

# ZN series digital counter manual

- Strong anti-jamming, high reliability, used widely in industrial control systems.
- Standard dimensions (48x48mm / 72x72mm), easy to install
- Fit to GB14048.5-2008 and many other national or industry standards, high-quality, high-performance
- Using high frequency crystal oscillator frequency division technology, timing accuracy, high precision
- With timing, counting, rotation speed, frequency, cumulative and other functions, cost-effective, variety relay work mode to meet the needs of the scene
- Can be connected to proximity sensors, photoelectric sensors, switch contacts, encoders and other sensors.
- Can set relay action mode, magnification a, magnification b, set value, cumulative value, count value, data will not lose when power off.
- Strictly produce according to standard, 9 working procedures and 5 times strict inspections.

## 1 Main technical parameter

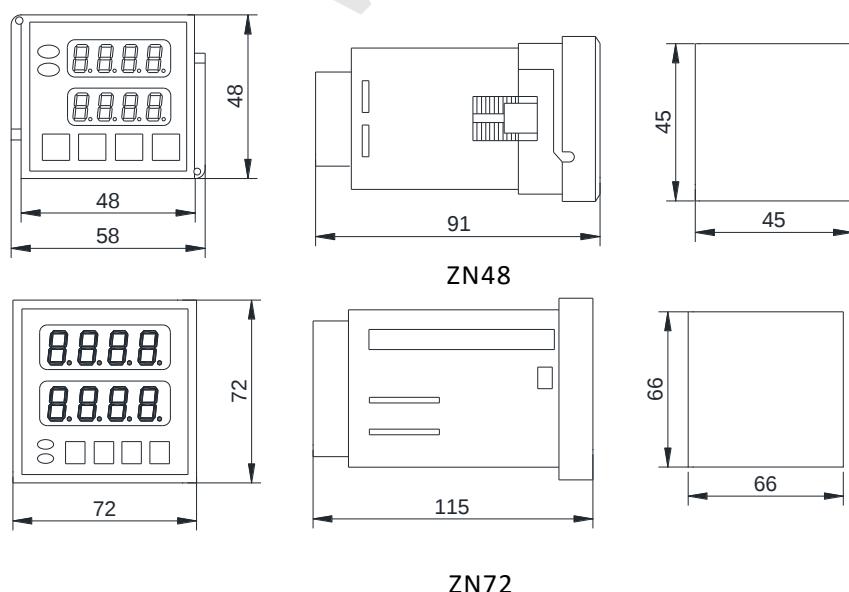
### 1. Function characteristic

|                       |                                                                      |                 |                      |
|-----------------------|----------------------------------------------------------------------|-----------------|----------------------|
| Supply voltage        | Refer to the label of case,<br>the voltage fluctuation is 85%-110%Ue | Mechanical life | ≥10 <sup>6</sup> ops |
| Power consumption     | ≤3VA                                                                 | Electrical life | ≥10 <sup>5</sup> ops |
| Operating temperature | -5℃-45℃                                                              | Pause time      | ≥0.05s               |
| Store temperature     | -20℃-70℃                                                             | Reset time      | ≥0.05s               |
| Auxiliary power       | DC12V 30mA (max)                                                     | Power restart   | ≥1s                  |
| Operating humidity    | 35-85%RH                                                             | Mounting type   | Panel                |
| Contact rating        | AC250V 5A COSΦ= 1; DC24V 7A                                          | Product weight  | About 150g           |
| Count type            | 1. Contact 2. NPN type sensor                                        | Counting speed  | 2-10KHZ              |

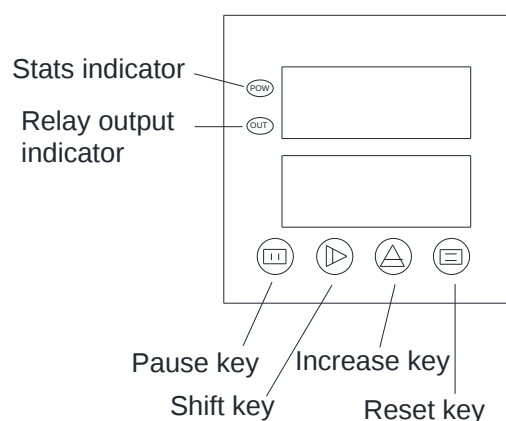
### 2. Electric characteristic

|                       |                                                                               |                     |                                                     |
|-----------------------|-------------------------------------------------------------------------------|---------------------|-----------------------------------------------------|
| Insulation resistance | 100MΩ min at 500Vdc                                                           | Dielectric strength | 2000Vac, 50/60Hz for 1min                           |
| Anti-jamming          | EFT execute GB/T17626-4 level                                                 | impact              | Impact resistance: 30G X、Y、Z direction 3 times each |
| Anti-jamming          | ESD execute GB/T17626-3 level                                                 | impact              | Malfunction: 10G X、Y、Z direction 3 times each       |
| vibration             | Shock resistance: 10-50Hz(1min periods) 0.75mm swing, X、Y、Z direction 1h each |                     |                                                     |
| vibration             | Malfunction: 10-55Hz(1min periods) 0.5mm swing, X、Y、Z direction 1min each     |                     |                                                     |

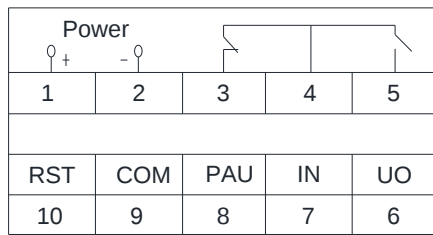
## 2 External dimensions and Perforation dimensions (Unit: mm)



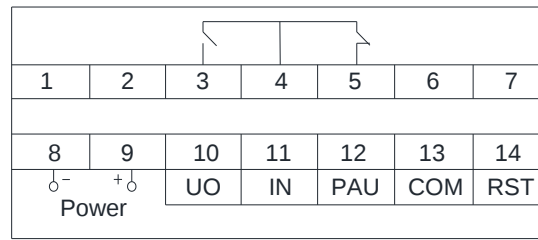
## 3 Front panel description



#### 4 Wiring diagram



ZN48



ZN72

#### 5 Product function code, description, working range correspondence table

| Function Code | Description                      | Range          | Relay action code | Magnification |
|---------------|----------------------------------|----------------|-------------------|---------------|
| 01            | Single delay (Up)                | 0. 01S-99. 99S | 1-6               |               |
| 02            | Single delay (Down)              | 0. 01S-99. 99S | 1-6               |               |
| 03            | Single delay (Up)                | 1M-9999M       | 1-6               |               |
| 04            | Single delay (Down)              | 1M-9999M       | 1-6               |               |
| 05            | Single delay (Up)                | 1S-9999S       | 1-6               |               |
| 06            | Single delay (Down)              | 1S-9999S       | 1-6               |               |
| 07            | Single delay (Up)                | 1S-99M59S      | 1-6               |               |
| 08            | Single delay (Down)              | 1S-99M59S      | 1-6               |               |
| 09            | Single delay (Up)                | 1M-99H59M      | 1-6               |               |
| 10            | Single delay (Down)              | 1M-99H59M      | 1-6               |               |
| 11            | Double delay (Up)                | 1M-99H59M      | 1, 2              |               |
| 12            | Double delay (Down)              | 1M-99H59M      | 1, 2              |               |
| 13            | Double delay (Up)                | 1S-99M59S      | 1, 2              |               |
| 14            | Double delay (Down)              | 1S-99M59S      | 1, 2              |               |
| 15            | Double delay (Up)                | 1S-9999S       | 1, 2              |               |
| 16            | Double delay (Down)              | 1S 9999S       | 1, 2              |               |
| 17            | Double delay (Up)                | 1M 9999M       | 1, 2              |               |
| 18            | Double delay (Down)              | 1M 9999M       | 1, 2              |               |
| 19            | Accumulation (reset immediately) | 0-99H59M59.99S | 1-6               |               |
| 20            | Accumulation (reset after 8s)    | 0-99H59M59.99S | 1-6               |               |
| 21            | Accumulation (reset immediately) | 0-9999H59M59S  | 1-6               |               |
| 22            | Accumulation (reset after 8s)    | 0-9999H59M59S  | 1-6               |               |
| 23            | Accumulation (reset immediately) | 0-9999D23H59M  | 1-6               |               |
| 24            | Accumulation (reset after 8s)    | 0-9999D23H59M  | 1-6               |               |
| 25            | Frequency                        | 1Hz-9999Hz     | 1, 3              |               |
| 26            | Frequency                        | 1.0Hz-999. 9Hz | 1, 3              |               |
| 27            | Rotation                         | 60-9999RPM     | 1, 3              |               |
| 28            | Frequency/Rotation               | 0-9999         | 1, 3              | a、 b          |
| 29            | Reversible count                 | 0-9999         | 1, 3, 5           |               |
| 30            | Reversible count                 | 0-9999         | 1, 3, 5           | a             |
| 31            | Reversible count                 | 0-99999999     | 1, 3, 5           |               |
| 32            | Reversible count                 | 0-99999999     | 1, 3, 5           | a             |

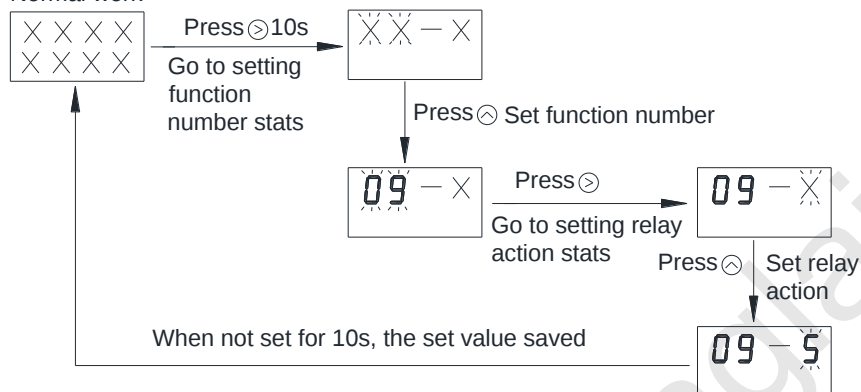
## 6 Relay action mode

| Code | Relay action content                                                                                                                                                                                                             |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | When power on, the counter work, reach or exceed the set value, relay switch on.                                                                                                                                                 |
| 2    | When power on, the counter don't work (can make it work by reset button or reset terminals), reach or exceed the set value, relay switch on.                                                                                     |
| 3    | When power on, the counter work, reach or exceed the set value, relay switch off.                                                                                                                                                |
| 4    | When power on, the counter don't work (can make it work by reset button or reset terminals), reach or exceed the set value, relay switch off.                                                                                    |
| 5    | When power on, the counter work, reach or exceed the set value, relay switch on, when reach to preset reset time, the counter reset automatically, begin work again.                                                             |
| 6    | When power on, the counter don't work (can make it work by reset button or reset terminals), reach or exceed the set value, relay switch on, when reach to preset reset time, the counter reset automatically, begin work again. |

## 7 Product function code and relay action code setting instructions

(1) e.g. the setting process of function code 09, relay action code 05, the setting process is as follow:

Normal work



(2) When the relay action code is 5 or 6, it will appear with reset time setting, range is 0.1-999.9s.

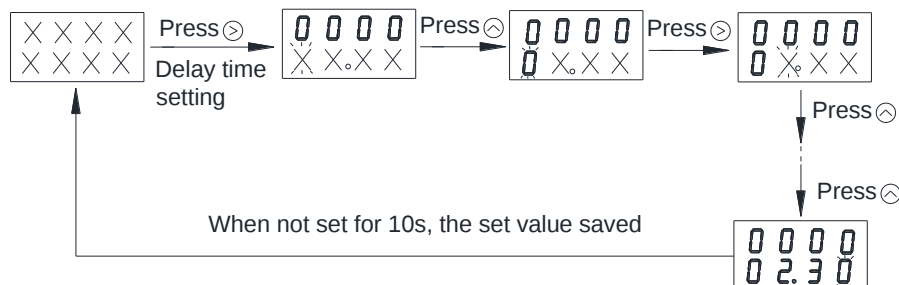
(3) Factory setting is as follow: function code 08, relay action code 1, the digital display is 08-1, that is to say, the instrument function is single delay time relay, time range is 1S-99M59S, countdown, when power on, the counter work, reach or exceed the set value, relay switch on.

## 8 Single delay time relay (function code 01-10)

(1) When single delay time relay, the upper digital tube show delay value, the lower digital tube show set value.

(2) e.g. function code is 07, set the single delay time delay's delay time to 2 minutes and 30 seconds, the setting process is as follow:

Normal work



(3) Pause key (PAU): When the single delay time relay work, press down the pause key, delay paused, release the pause key, delay continues.

(4) Reset key (RST): When the single delay time delay work, press down the reset key, the time relay restores to initial state, release the reset key, time relay begins to delay work.

(5) PAU terminal: delay stopped when connect to COM terminal, delay continues when disconnect.

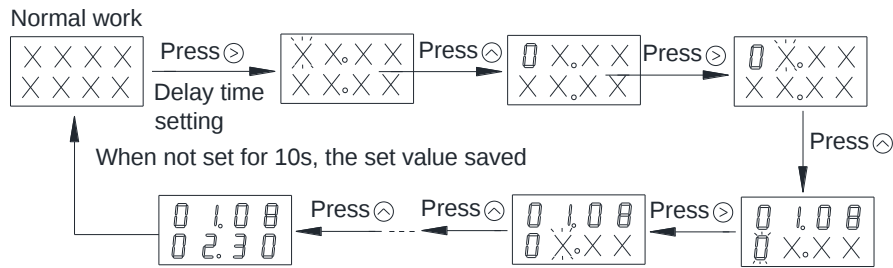
(6) reset (RST): restore to initial state when connect to COM terminal, renew delay when disconnect.

(7) IN terminal is invalid.

### 9 Double delay time relay (function code 11-18)

(1) When double delay time relay work, the upper digital tube shows the relay release and pick up's current value in sequence, the lower digital tube shows the corresponding value.

(2) e.g. function code is 13, set the double delay time delay's release time to 1 minute and 8 seconds, pick up time to 2 minutes and 30 seconds, the setting process is as follow (When setting, the upper digital tube is release time, the lower digital is pick up time):



(3) Pause key (PAU): When the double delay time relay work, press down the pause key, delay paused, release the pause key, delay continues.

(4) Reset key (RST): When the double delay time delay work, press down the reset key, the time relay restores to initial state, release the reset key, time relay begins to delay work.

(5) PAU terminal: delay stopped when connect to COM terminal, delay continues when disconnect.

(6) Reset (RST): restore to initial state when connect to COM terminal, renew delay when disconnect.

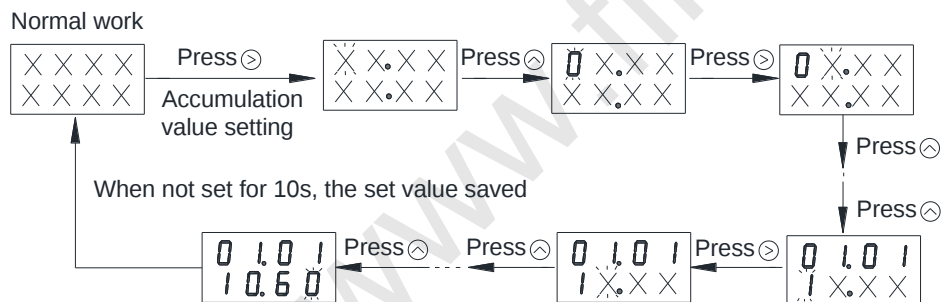
(7) IN terminal is invalid.

(8) When normal work, press the key directly, the upper and lower digital tubes is flashing, the upper four digits display the relay release time action value, the lower four digits show relay pick up time action value.

### 10 Eight-bit accumulation relay (function code 19-24)

(1) When accumulation relay work, the eight digital tubes show the current cumulative time.

(2) e.g. function code is 19, set the relay action time to 1 hour 1 minute 10.6 seconds, the setting process is as follow:



(3) Pause key (PAU): When the accumulation relay work, press down the pause key, cumulative time paused, release the pause key, cumulative time continues.

(4) Reset key (RST): When the accumulation relay work, press down the reset key, accumulation relay restores to initial state, release the reset key, accumulation relay begins to cumulative time. When the function code is 20, 22, 24, the reset will work after 8s.

(5) PAU terminal: cumulative time stopped when connect to COM terminal, cumulative time continues when disconnect.

(6) Reset (RST): restore to initial state when connect to COM terminal, renew cumulative time when disconnect. When the function code is 20, 22, 24, the reset will work after 8s.

(7) IN terminal is invalid.

(8) When normal work, press the key directly, the upper and lower digital tubes is flashing, display time action value.

### 11 Frequency meter (function code 25-26)

(1) When frequency meter work, the upper digital tube display frequency measured value, the lower digital display frequency set value.

The flowchart illustrates the 'Normal work' process for frequency value setting. It begins with a display showing eight 'X' characters. Pressing the 'F' key (indicated by a circle with 'F') leads to a display where the first four digits are '0' and the last four are 'X'. Pressing the 'F' key again leads to a display where the first digit is '9' and the last three are 'X'. Pressing the 'F' key a third time leads to a display where the first digit is '9', the second is 'X', and the last three are 'X'. From this state, pressing the 'F' key leads to a display showing '0000' over '9030'. A feedback loop labeled 'When not set for 10s, the set value saved' returns from this final display to the initial 'XXXXXX' display. The text 'Frequency value setting' is positioned below the first transition.

(5) IN is an external pulse input.

(7) Valid measured frequency upper limit and trigger selection:

A, the upper digital tube is the maximum measured frequency.

C, after changing screen, the upper digital tube is the frequency measurement interrupt trigger mode selection. 0000: falling edge interrupt; 0001: rising edge interrupt.

e.g. When input by lower frequency signal, set the upper measured frequency limit to 5000, the setting process is as follow:

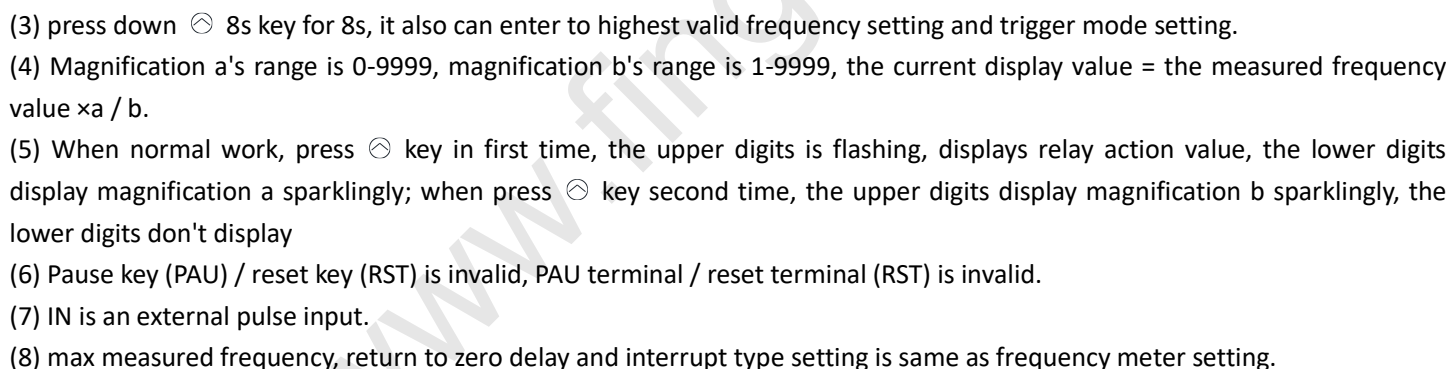
The flowchart illustrates the normal work sequence for the device. It begins with a screen showing 'X X X X' in all four positions. A 'Press' button (represented by a circle with a right-pointing arrow) leads to a screen showing '9 9 9 9' in the top row and 'X X X X' in the bottom row. This is labeled 'Valid frequency value setting'. Another 'Press' button leads to a screen showing '5 9 9 9' in the top row and 'X X X X' in the bottom row. A third 'Press' button leads to a screen showing '5 0 9 9' in the top row and 'X X X X' in the bottom row. From here, a 'Press' button leads to a screen showing '9 1 6 0' in the top row and 'X X X X' in the bottom row. A 'Press' button leads to a screen showing '5 0 0 0' in the top row and 'X X X X' in the bottom row. A 'Press' button leads to a screen showing '5 0 0 0' in the top row and 'X X X X' in the bottom row, labeled 'Set the delay to zero'. A 'Press' button leads to a screen showing '0 0 0 0' in the top row and 'X X X X' in the bottom row, labeled 'Press change screen'. A 'Press' button leads to a screen showing '0 0 0 1' in the top row and 'X X X X' in the bottom row, labeled 'Press, Press Set to select rising edge to interrupt'. A final 'Press' button leads to a screen showing 'X X X X' in all four positions, labeled 'When not set for 10s, the set value saved'.

(1) When tachometer work, the upper digital tube displays the rotational speed's measured value, the lower digital tube displays the rotational speed's set value.

The diagram illustrates the 'Normal work' cycle for setting a rotation value. It starts with a display showing 'XXXXX' in two rows. Pressing the 'Rotation value setting' button (indicated by a circle with a right arrow) leads to a display where the first digit is '1' and the rest are 'X'. Pressing the 'OK' button (indicated by a circle with a checkmark) leads to a display where the first digit is '2' and the rest are 'X'. Pressing the 'OK' button again leads to a display where the first two digits are '00' and the last two are 'X'. Pressing the 'OK' button a third time leads to a display showing '0000' in two rows. A dashed arrow labeled 'Press OK' points down to a display showing '0000' in two rows, with '2050' below it. A solid arrow labeled 'When not set for 10s, the set value saved' points from this display back to the initial 'XXXXX' display, completing the cycle.

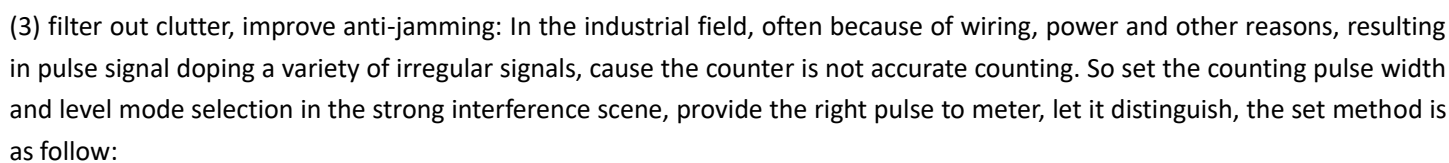
- 13 Frequency meter with magnification (function code 28)

- ### Normal work



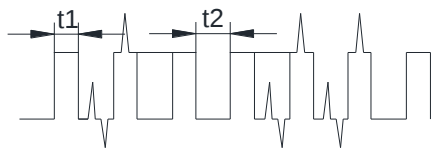
**14** Reversible counter (Function code 29)

- ### Normal work



Press  $\odot$  key for 8s, to enter count pulse width setting, the upper digital tube display valid min pulse width t1, the lower

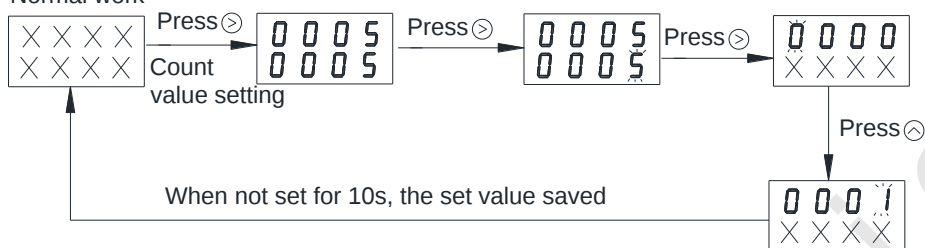
digital tube display min pulse Interval width  $t_2$ . Their set range is all 0.1-999.9ms. The frequency is more high, the pulse width is more narrow, when user's frequency is more than 5KHz, can set  $t_1=0$ ,  $t_2=0$  directly, user can refer to the follow table, to calculate  $t_1$ ,  $t_2$  values, but please note,  $t_1$  and  $t_2$  usually is not symmetric,  $t_1$  is closed to real pulse width basically, if  $t_1$  is too small, will result in pulse lose, if too big, will reduce the filtering out clutter ability, result in count more.



| Frequency(Hz) | Period (ms, $t_1+t_2$ ) |
|---------------|-------------------------|
| 1             | 1000.0                  |
| 10            | 100.0                   |
| 100           | 10.0                    |
| 1000          | 1.0                     |
| 2000          | 0.5                     |
| 10000         | 0.2                     |

Press  $\odot$  key again, when screen change, the upper digital tube is count level selection, if set to 0, then the pulse's low level is valid (or valid when terminal IN connect to COM), if set to 1, then the pulse's high level is valid (or valid when terminal IN disconnect COM), the above setting is fit to NPN sensor.

Normal work



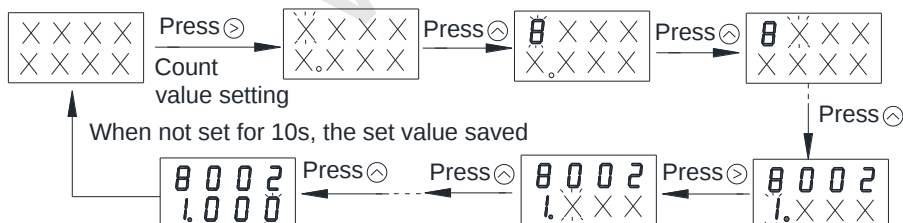
When counting, if the pulse width is less then set value, will be eliminated as an interference.

- (4) Pause terminal is reversible counter control terminal: count down when connect to COM, count up when disconnect.
- (5) reset terminal (RST): restore to initial state when connect to COM terminal, renew count when disconnect.
- (6) Reset key (RST): When the counter work, press down the reset key, the counter restores to initial state, release the reset key, time relay begins to count.
- (7) IN is an external pulse input.
- (8) Pause key (PAU): Invalid

### 15 Reversible counter with magnification (function code 30)

- (1) When counter work, the upper digital tube displays count value, the lower digital tube displays count set value.
- (2) e.g. set the count to 8002, magnification  $a=1.000$ , the upper digits are set value, the lower digits are magnification  $a$ , the setting process is as follow:

Normal work



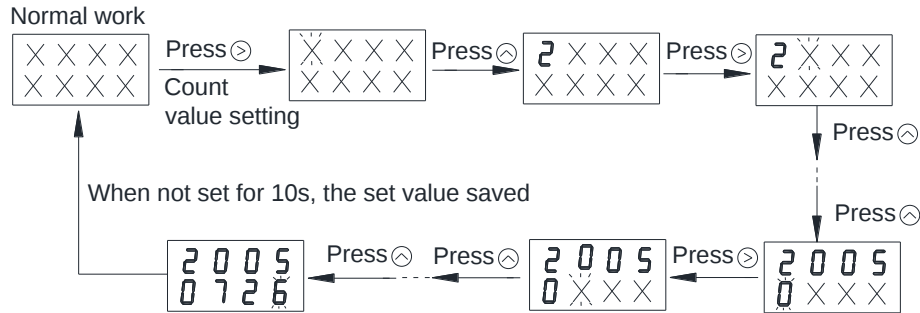
- (3) Pulse width setting and level setting, refer to "14 Reversible counter (3)".
- (4) PAU terminal is reversible counter control terminal: count down when connect to COM, count up when disconnect.
- (5) reset terminal (RST): restore to initial state when connect to COM terminal, renew count when disconnect.
- (6) Reset key (RST): When the counter work, press down the reset key, the counter restores to initial state, release the reset key, time relay begins to count.
- (7) IN is an external pulse input.
- (8) Pause key (PAU): Invalid.
- (9) The current display value = the number of measured pulses  $\times a$ , magnification  $a$ : 0.001-9.999.
- (10) When normal work, press  $\odot$  key directly, the upper digits display relay action value sparkingly, the lower digits display

magnification a sparkingly.

#### 16 Eight-bit reversible counter (function code 31)

(1) When counter work, the eight digits display the current count value.

(2) e.g. set the count to 20050726, the eight digits are set value, the setting process is as follow:



(3) Pulse width setting and level setting, refer to "14 Reversible counter (3)".

(4) PAU terminal is reversible counter control terminal: count down when connect to COM, count up when disconnect.

(5) reset terminal (RST): restore to initial state when connect to COM terminal, renew count when disconnect.

(6) Reset key (RST): When the counter work, press down the reset key, the counter restores to initial state, release the reset key, time relay begins to count.

(7) IN is an external pulse input.

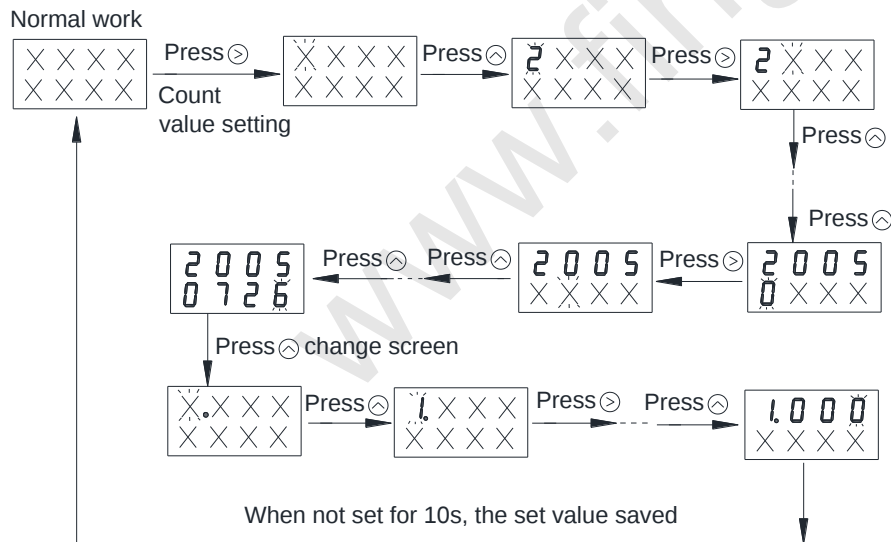
(8) Pause key (PAU): Invalid.

(9) When normal work, press key directly, the eight digits display relay action value sparkingly.

#### 17 Eight-bit reversible counter with magnification (function code 32)

(1) When counter work, the upper digital tube displays count value, the lower digital tube displays value set value.

(2) e.g. set the count to 20050726, magnification a=1, the eight digits are count value, when change screen, the upper digits are magnification, the lower digits don't display, the setting process is as follow:



(3) Pulse width setting and level setting, refer to "14 Reversible counter (3)".

(4) PAU terminal is reversible counter control terminal: count down when connect to COM, count up when disconnect.

(5) reset terminal (RST): restore to initial state when connect to COM terminal, renew count when disconnect.

(6) Reset key (RST): When the counter work, press down the reset key, the counter restores to initial state, release the reset key, time relay begins to count.

(7) IN is an external pulse input.

(8) Pause key (PAU): Invalid.

(9) The current display value = the number of measured pulses  $\times$  a, magnification a: 0.001-9.999.

(10) When normal work, press key directly in first time, the eight digits display relay action value sparkingly, when press key second time, the upper digits display magnification sparkingly, the lower digits don't display.