PA10 Series

Multifunctional sensor controller

Features
- 13 kinds of various operation modes selected by DIP switches
- High speed input response
- Flip-flop mode for level control
- Multifunctional unit with timer mode
- DIN rail, Mounting to panel
- Wide range of power supply(100-240VAC 50/60Hz)

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

Ordering information

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input(IN1)(IN2)</td>
<td>Selectable NORM/INV. Operation for IN1, IN2 AND.</td>
</tr>
<tr>
<td>Input type</td>
<td>NPN input type</td>
</tr>
<tr>
<td>PA10-U</td>
<td>No mark</td>
</tr>
<tr>
<td>PA10-V</td>
<td>P</td>
</tr>
<tr>
<td>PA10-VP</td>
<td>U</td>
</tr>
<tr>
<td>PA10-W</td>
<td>V</td>
</tr>
<tr>
<td>PA10-WP</td>
<td>W</td>
</tr>
</tbody>
</table>

Specifications

Model | PA10-U | PA10-V | PA10-VP | PA10-W | PA10-WP
---|---|---|---|---|---
Power supply | 100-240VAC 50/60Hz | 100-240VAC 50/60Hz | 100-240VAC 50/60Hz | 100-240VAC 50/60Hz | 100-240VAC 50/60Hz
Allowable operation voltage | 90 to 110% of rated voltage | 90 to 110% of rated voltage | 90 to 110% of rated voltage | 90 to 110% of rated voltage | 90 to 110% of rated voltage
Power consumption | 100VAC 50/60Hz: Max. 9VA (Condition: 12VDC/200mA resistive load), 240VAC 50/60Hz: Max. 10VA | 100VAC 50/60Hz: Max. 9VA (Condition: 12VDC/200mA resistive load), 240VAC 50/60Hz: Max. 10VA | 100VAC 50/60Hz: Max. 9VA (Condition: 12VDC/200mA resistive load), 240VAC 50/60Hz: Max. 10VA | 100VAC 50/60Hz: Max. 9VA (Condition: 12VDC/200mA resistive load), 240VAC 50/60Hz: Max. 10VA | 100VAC 50/60Hz: Max. 9VA (Condition: 12VDC/200mA resistive load), 240VAC 50/60Hz: Max. 10VA
Power for external sensor | 12VDC ±10% Approx. 200mA | 12VDC ±10% Approx. 200mA | 12VDC ±10% Approx. 200mA | 12VDC ±10% Approx. 200mA | 12VDC ±10% Approx. 200mA

Time setting function by each mode
- Only for PA10-U
- 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

Response time
- Input: Min. 2μs, Relay contact output: Min. 10ms, Transistor output: Min. 0.5μs (When it is encoder mode)
- 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

Relay life cycle
- Mechanical: Min. 10,000,000 operations
- Electrical: Min. 100,000 operations (250VAC 3A resistive load)

Dielectric strength
- 2000VAC 50/60Hz for 1 minute

Insulation resistance
- Min. 100MΩ (at 500VDC megger)

Environmental condition
- Ambient temperature: -10 to 55°C, storage: -25 to 60°C
- Ambient humidity: 35 to 85%RH, storage: 35 to 85%RH

Unit weight
- Approx. 150g
- Approx. 160g

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

- **Photoelectric sensor**
- **Fiber optic sensor**
- **Door/Area sensor**
- **Proximity sensor**
- **Pressure sensor**
- **Rotary encoder**
- **Connector/Socket**
- **Temp. controller**
- **SSR/Power controller**
- **Counter**
- **Timer**
- **Panel meter**
- **Tacho/Speed/Pulse meter**
- **Display unit**
- **Sensor controller**
- **Switching mode power supply**
- **Stepper motor & Driver & Controller**
- **Field network device**
- **Software**
- **Other**

## Dimensions

![Dimensions Diagram]

(unit: mm)

## Connections

- **PA10-U**
- **PA10-V/PA10-VP**
- **PA10-W/PA10-WP**

## Input connections

- **PA10-U**
- **PA10-V / PA10-W**
- **PA10-VP / PA10-WP**
PA10 Series

Function diagram

PA10-U

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input

PA10-V, PA10-VP

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

PA10-W, PA10-WP

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

Front panel identification

PA10-U

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

PA10-V, PA10-VP

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

PA10-W, PA10-WP

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

Front panel identification

PA10-U

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

PA10-V, PA10-VP

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

PA10-W, PA10-WP

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

Front panel identification

PA10-U

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

PA10-V, PA10-VP

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

PA10-W, PA10-WP

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

Front panel identification

PA10-U

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

PA10-V, PA10-VP

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)

PA10-W, PA10-WP

1. Power indicator: LED is turned on when AC power applied
2. Output indicator: Indication of output 1 operation status
3. Sensor input indicator: Indicates sensor input signal
   (LED is turned on when sensor input is Low)
4. AND/OR selection switch: Select “AND” or “OR” for IN1, IN2 Input
5. Derivative action selection of IN2 input signal (OR/AND selection switch: AND)
   NORM: IN2 Derivative action of IN2 input signal. (※Refer to O-7, Application of derivative operation)
Sensor Controller

Operation mode (PA10-U)

- **MODE 0  Normal mode**
  OUT will work according to input signal regardless Timer.

```
<OR function>

IN1    IN2    OUT
ON     OFF    ON
OFF    ON     ON
<AND function>

IN1    IN2    OUT
ON     OFF    ON
OFF    ON     OFF
```

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

```
<OR function>

IN1    IN2    OUT
ON     OFF    ON
OFF    ON     ON
T: Setting time
```

*Output will be ON on both IN1 and IN2 are ON.*

- **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.

```
<OR function>

IN1    IN2    OUT
ON     OFF    ON
OFF    ON     ON
T: Setting time
```

- **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.

```
<OR function>

IN1    IN2    OUT
ON     OFF    ON
OFF    ON     ON
T: Setting time
```

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

```
<OR function>

IN1    IN2    OUT
ON     OFF    ON
OFF    ON     ON
T: Setting time
```

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

Note) In case of one-shot mode, it is not different between **MODE 4** and **MODE 5**.

```
<AND function>

IN1    IN2    OUT
ON     OFF    ON
OFF    ON     OFF
T: Setting time
```

*Note*) In case of one-shot mode, it is not different between **MODE 4** and **MODE 5**.

```
<AND function>

IN1    IN2    OUT
ON     OFF    ON
OFF    ON     OFF
T: Setting time
```

*Note*) In case of one-shot mode, it is not different between **MODE 4** and **MODE 5**.

```
T: Setting time, Ts: One-Shot output time
```
**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.

  ![Mode 6 Diagram]

  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.

  ![Mode 7 Diagram]

  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).

<table>
<thead>
<tr>
<th>TIME S/W</th>
<th>MODE 1 to MODE 7, MODE 12</th>
<th>MODE 6 to MODE 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 T2</td>
<td>Setting time range</td>
<td>Input frequency</td>
</tr>
<tr>
<td></td>
<td>0.01 to 0.1sec</td>
<td>100 to 10Hz</td>
</tr>
<tr>
<td>T1 T2</td>
<td>0.1 to 1 sec</td>
<td>10 to 1 Hz</td>
</tr>
<tr>
<td>T1 T2</td>
<td>1 to 10 sec</td>
<td>1 to 0.1 Hz</td>
</tr>
<tr>
<td>T1 T2</td>
<td>10 to 100 sec</td>
<td>0.1 to 0.01 Hz</td>
</tr>
</tbody>
</table>

  ※ 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).

  ![Mode 8 Diagram]

  Note) IN2 will be prior to all input signal.
  Note) Both OR and AND 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 OUT1) 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. Selection switches can be set at any position.

#### Time switches in encoder mode

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

<table>
<thead>
<tr>
<th>Time switch</th>
<th>Max. input frequency</th>
<th>Output pulse width (Tw)</th>
<th>Input speed of connected equipment (cps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1kHz</td>
<td>100Hz</td>
<td>Approx. 50μs</td>
<td>Min. 20kHz (20kcps)</td>
</tr>
<tr>
<td>1kHz</td>
<td>1kHz</td>
<td>Approx. 5μs</td>
<td>Min. 200kHz (200kcps)</td>
</tr>
<tr>
<td>1kHz</td>
<td>100Hz</td>
<td>Approx. 500μs</td>
<td>Min. 2kHz (2kcps)</td>
</tr>
<tr>
<td>10kHz</td>
<td>100kHz</td>
<td>Approx. 0.5μs</td>
<td>Min. 2000kHz (2000kcps)</td>
</tr>
<tr>
<td>10kHz</td>
<td>1kHz</td>
<td>Approx. 5μs</td>
<td>Min. 200kHz (200kcps)</td>
</tr>
<tr>
<td>10kHz</td>
<td>100Hz</td>
<td>Approx. 500μs</td>
<td>Min. 2kHz (2kcps)</td>
</tr>
</tbody>
</table>

#### 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.
**Application of derivative operation**

**Sensing labels of glass bottles**

- **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.

---

**Factory default for S/W**

- **PA10-U:** MODE1 ON-DELAY
- **PA10-V:** NORM
- **PA10-VP:** NORM
- **PA10-W:** NORM
- **PA10-WP:** NORM

---

**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.)

- **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°C to 55°C.)
- 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 controller 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.

---

(A) Photo electric sensor
(B) Fiber optic sensor
(C) Door/Area sensor
(D) Proximity sensor
(E) Pressure sensor
(F) Rotary encoder
(G) Connector/Socket
(H) Temp. controller
(I) SSR/Power controller
(J) Counter
(K) Timer
(L) Panel meter
(M) Tacho/Speed/Pulse meter
(N) Display unit
(O) Sensor controller
(P) Switching mode power supply
(Q) Stepper motor&Driver&Controller
(R) Graphic/Logic panel
(S) Field network device
(T) Software
(U) Other