE ●ENCODER(MODE 9 to 11)				
Relay life cycle : Mechanical	Min.10,000,000 times				
Relay life cycle : Electrical	Min.100,000 times(250VAC 3A resistive load)				
Dielectric strength	2000VAC 50/60Hz for 1 minute				
Insulation resistance	Min. 100MΩ(at 500VDC)				
Ambient temperature	-10 to 55℃(at non-freezing status)				
Storage temperature	-25 to 60℃(at non-freezing status)				
Ambient humidity	35 to 85%RH				
Weight	Approx. 150g			Approx. 160g	

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

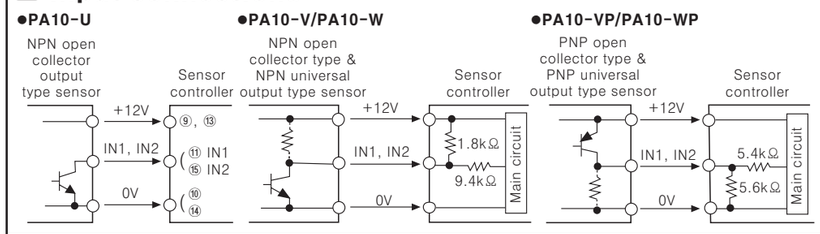
▣ Dimensions



▣ Connections

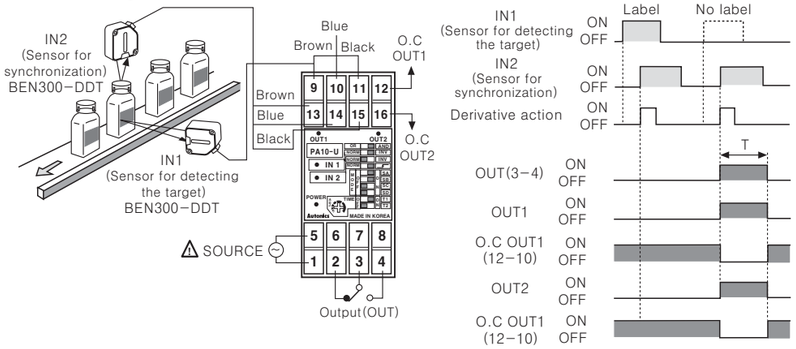


▣ Input connections



▣ Derivative action applications

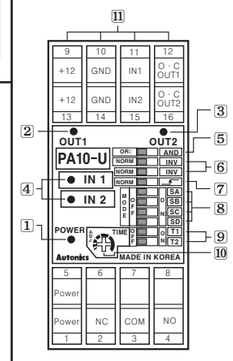
◎Detect label of glass bottle



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

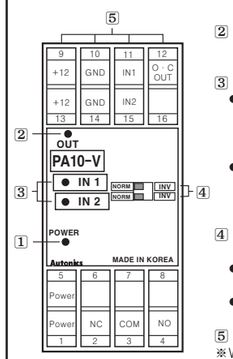
▣ Front panel indentification

●PA10-U



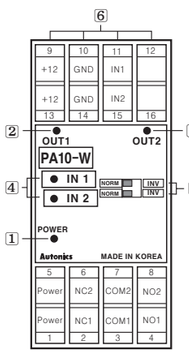
① **Power indicator** : LED turns on when AC power applied
② **Output indicator 1** : Indication of output signal
③ **Output indicator 2** : Indication of output signal
④ **Sensor input indicator** : Indication of sensor input signal (LED turns on when sensor input is Low)
⑤ **AND/OR selection switch** : Select "AND" or "OR" for IN1, IN2 Input
⑥ **Selection switch of sensor input signal** :
NORM INV (Input signal reverse turn function)
●NORM : LED turns on when input signal is low. ( )
●INV : LED turns 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. ※See 〈▣ Applications〉
⑧ **Selection switch for operation mode** : See 〈▣ Operation〉 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 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
⑩ **Timer volume** : Adjust time as same as the range of NO.9 function.
⑪ **Terminal block**

●PA10-V/PA10-VP



① **Power indicator** : LED turns on when AC power applied
② **Output indicator** : Indication of output signal
③ **Sensor input indicator** :
●PA10-V : Indication of sensor input signal(LED turns on when sensor input is Low)
●PA10-VP : Indication of sensor input signal(LED turns on when sensor input is High)
④ **Selection switch of sensor input signal**
●NORM : LED turns on when input signal is low.
●INV : LED turns on when input signal is high.
⑤ **Terminal block**
※When IN1, IN2 input signal is AND, OUT will work.

●PA10-W/PA10-WP

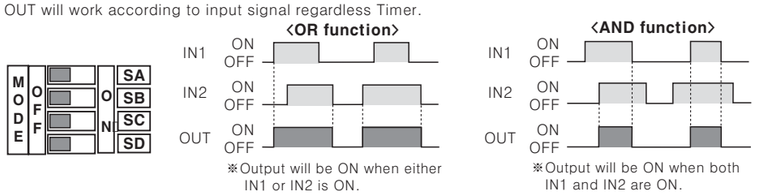


① **Power indicator** : LED turns on when AC power applied
② **Output indicator** : Indication of output signal
③ **Sensor input indicator** :
●PA10-W : Indication of sensor input signal(LED turns on when sensor input is Low)
●PA10-WP : Indication of sensor input signal(LED turns on when sensor input is High)
④ **Selection switch of sensor input signal**
●NORM : LED turns on when input signal is low.
●INV : LED turns on when input signal is high.
⑤ **Terminal block**
※Selectable NORM/INV. Selection function for IN1, IN2 individual operation.

▣ Operation mode

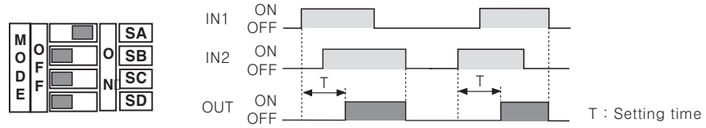
●MODE 0 NORMAL MODE

: OUT will work according to input signal regardless Timer.



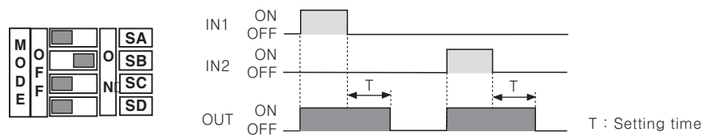
●MODE 1 ON-DELAY MODE

: OUT will be ON after setting time 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)



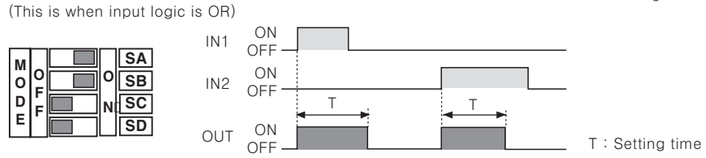
●MODE 2 OFF-DELAY MODE

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



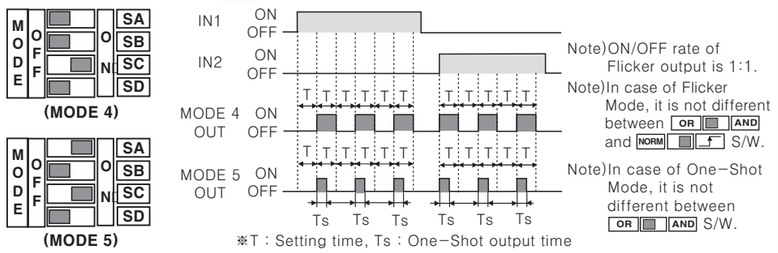
●MODE 3 ONE-SHOT DELAY MODE

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



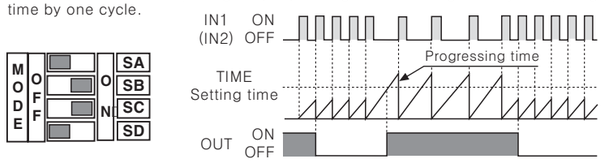
●MODE 4, 5 FLICKER MODE / FLICKER ONE-SHOT MODE

: OUT will be ON after setting time for IN1 input then it is flickering and OUT will be flickering after setting time from ON. But, in case of One-shot Mode, output time(Ts) will 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 to the setting time by one cycle.

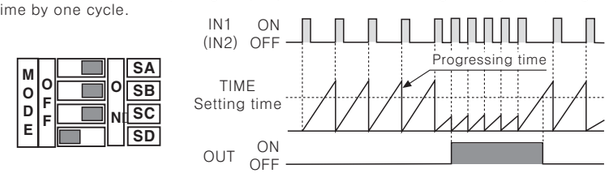


Note)Above is when input logic is OR and it will be the same by using IN2 input signal terminal instead of IN1.

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 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 ~ MODE 7)

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

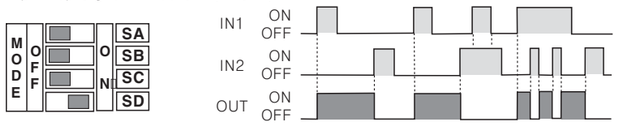
MODE / TIME S/W	MODE 1 to MODE 7 Setting time range	MODE 6 to MODE 7 Input frequency	MODE 6 to MODE 7 rpm
T1 / T2	0.01 to 0.1sec	100 to 10Hz	6,000 to 600rpm
T1 / T2	0.1 to 1sec	10 to 1Hz	600 to 60rpm
T1 / T2	1 to 10sec	1 to 0.1Hz	60 to 6rpm
T1 / T2	10 to 100sec	0.1 to 0.01Hz	6 to 0.6rpm

※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 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) are OFF.

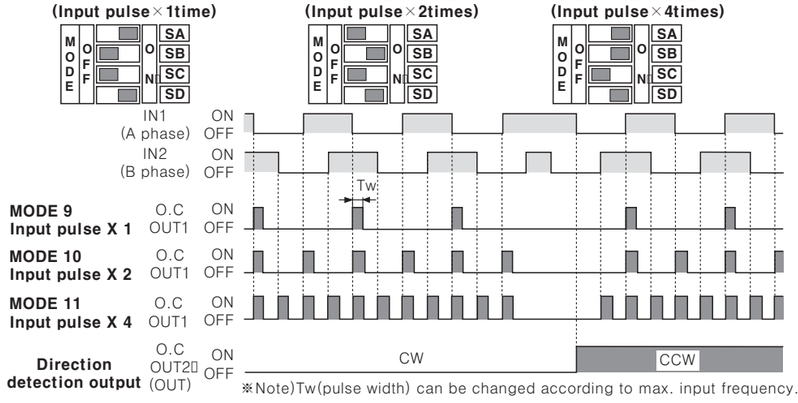
◎ENCODER MODE(MODE 9 ~ MODE 11)

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 Totempole output type of encoder with PA10-U.
   In this case, turnded to CW direction detection signal(O.C OUT2, OUT) output of PA10-U will be OFF.
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, OUT) function which detects direction of encoder rotation in Encoder mode.
4) Be sure to Input speed(cps) of connected equipment due to pulse width of O.C OUT1 is short.
5) OR AND NORM NORM INV Selection S/W can be set at any position.

●MODE 9 ENCODER (Input pulse×1time)

●MODE 10 ENCODER (Input pulse×2times)

●MODE 11 ENCODER (Input pulse×4times)



◎TIME S/W function in Encoder mode

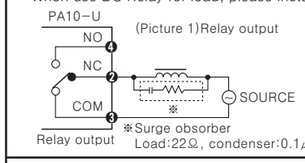
: TIME S/W is to convert output pulse width(Tw).

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

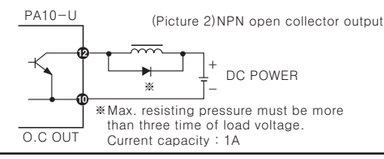
▣ Output

◎Load connection

Ability to reduce noise generating if install surge obsorber between inductive loads(Motor, Solenoid, etc) as Picture1.
When use DC Relay for load, please install a diode at relay coils as Picture 2. (Be sure to power polarity)



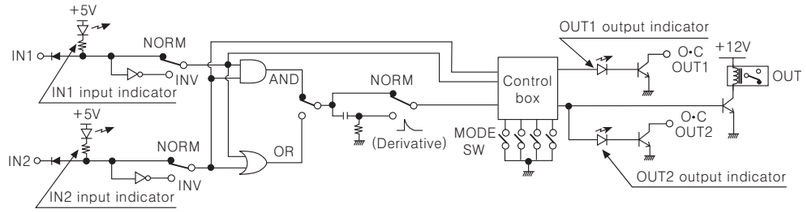
(Picture 1)Relay output



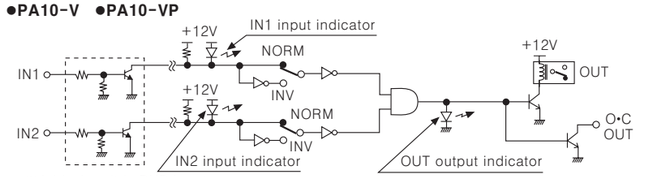
(Picture 2)NPN open collector output

▣ Function diagram

●PA10-U

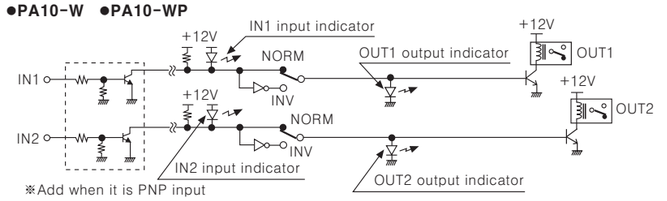


●PA10-V ●PA10-VP



※Add when it is PNP input

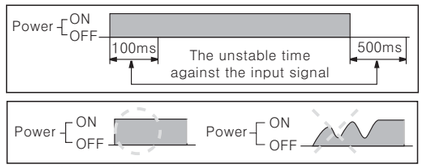
●PA10-W ●PA10-WP



※Add when it is PNP input

▣ Caution for using

1. Power
   ①The 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.
   ②Please use the power within rating power and apply or cut the power at once to prevent from chattering.



2. Input signal line
   ①Shorten the cable distance between the sensor and this product.
   ②Please shielded wire for input signal needed to be long.
   ③Please wire input signal line separated from power line.
3. When test dielectric voltage and insulation resistance of the control panel with this unit installed.
   ①Please isolate this unit from the circuit of control panel.
   ②Please make all terminals of this unit short-circuited.
4. Do not use this unit at below places.
   ①Place where there are severe vibration or impact.
   ②Place where strong alkalis or acids are used.
   ③Place where there are direct ray of the sun
   ④Place where strong magnetic field or electric noise are generated.
5. Installation environment
   ①It shall be used indoor
   ②Altitude Max. 2000m
   ③Pollution Degree 2
   ④Installation Category Ⅱ.

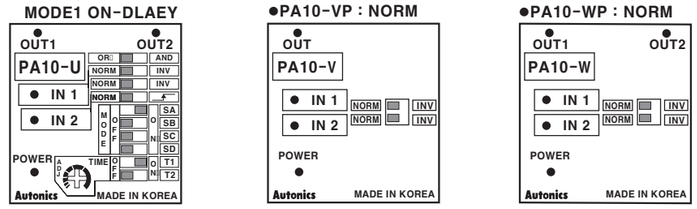
※It may cause malfunction if above instructions are not followed.

▣ Factory specification for S/W

●PA10-U : MODE1 ON-DLAEY

●PA10-V : NORM
●PA10-VP : NORM

●PA10-W : NORM
●PA10-WP : NORM



▣ Main products

- COUNTER
- TIMER
- TEMPERATURE CONTROLLER
- PANEL METER
- TACHOMETER/LINE SPEED METER/ PULSE METER
- DISPLAY UNIT
- PROXIMITY SENSOR
- PHOTOELECTRIC SENSOR
- FIBER OPTIC SENSOR
- PRESSURE SENSOR
- ROTARY ENCODER
- SENSOR CONTROLLER
- POWER CONTROLLER
- STEPPING MOTOR & DRIVER & CONTROLLER

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