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# OPERATION MANUAL

PRODUCT NAME : 3 -points preset counter

MODEL : CEU1

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- Read this operation manual carefully to understand before installation and operation.
- Pay extra attention on the clause concerning the safety.
- Keep this operation manual available whenever necessary.

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## Chapter 1 Read Before Use

These safety instructions are intended to prevent a hazardous situation and/ or equipment damage. These instructions indicate the level of potential hazard by label of "Caution", "Warning" or "Danger". To ensure safety, follow the below instructions as well as other safety instructions.

 <b>Caution</b>	Operator error could result in injury or equipment damage.
 <b>Warning</b>	Operator error could result in serious injury or loss of life.
 <b>Danger</b>	In extreme conditions, there is a possible result of serious injury or loss of life.

### Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.  
Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/ or tests to meet your specific requirements. Ensuring the initial performance and safety are the responsibility of the person who decides the compatibility of pneumatic system. Pneumatic systems should be constructed after full review on the details of the products other than specifications and possibilities of failures by checking the latest product information.
2. Only trained personnel should operate pneumatically operated machinery and equipment.  
Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.
3. Do not service machinery/ equipment or attempt to remove component until safety is confirmed.
  - a. Inspection and maintenance of machinery/ equipment should only be performed after confirmation of safe locked-out control positions.
  - b. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
  - c. Before machinery/ equipment is re-started, take measures to prevent shooting-out of cylinder piston rod etc.
4. Contact SMC and take necessary safety measures if the products are to be used in any of the following conditions:
  - a. Conditions and environments beyond the given specifications, or if products are used outdoors.
  - b. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
  - c. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

## Installation

### Warning

1. Operation manual

Do not install the products unless the safety instructions have been read and understood.

Keep this operation manual on file for future reference.

### Caution

1. Maintenance space

When installing the products, allow space for maintenance.

## Wiring

### Warning

1. Preparation for wiring

Shut off the power before wiring (including insertion and removal of connectors). Mount a protective cover on the terminal block after wiring.

2. Check the power

Make sure the power has sufficient capacity and voltages are within the specified range before wiring.

3. Grounding

Ground terminal block F.G. (Frame Ground). Do not ground it with devices generating strong electromagnetic noise.

4. Separation of signal line from power line

Avoid common or parallel wiring of signal and power lines to prevent malfunction due to noise.

5. Wiring check

Incorrect wiring may cause damage or malfunction of the products. Make sure the wiring is correct before operation.

6. Wiring arrangement and fixation

Avoid bending cables sharply at connector part or electrical entry in wiring arrangement.

Improper arrangement may cause disconnection which in turn causes malfunction. Fix cables close enough not to give excessive force to the connector.

## Operating and Storage Environments

### Warning

1. Environments to be avoided

Avoid using or storing the products in the following environments which may cause failures.

If the products need to be used or stored in those environments, take necessary measures.

a. Place where ambient temperature exceeds the range of 0°C to 50°C.

b. Place where ambient humidity exceeds the range of 35% to 85% RH.

- c. Place where condensation occurs due to sudden temperature change.
- d. Place where atmosphere containing corrosive gas, flammable gas or organic solvent.
- e. Place where atmosphere containing conductive powder such as dust and iron chips, oil mist, salt, or organic solvent, or splashing cutting chips, dust and cutting oil (water , liquid) over the products.
- f. Place where the products are exposed to direct sunlight or radiated heat.
- g. Place where strong electromagnetic noise is generated (place where strong electric field, strong magnetic field or surge is generated).
- h. Place where static electricity is discharged or condition that the products have electrostatic discharge.
- i. Place where strong high frequency is generated.
- j. Place where damages of thunder are expected.
- k. Place where vibration or impact is directly given to the products.
- l. Condition that the products are deformed by force or weight applied.

## Operation

### Warning

#### 1. Terminal block protective cover

Key operation should be done with the condition that the terminal block protective cover is mounted. If human body touches the terminal block accidentally, an electric shock may be a result.

#### 2. Prohibition of operation with wet hands

Do not perform key operation with wet hands, which may cause an electric shock and/ or failure of the products and other devices.

## Maintenance

### Caution

#### 1. Performing regular check

Check regularly that the products do not operate with failures unsolved. Check should be done by trained and experienced operators.

#### 2. Prohibition of disassembly and modification

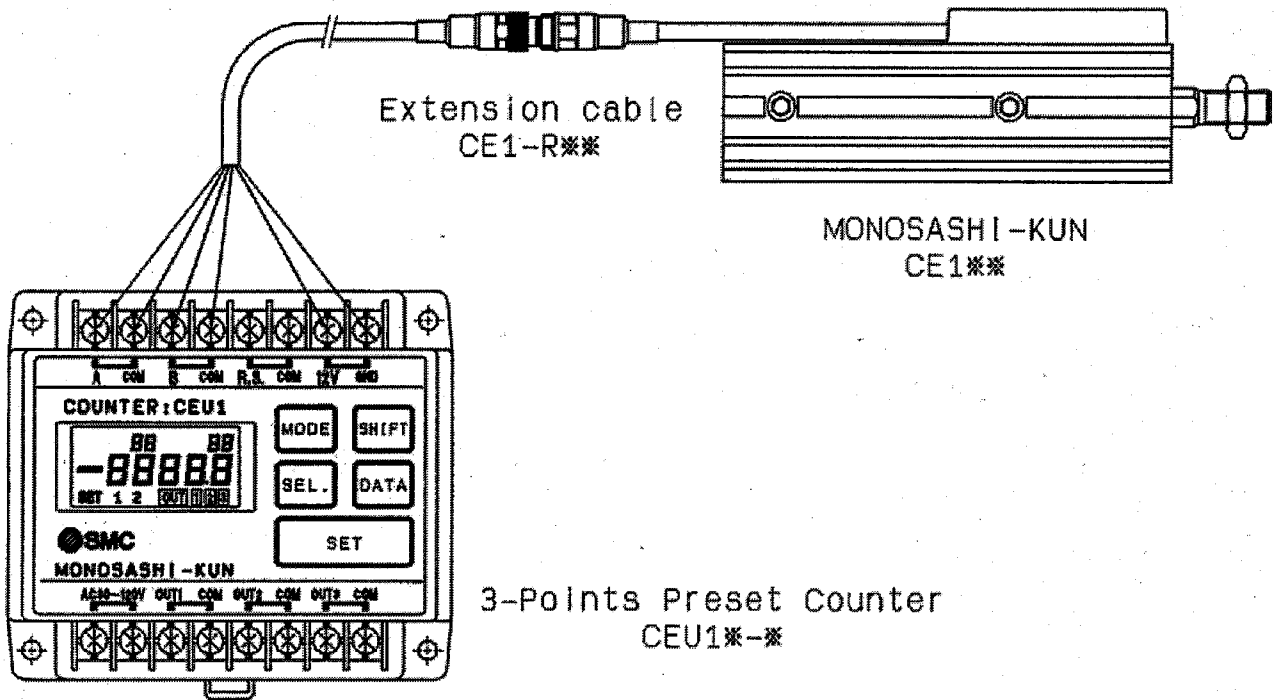
To prevent accidents such as failures and electric shocks, do not remove the cover to perform disassembly or modification. If the cover has to be removed, shut off the power before removal.

#### 3. Disposal

Request a special agent for handling industrial waste to dispose the products.

## Chapter 2 Product Summary

3-points preset counter (CEU1) is a product to indicate travel distance of cylinder by 0.1mm and used in connection with Monosashi-kun (scale cylinder) (CE1). It has 3 points independent preset function and produces preset output when its counted value and set preset value are consistent.



Color of wire core of Monosashi-kun	Description of counter terminal base
White	A
Blue	COM
Yellow	B
Brown	COM
Red	12V
Black	GND

Shield shall be FG (Frame Ground).

### Features of 3-points preset counter

- Mounting on DIN rail is available.
- Number of output point is 3.
- Fast response (follow up 2m/s at max. cylinder speed)
- Output mode selectable among 3 types (1-shot, Hold, Compare)
- Possible to specify tolerance (+/- ΔXmm)

## 2-1 How to order

Four variations of CEU1 are available for different functions.

**CEU1** ※ - ※

Model no.

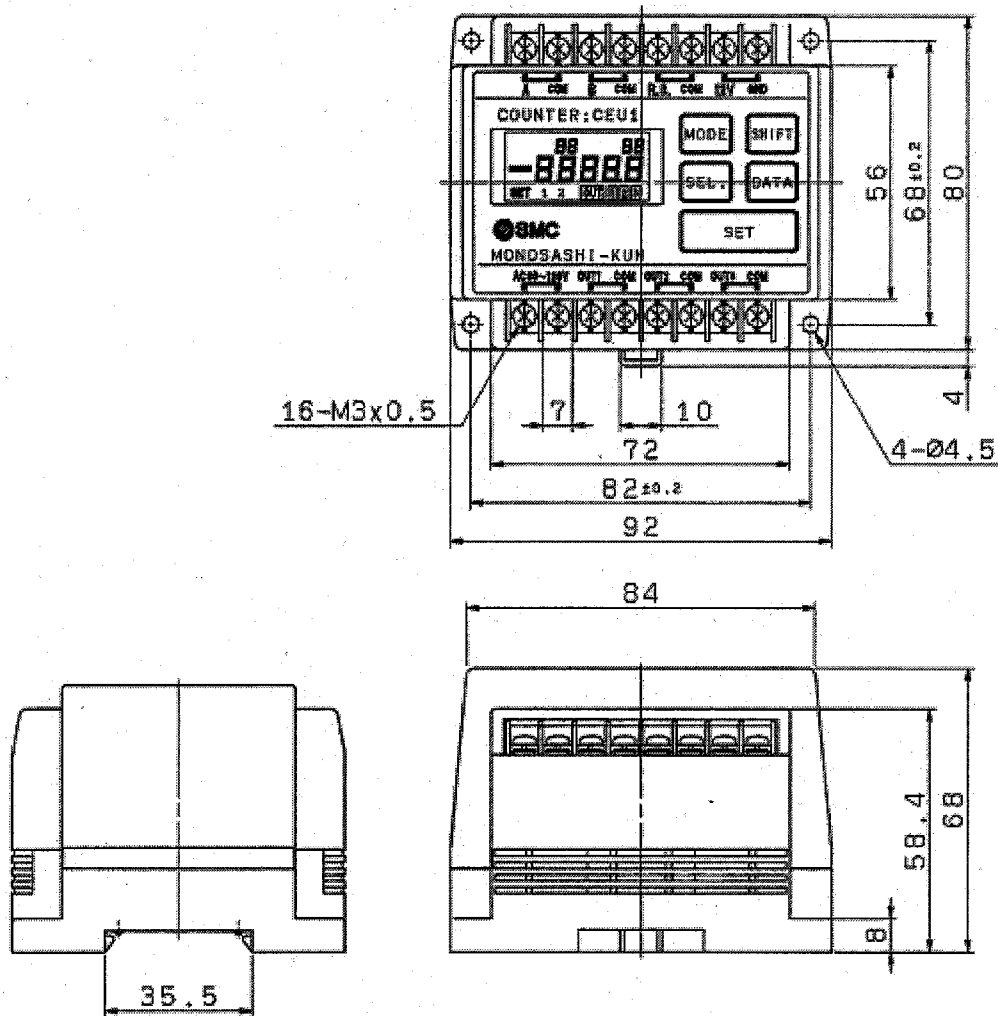
Counter driving power supply

N I L	AC80 to 120V
D	DC21.6 to 26.4V

Output method

N I L	NPN open collector output
P	PNP open collector output

## 2-2 Outline dimensions



## Chapter 3 Applicable Products and Extension Cable

### 3-1 Applicable products

C E 1 ※ ※ - ※ ※ ※ ※

B	Tap on both sides
L	Foot
F	Flange at rod side
G	Flange at head side
D	Double mount clevis

NIL	0.5m
L	3 m

NIL	With connector
Z	Without connector

12	φ 12
20	φ 20
32	φ 32
40	φ 40
50	φ 50
63	φ 63

NIL	With cushion on both sides
N	Without cushion
R	With cushion at rod side
H	With cushion at head side

Stroke Refer to Table 1)

\*) Applicable to φ 40 to 63.  
φ 12 to 32 are available  
with NIL(Without cushion  
at both sides)

Table 1

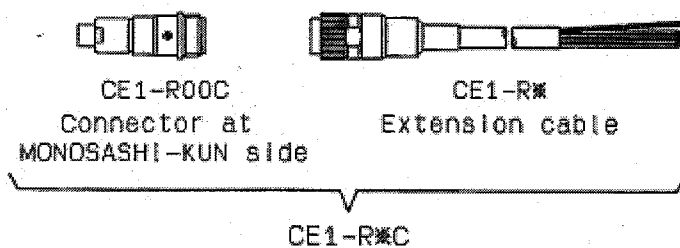
I.D. (mm)	Stroke (mm)											
	25	50	75	100	125	150	175	200	250	300	400	500
12	●	●	●	●	●	●						
20	●	●	●	●	●	●	●	●				
32		●	●	●	●	●	●	●	●	●		
40				●	●	●	●	●	●	●	●	●
50								●		●		●
63								●		●		●

### 3-2 Extension cable

C E 1 - R ※ ※

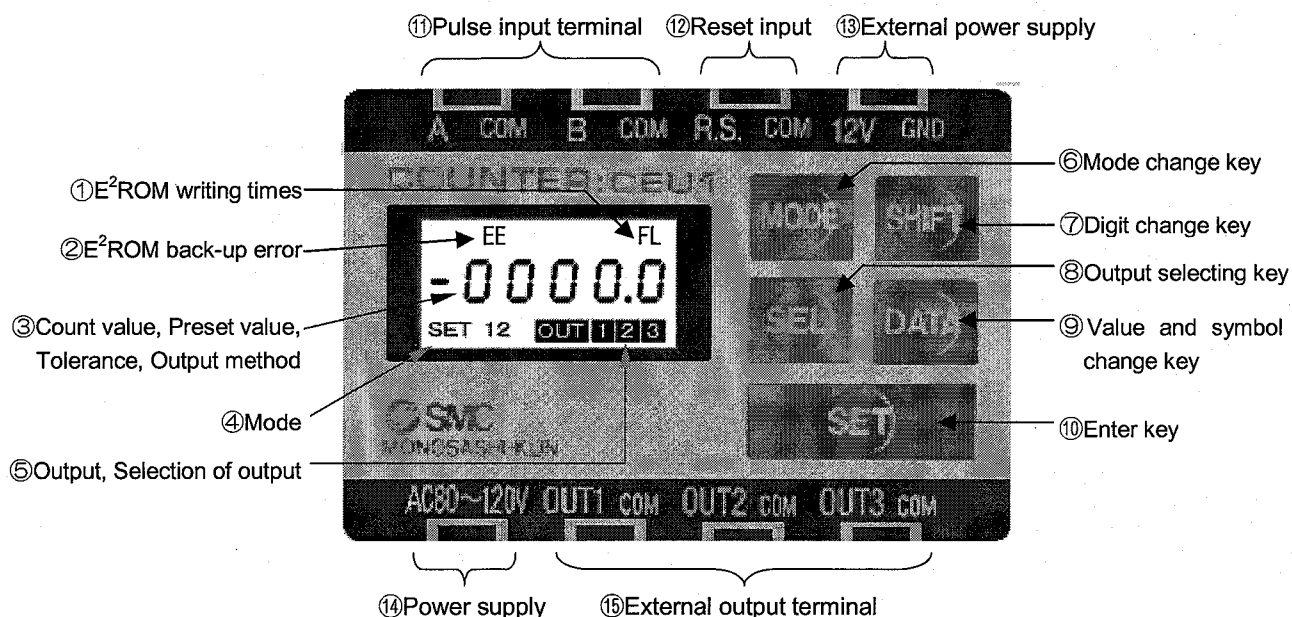
05	5m
10	10m
15	15m
20	20m

NIL	Extension cable
C	Extension cable + connector





## Chapter 4 Description of Each Part



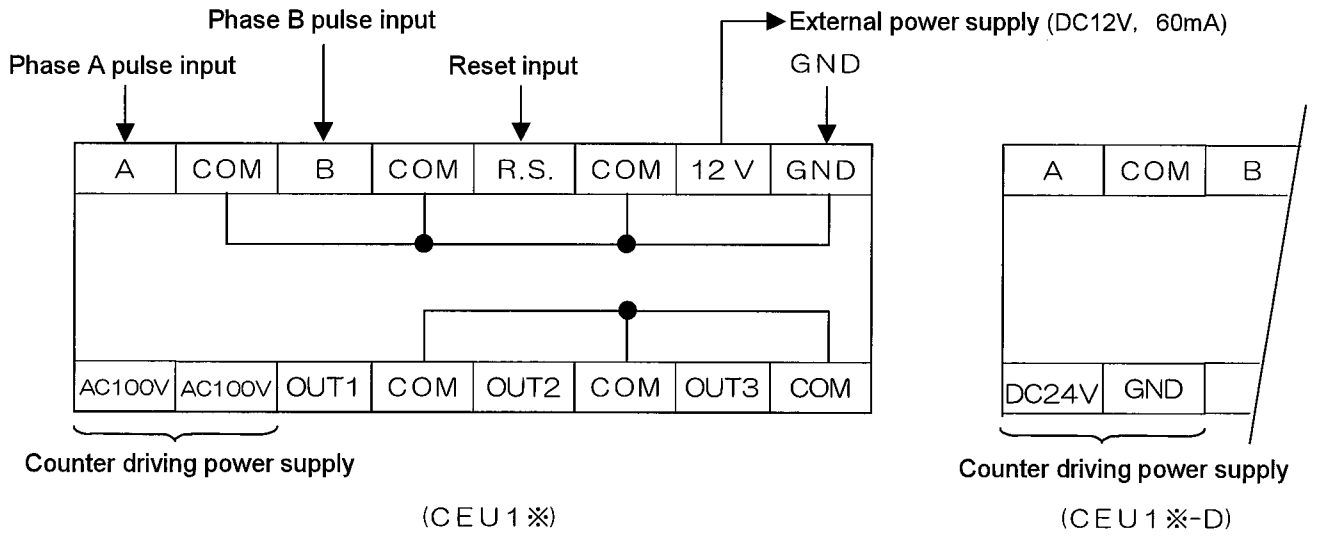
	No.	Summary
LCD indication	①	Indicates "FL" when E <sup>2</sup> ROM is written approx. 65,000 times.
	②	Indicates "EE" indicated when memorized content has an error.
	③	Counted value, preset value, tolerance, output type are indicated.
	④	Goes off in count mode and flashes or lights up in setting mode.
	⑤	Indicates number where output comes in count mode and output number to be set in setting mode.
Key	⑥	Switches between count mode and setting mode.
	⑦	Changes digit in setting mode.
	⑧	Changes among OUT1, OUT2 and OUT3 in setting mode.
	⑨	Changes number or symbol in setting mode.
	⑩	Enter set content in setting mode.
Terminal base	⑪	Connects pulse output from Monosashi-kun
	⑫	Clears indication and output.
	⑬	Power supply for Monosashi-kun (DC12V, 60mA)
	⑭	Power supply to drive counter. (AC80 to 120V or DC21.6 to 26.4V)
	⑮	Turns output on and off corresponding to set content.

## Chapter 5 Specifications

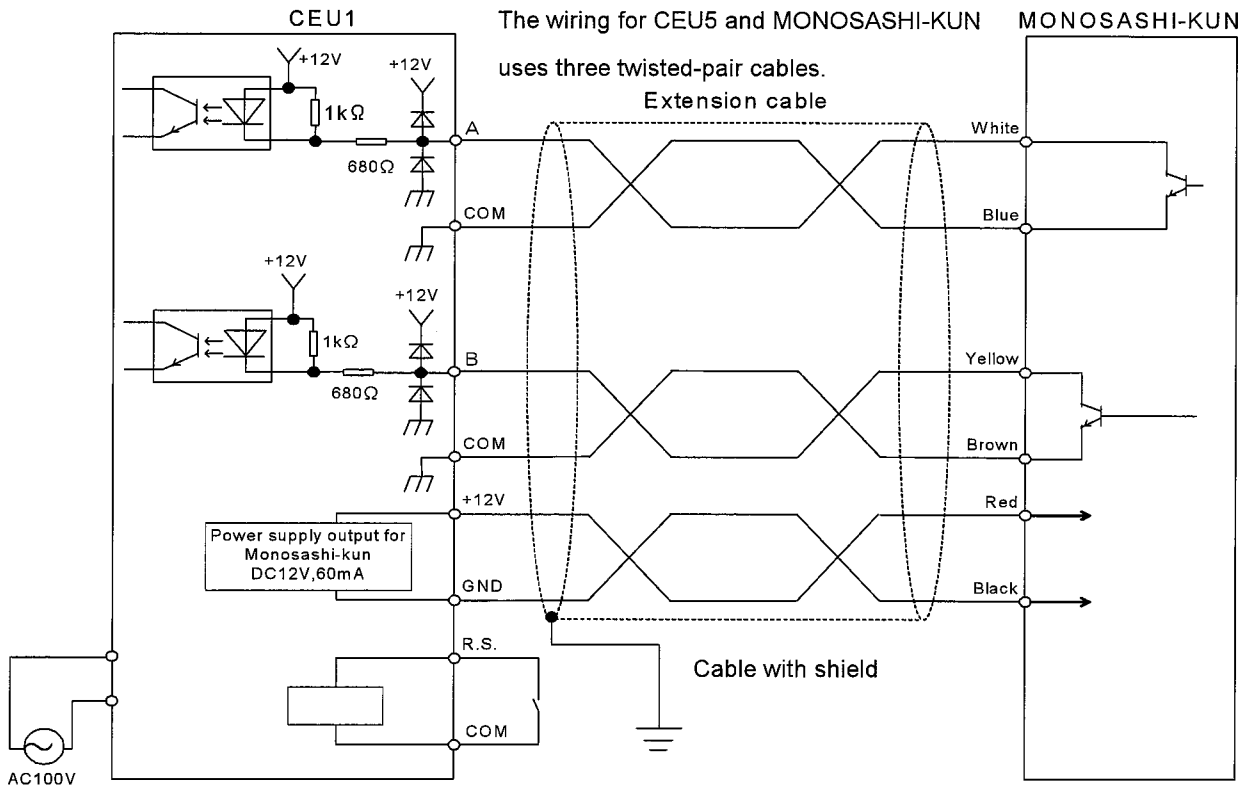
Model	CEU1	CEU1P	CEU1-D	CEU1P-D
Type	3-points preset counter			
Mounting	Surface mount (with DIN rail or set screws)			
Operation	Addition and subtraction			
Operating mode	Operation mode, Preset data setting mode			
Reset	External reset terminal			
Display	LCD (with back-light)			
Number of digits	5 digits (-9999.9 to 9999.9)			
Memory backup {media}	Preset data (hold all the time) { E <sup>2</sup> ROM (warning indication: FL when written over approx. 65,000 times) }			
Input signal	Count input, Reset input			
Count input	No-voltage pulse input			
Pulse signal input	90° phase difference input (A/B quadrature input)			
Counting speed	20kHz			
Reset input	Conduction between R.S. and COM terminal for 10ms or more (pulse input)			
Power supply for sensor	DC10.8 to 13.2V, 60mA			
Output signal	Preset output			
Preset output form	Compare, hold, one-shot (fixed at 100 ms)			
Output time lag	5ms or less			
Output transistor mode	NPN open collector Max DC30V 50mA	PNP open collector Max DC30V 50mA	NPN open collector Max DC30V 50mA	PNP open collector Max DC30V 50mA
Power supply voltage	AC80 to 120V, 50/60Hz		DC21.6 to 26.4V	
Power consumption	10VA or less		5W or less	
Withstand voltage	Between case and AC line: 1500 VAC, 1 minute Between case and signal ground: 500 VAC, 1 minute			
Insulation resistance	Between case and AC line: 500 VDC, 50MΩ or more			
Ambient temperature	0 to +50°C (Without freezing)			
Ambient humidity	35 to 85% RH (Without condensation)			
Noise resistance	Square wave noise by noise simulator (pulse width: 1 μs) Between power supply terminals: ±1500V, input/output line: ±600V			
Vibration resistance	Durable to 10 Hz to 55 Hz and amplitude of 0.75 mm in X, Y and Z directions for 2 hours each.			
Impact resistance	Durable to 10 G in X, Y and Z directions for three times each.			
Weight	Approx. 250 g			

# Chapter 6 Wiring

## 6-1 Terminal block arrangement



## 6-2 Connection with Monosashi-kun



### 6-3 Noise countermeasures

Follow the instructions below to prevent malfunction due to noise.

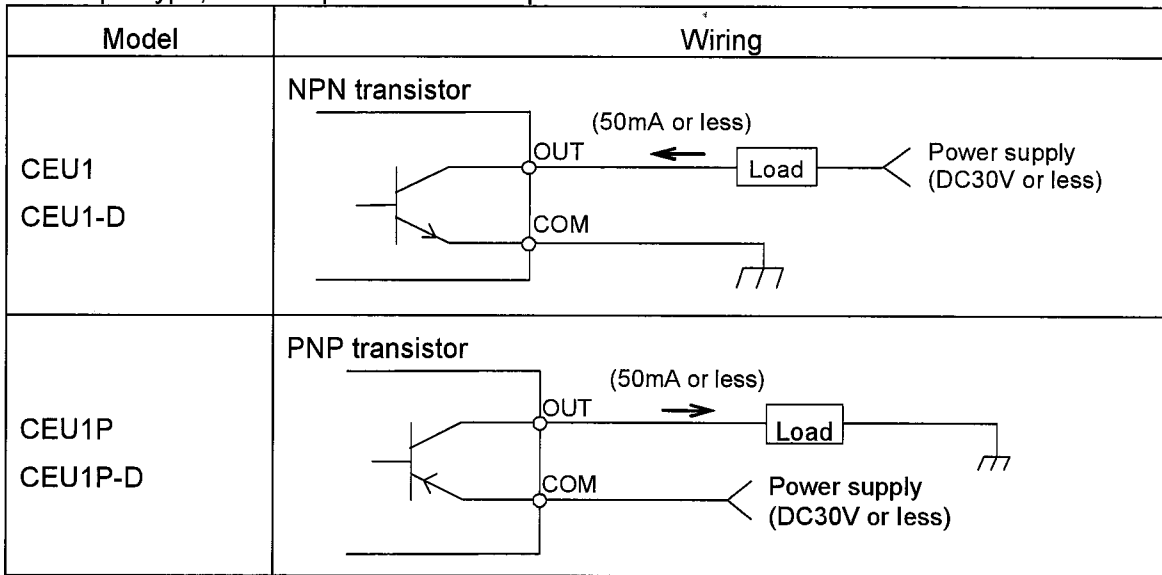
- (1) Use SMC extension cable CE1-R\*\* for wiring of Monosashi-kun and CEU1.
- (2) Use a shielded cable of 5 meters or less for wiring of control input signals, output signals.
- (3) Keep signal wires away from the power cables (motor, welding machine) in wiring.
- (4) When cables may cause radiation noise, mount a ferrite core on a signal cable.  
(Ex.: Kitagawa Industries, SFC-10).
- (5) Use another stable power source for CEU1 power supply, separate from motor and solenoid valve for AC type.
- (6) Mount a noise filter for possible noise effects of power source(100VAC).  
(Ex.:TDK,ZGB2203-01U).  
Mount a varistor between output terminals of power supply for Monosashi-kun.  
(Ex.: Panasonic, ERZV10D220).
- (7) Keep relays at least 10 cm away from CEU1 when they are installed.
- (8) Power supply voltage DC24V type of CU1 \*-D will conform to EMC directive (2004/108/EC).

Please use the power supply of the CE marking.

The power supply line length is within 10m.

## 6-4 Wiring of output part

Two output type, NPN output and PNP output are available.

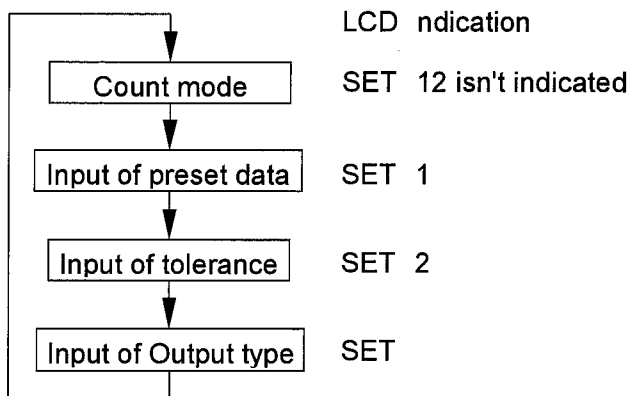


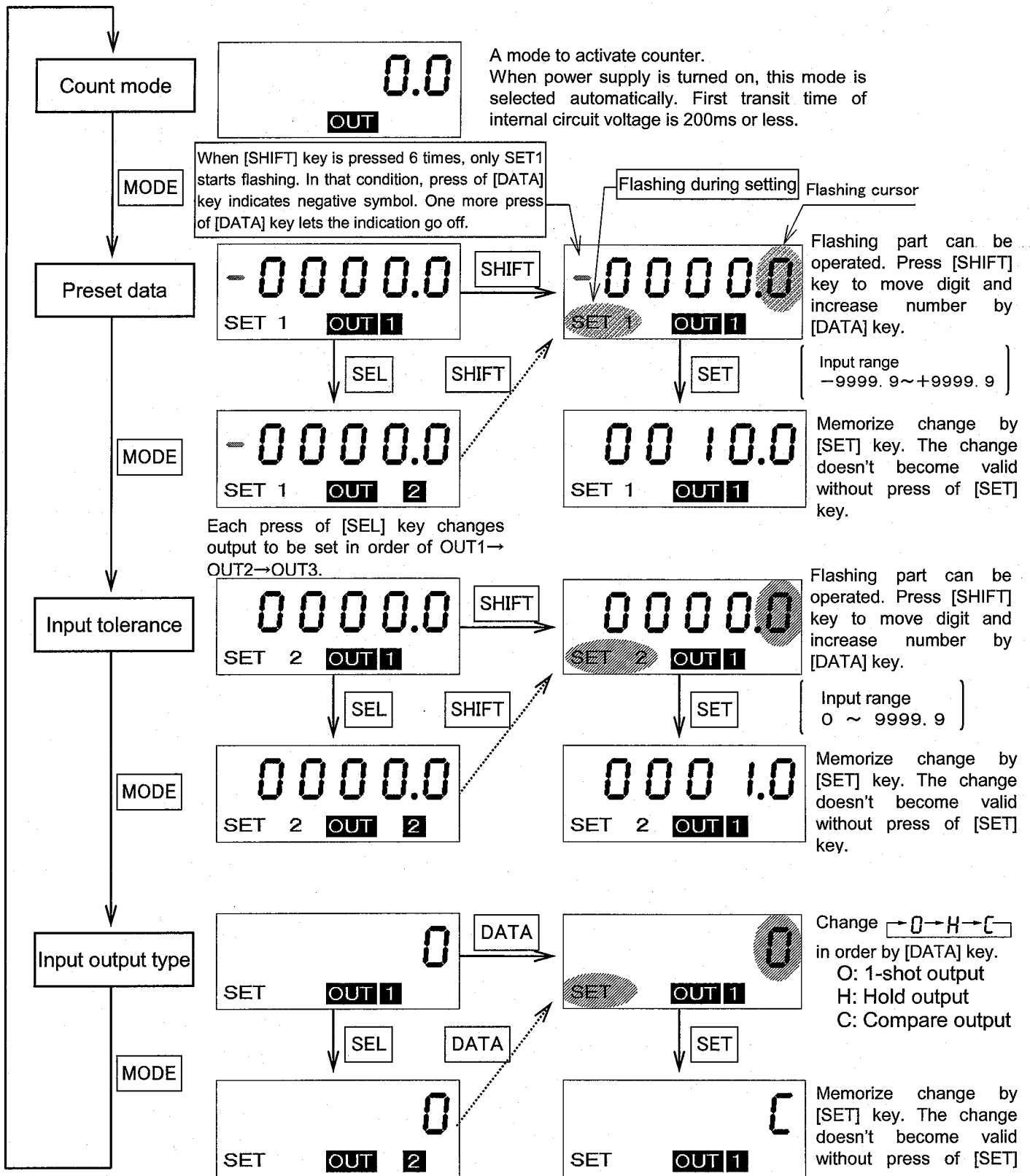
## Chapter 7 Operation

《Keys description and function》

Description	Function
MODE	Switches between count mode and setting mode.
SHIFT	Changes digit when preset data or tolerance is inputted. Flashing cursor is moved left per press.
SEL	Changes output terminal to be set in setting mode. Each press changes in order of OUT1, OUT2 and OUT3.
DATA	Changes number and symbol in setting mode. The number is increased one by one per press. The display of "-" is lit and turned off.
SET	Enter set content in setting mode. This key is pressed to enter set content when setting is changed. If [MODE] and [SEL] keys are pressed without pressing [SET] key to change the screen, the content is not entered.

The mode of counter is changed in the following order per press of [MODE] key.





- Each output terminal from 1 to 3 can be set individually.
- Tolerance is indicated with both of positive and negative in CEU1. (A function which enables different value for upper and lower limit respectively is provided only for CEU5.)

### Example of setting

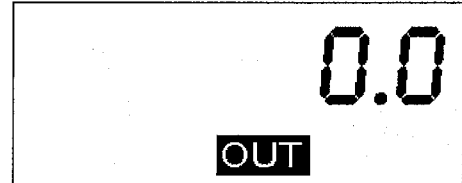
When counted value is in a range from 99.5 (mm) to 100.5 (mm), ON signal is obtained from external output terminal OUT2. (Transistor contact between OUT2 and COM terminals is ON.)

Preset data : 100.0 (Output terminal OUT 2)

Tolerance : 0.5 (Output terminal OUT2)

Output type : C (Compare output)

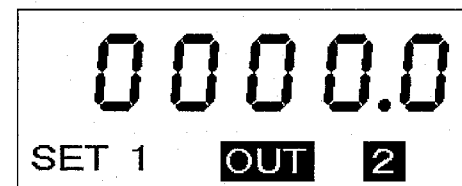
- ① Turn on power supply.  
The indication of count mode appears.



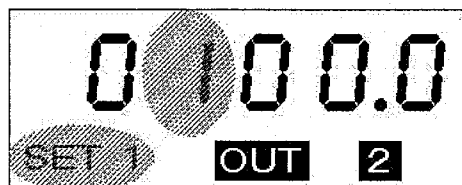
- ② Press [MODE] key once.  
The indication for preset data input appears.



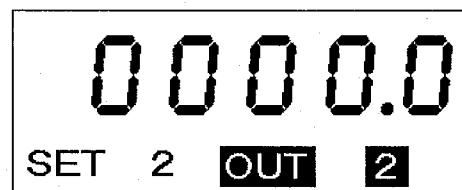
- ③ Press [SEL] key once.  
Output terminal indication is changed to OUT2.



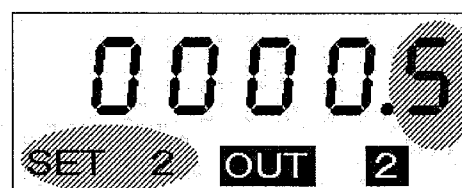
- ④ Press [SHIFT] key 4 times and select setting digit. Then, press [DATA] key once to indicate preset data 100.0.



- ⑤ Press [SET] key once.  
Set preset data is entered.



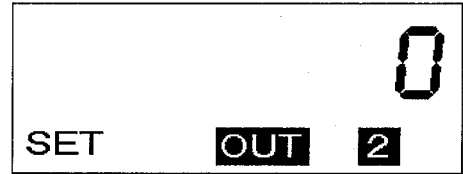
- ⑥ Press [MODE] key once.  
The indication for tolerance input appears.



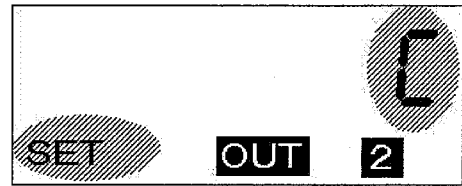
- ⑦ Press [SHIFT] key once and select setting digit. Then, press [DATA] key 5 times to indicate tolerance 0.5.

⑧ Press [SET] key once. Set tolerance is entered.

⑨ Press [MODE] key once. The indication for input of output type appears.

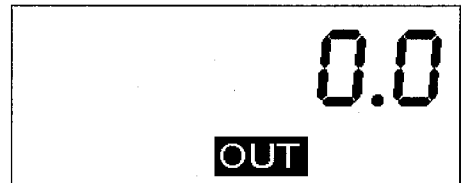


⑩ Press [DATA] key 3 times and select C (Compare output).



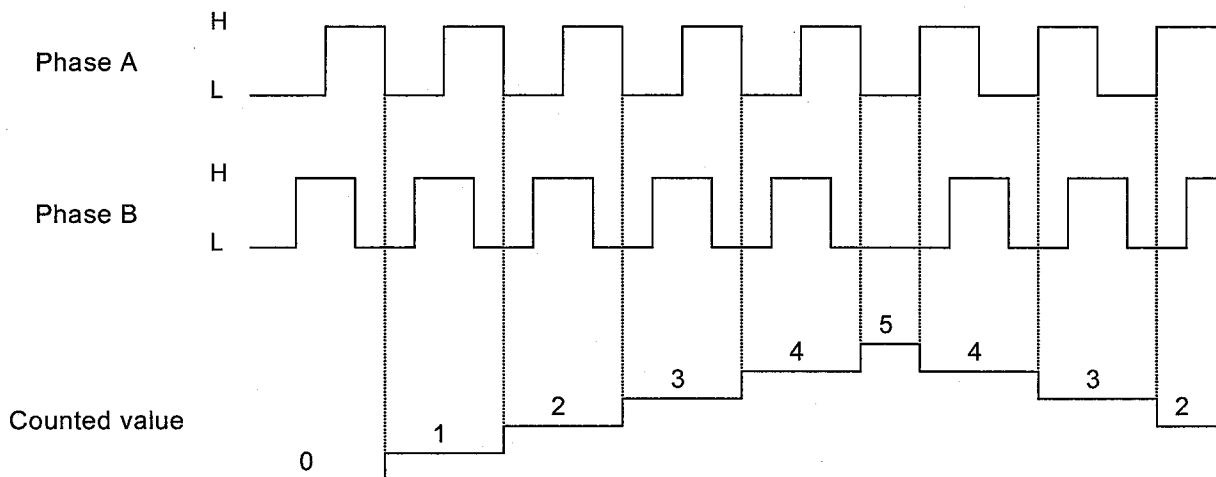
⑪ Press [SET] key once. Set output type is entered.

⑫ All settings are finished. Press [MODE] key once to return the indication to count mode.



## Chapter 8 Input and Output

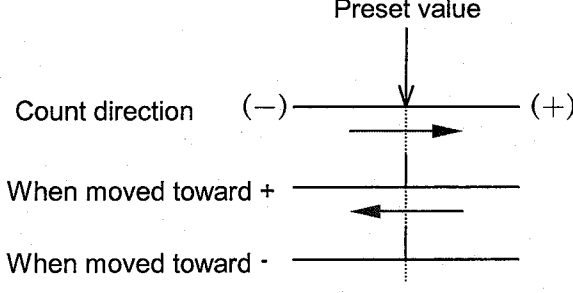
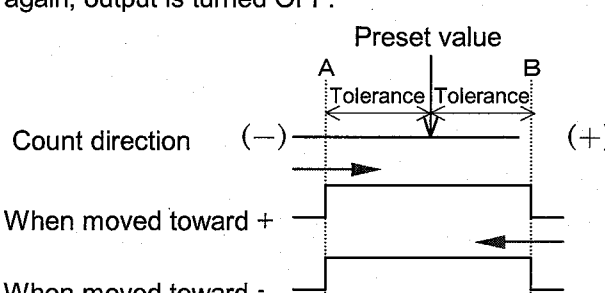
### 8-1 Input pulse and counted value



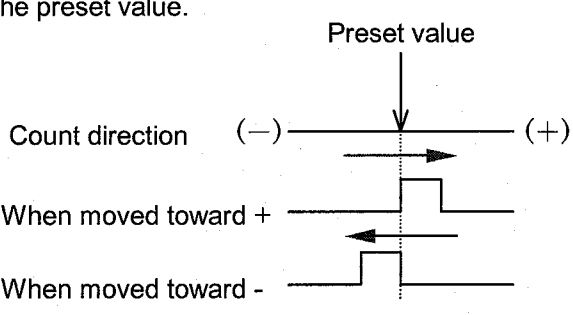
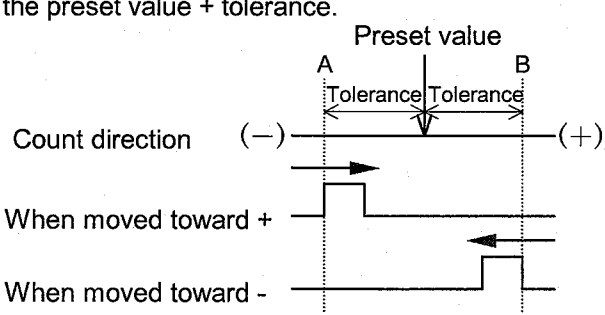


## 8-2 Operation of each output mode

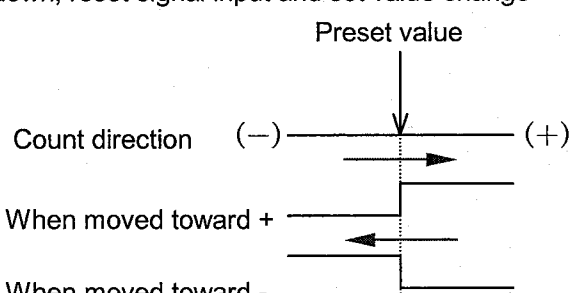
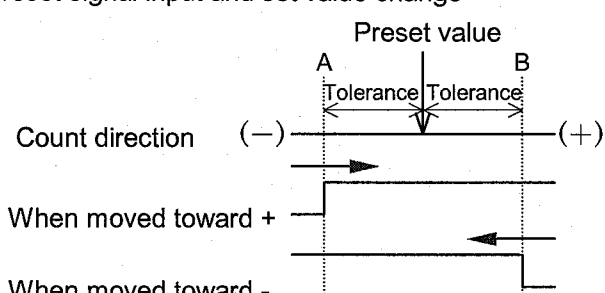
《Compare》 - LCD indication 「  」 -

Without tolerance	With tolerance
<p>When a count matches with the preset value, output is ON. When they are different, output is OFF</p>	<p>When a count is within the range of the preset value + tolerance, output is ON. When a count comes out of the setting range again, output is turned OFF.</p>
<p style="text-align: center;">Preset value</p> 	<p style="text-align: center;">Preset value</p> 

《1-Shot》 - LCD indication 「  」 -

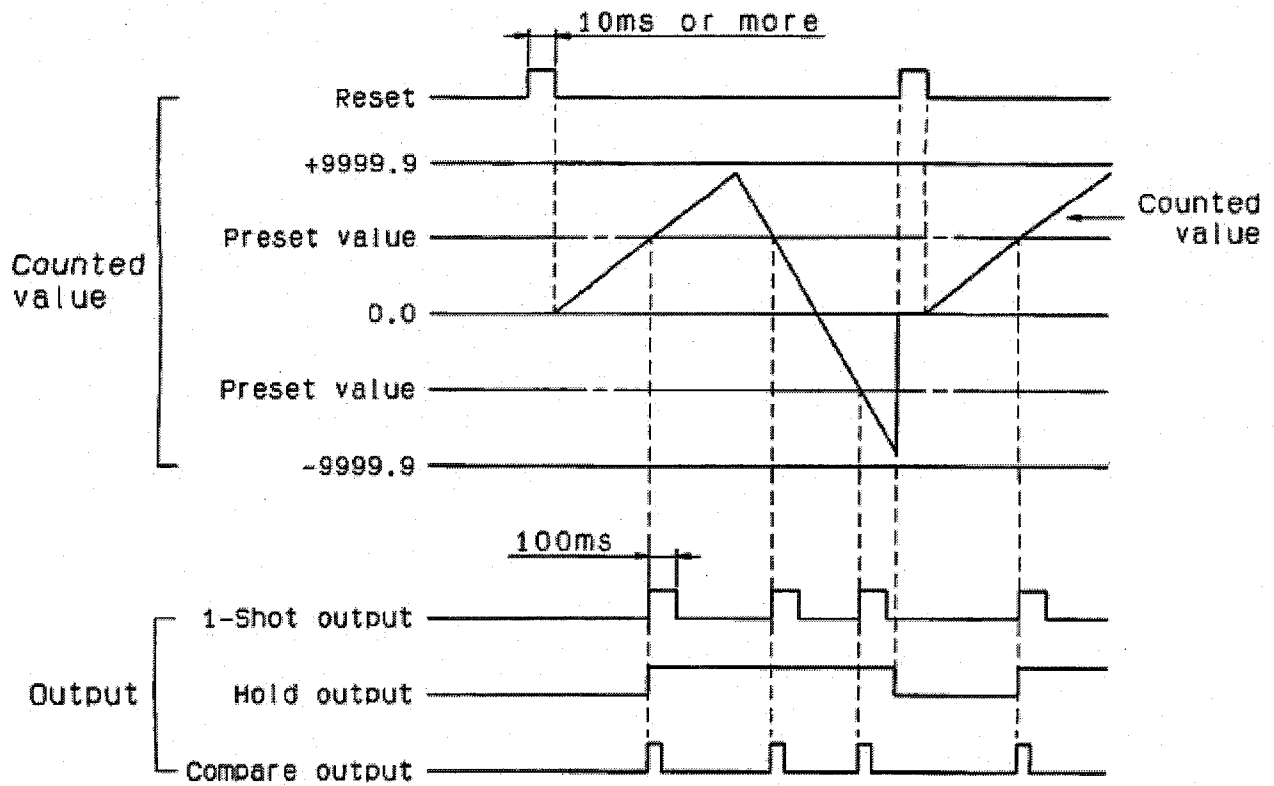
Without tolerance	With tolerance
<p>Output is ON for 100ms when a count crossed the preset value.</p>	<p>Output is ON for 100ms when a count crossed the preset value + tolerance.</p>
<p style="text-align: center;">Preset value</p> 	<p style="text-align: center;">Preset value</p> 

《Hold》 - LCD indication 「  」 -

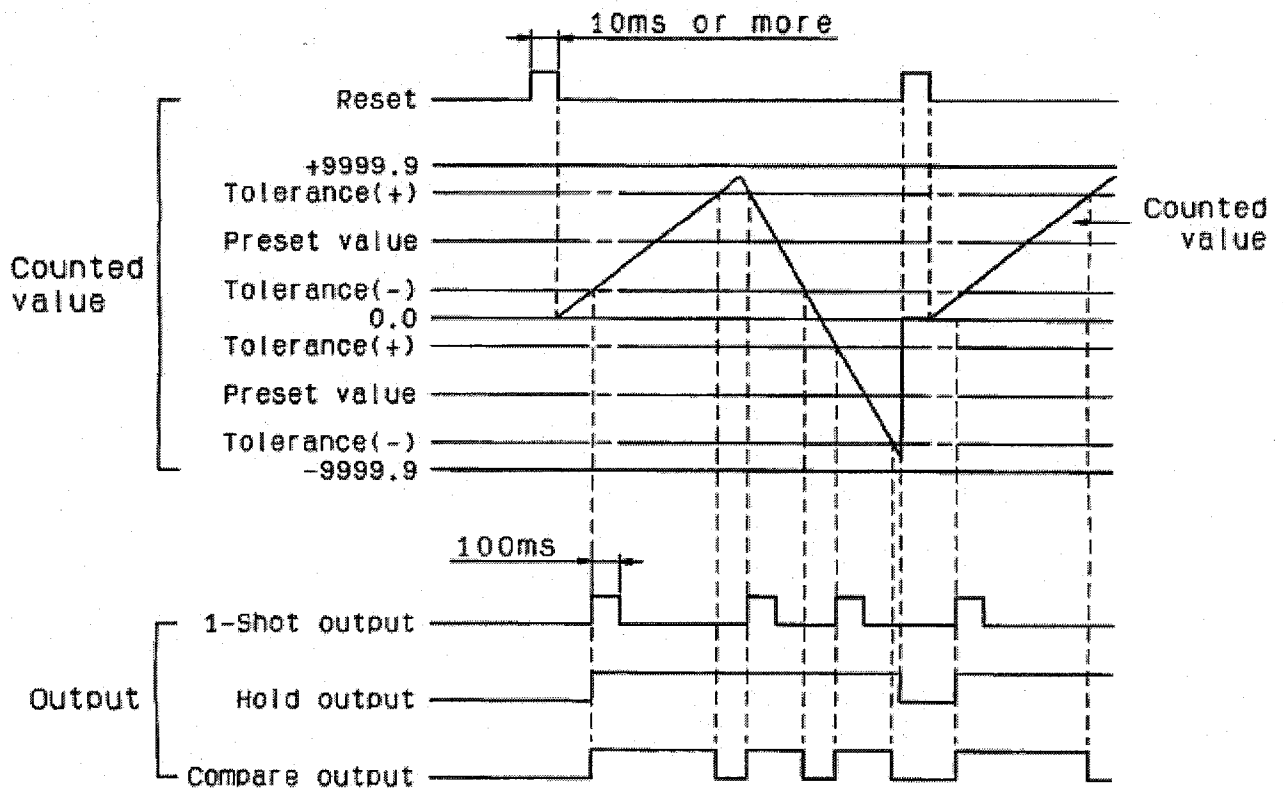
Without tolerance	With tolerance
<p>Output is ON when a count crossed the preset value and the ON state is maintained until output is released. Releasing output is done either in power shut down, reset signal input and set value change</p>	<p>Output is ON when a count crossed the preset value and the ON state is maintained even when a count becomes out of the setting range. Releasing output is done either in power shut down, reset signal input and set value change</p>
<p style="text-align: center;">Preset value</p> 	<p style="text-align: center;">Preset value</p> 

### 8-3 Output timing chart

#### 1. Without tolerance



#### 2. With tolerance



## Chapter 9 When the counter doesn't operate normally

### Troubleshooting

Failure	Cause	Countermeasure
Does not count	Is connection with Monosashi-kun performed properly?	Correct wiring with reference to section for wiring.
	Is count mode selected?	Press [MODE] key to change to count mode. (LCD indication "SET" will go off.)
Miscounting	Doesn't frequency of output signal from Monosashi-kun exceed counting speed?	Decrease frequency of output signal from Monosashi-kun by reducing speed etc.
	Is the line connected to Monosashi-kun separated from power line? (If not, noise influence is considered.)	Conjunction of line for Monosashi-kun with power line allows noise to apply. Separate them as much as possible.

## Chapter 10 Check Function

### 10-1 Self-check

Self-check starts automatically when power supply is turned on. If an error arises, take the following actions.

LCD indication	Check point	Content	Output condition	Remarks
	ROM	ROM has an error when power supply is turned on. At this time, CPU stops.	OFF	Replace ROM.
	RAM	RAM has an error when power supply is turned on. At this time, CPU stops.	OFF	Replace RAM.
	E <sup>2</sup> ROM	Set value memorized by E <sup>2</sup> ROM has some error when power supply is turned on.	OFF	Reset by press any key. Set value after reset is rewritten forcedly to default value*.
	E <sup>2</sup> ROM	Indicated when E <sup>2</sup> ROM is written over approx. 65,000 times.	No change	Replace E <sup>2</sup> ROM in short period. (When upper limit of writing is reached, set value can't be memorized.)

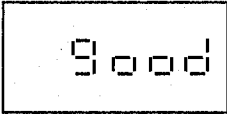

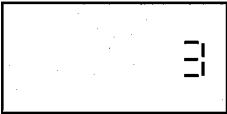
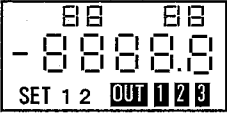
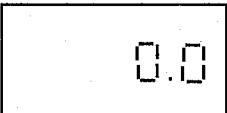

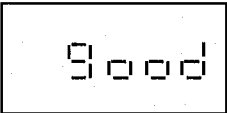
\* Preset value : 0. 0

Tolerance : 0. 0

Output mode : 1-Shot

## 10-2 Manual check

- 1) Manual check mode can be selected by pressing [MODE], [SHIFT] and [SEL] keys when power supply is turned on.
- 2) When manual check is selected, " " is indicated and flashes.
- 3) Select check no. by [DATA] key. Then, the item corresponding to selected no. is checked.
- 4) To return selecting screen of manual check, press [MODE] key.
- 5) To return count mode, input reset signal or turn off power supply and then turn it on again.

Check no	Check item	Content	LCD indication										
1	ROM	Normal " Good" Abnormal " Error"											
2	RAM	Normal " Good" Abnormal " Error"											
3	Key	Press of key other than [MODE] key indicates the code corresponding to pressed key on LCD. <table border="1" data-bbox="509 981 1145 1084"> <thead> <tr> <th>Key</th> <th>SHIFT</th> <th>SEL.</th> <th>DATA</th> <th>SET</th> </tr> </thead> <tbody> <tr> <td>Code</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> </tbody> </table>	Key	SHIFT	SEL.	DATA	SET	Code	1	2	3	4	
Key	SHIFT	SEL.	DATA	SET									
Code	1	2	3	4									
4	LDC	Each segment flashes in order with a certain time interval. Press of [SHIFT] key enables check of other LCDs.											
5	Count	Counts input pulse same as count mode.											
6	Output	Press of [SEL] key changes OUT number of LCD in order and turns on output simultaneously.											
7	E <sup>2</sup> ROM	Normal " Good" Abnormal " Error" When this check is performed, set value is automatically rewritten to default value.											

This operation manual is subject to change without prior announcement.