

KCX series

Electronic Counters

KCV

KCN-A

KCX

KCM

Category			Model number	Number of digits	Memory backup at power failure	Operation speed	Sensor power	Source voltage
Preset Counter	Single preset	Addition with I/O indicators	KCX-1	1		10cps/ 200cps	DC12V 50mA	AC90~132V AC180~264V 50/60Hz
			KCX-2	2				
			KCX-3	3		10cps/ 1kcps		
			KCX-4	4				
		Addition with numerical display	KCX-1D	1		10cps/ 200cps		
			KCX-2D	2				
			KCX-2DM	2	●	10cps/ 1kcps		
			KCX-3D	3				
			KCX-3DM	3	●			
			KCX-4D	4				
			KCX-4DM	4	●	10cps/ 5kcps		
			KCX-5D	5				
	KCX-5DM	5	●					
	KCX-6D	6						
	Addition and Subtraction	KCX-6DM	6	●	10cps/ 20kcps	DC24V 80mA	AC90~132V AC180~264V 50/60Hz	
		KCX-B4	4					
		KCX-B4M	4	●				
		KCX-B6	6					
	Dual preset (with numerical display)	Addition	KCX-B6M	6	●	10cps/ 2kcps	DC12V 50mA	AC90~132V AC180~264V 50/60Hz
			KCX-3W	3				
KCX-4W			4					
KCX-4WM			4	●				
KCX-5W			5					
KCX-6W			6					
Addition and Subtraction		KCX-6WM	6	●	10cps/ 20kcps	DC24V 80mA	AC90~132V AC180~264V 50/60Hz	
		KCX-B4W	4					
		KCX-B4WM	4	●				
		KCX-B6W	6					
		KCX-B6WM	6	●				
Total counter	Addition	KCX-4T	4	●	10cps/ 1Kcps	DC12V 50mA	AC90~132V AC180~264V 50/60Hz	
		KCX-6T	6	●	10cps/ 5Kcps			
		KCX-8T	8	●	10cps/ 10Kcps			
	Addition and Subtraction	KCX-B6T	6	●	10cps/ 20kcps			DC24V 80mA

Accessory: Metal fitting(bracket)

KCX-□, □M, □D, □DM

Single Preset Green Counters for Addition

Maximum Counting speed

1- or 2-digit: 10cps or 200cps
3- or 4-digit: 10cps or 1Kcps
5- or 6-digit: 10cps or 5Kcps

These counters feature an easy to read green LED screen to display one- to six-digit values, and operation modes and status. Advanced functions are also integrated, including dust insulation and power backup.

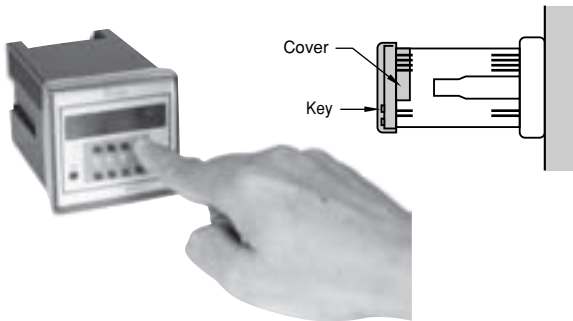
Merits

●Green LED for easy reading

Each model features a green LED display to facilitate reading. Numerical values are displayed with the height of 8 mm.

●Dust prevention cover

On all models, a protective cover is attached to the front panel. The keys and buttons can be operated through this cover.



●Minimum space requirement

In compliance with the DIN standard, all models are sized 72 mm (height)~72 mm (width)~103.5 mm (depth).

●Memory backup at power shutdown

Nickel cadmium battery is supported for minimum maintenance work. During power shutdown, current consumption is kept as low as several microamperes allowing memory backup for up to 2,000 hours. Power failure is detected by an integrated circuit to activate emergency I/O gates. Input status before shutdown is stored so the counter can resume operation upon recovery. Any pulse input is ignored during power shutdown.

●Built-in sensor power

A DC12V, 50 mA power source is included in all counters to allow direct connection to a proximity switch, photoelectric sensor or rotary encoder.

●Variable output duration

On the front panel, you can control the duration of One shot (Type A) output. Using a dial, the output time can be adjusted between 50 ms and 1,000 ms. You can extend it to 10 seconds by adding a capacitor.

KCX-6 Counter with I/O indicators

KCX-6D Counter with numerical display



●Type A and Type B output options

With a small change to the connection, the output mode can be switched between One shot and Hold.

●Six counter modes

Any of the six combinations can be selected as described on page 78.

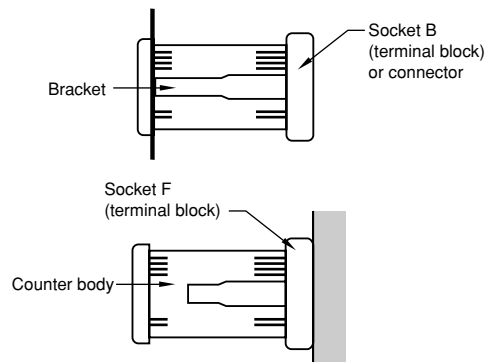
●Wide range of source voltage

You can choose source voltage of either AC90 to 132V, or AC180 to 264V.

●Option to disable count input

●Mounting

The counter can be mounted onto the wall surface in either way, wall surface mounting or flush mounting. Use mounting bracket for the flush mounting and use terminal block (socket F) for wall surface mounting.



Electronic Counters

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KCX-□,□M,□D,□DM

Specifications

Model number	I/O indicators	Standard	KCX-1	KCX-2	KCX-3	KCX-4	—	—		
	Numerical display	Standard backup memory	KCX-1D —	KCX-2D KCX-2DM	KCX-3D KCX-3DM	KCX-4D KCX-4DM	KCX-5D KCX-5DM	KCX-6D KCX-6DM		
Number of digits			1-digit	2-digit	3-digit	4-digit	5-digit	6-digit		
Operation	Type A: One shot output with auto reset Type B: Hold output									
Count input			Contact input	Static input	Contact input	Static input	Contact input	Static input		
	Maximum count speed		10cps	200cps	10cps	1kcps	10cps	5kcps		
	Minimum pulse width		50ms	2.5ms	50ms	0.5ms	50ms	0.1ms		
	Input resistance		6kΩ	12kΩ	6kΩ	12kΩ	6kΩ	12kΩ		
Input voltage	"L"0~2V/"H"6~30V									
External reset	Response time		On delay: 20ms Off delay: 4ms		On delay: 10ms Off delay: 2ms		On delay: 5ms Off delay: 1ms			
	Input resistance		6kΩ							
	Input voltage	"L"0~2V/"H"6~30V								
Auto reset	Response time		Max. 5ms		Max. 1ms		Max. 0.2ms			
Power-on reset*1	Power shutdown		Min. 0.2s							
	Reset duration		Min. 0.2s							
DC output*2	Output resistance		1.2kΩ (at no load voltage of 12V)							
	Output current		Source: 2.5mA Sink: 8.0mA							
	Withstand voltage		45V							
	Output duration		Type A: Variable Type B: Held							
Relay output	Capacity		AC250V 2A							
	Circuit		One transfer circuit							
	Output duration		Type A: Variable Type B: Held							
	Electrical durability		Min. 1,000,000 contacts at AC250V resistance load)							
	Mechanical durability		Min. 10,000,000 contacts							
I/O response*3			10cps	200cps	10cps	1kcps	10cps	5kcps		
	Voltage output		Approx. 10ms	Approx. 4ms	Approx. 10ms	Approx. 0.8ms	Approx. 10ms	Approx. 0.15ms		
	Contact output		Approx. 20ms	Approx. 14ms	Approx. 20ms	Approx. 10ms	Approx. 20ms	Approx. 10ms		
Memory backup at power shutdown (Only models with battery)	Time for charging*4		50hours							
	Backup duration		Approx. 2,000 hours at 25°C or 800 hours at 45°C							
	Response of emergency input gate*5		20~200ms (70ms typ)							
	Response of input gate upon recovery*6		50~500ms (120ms typ)							
Sensor power	DC+12V±2V 50mA Max. 10% (rms) ripple									
Withstand voltage	AC 2kV for one minute (For each of AC power, pin E and relay contact interconnections)									
Insulation resistance	DC 500V Min. 20MΩ									
Vibration resistance	(In compliance with JIC C0911) Durable for one hour along three axes at 10 to 55 Hz with 0.5mm amplitude No error for one hour along three axes at 10 to 55 Hz with 0.35mm amplitude									
Source voltage	AC 90~132V, or AC 180~264V (50/60Hz)									
Power consumption	With numerical display: Approx. 5VA With I/O indicators: Approx. 3VA									
Ambient temperature (during operation)	During power supply: 0~+40°C (-10~+50°C with no risk of destroyed battery) During memory backup: -10~+50°C									

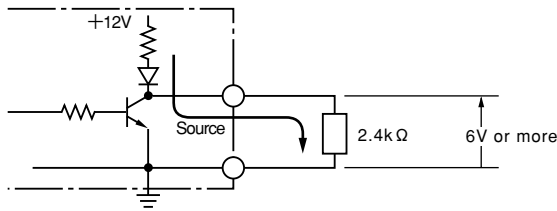
Storage temperature	With memory backup (included battery): $-20\sim+50^{\circ}\text{C}$ ($-20\sim+70^{\circ}\text{C}$ during transportation of less than one week) Without memory backup: $-20\sim+55^{\circ}\text{C}$
Ambient/Storage humidity	35~85%RH (with no dewing)
Noise resistance *7	1kV (square wave pulse with 1 μs width)
Weight	Approx. 0.5kg

Notes:

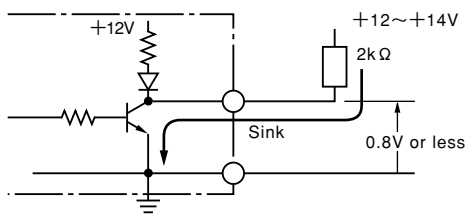
- * 1. Power-on reset is available on the KCX-1 to 6 and KCX-1D to 6D, the models without the memory backup option (battery). "Reset time" is the time required for the counter to restart counting after the power is turned on.
- * 2. DC output

When connected to 12V

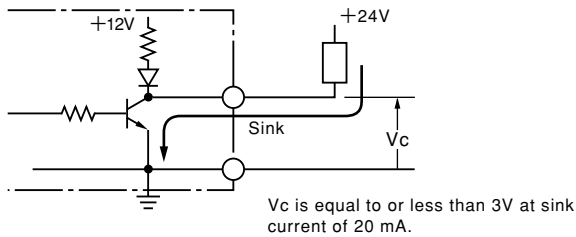
● Positive load



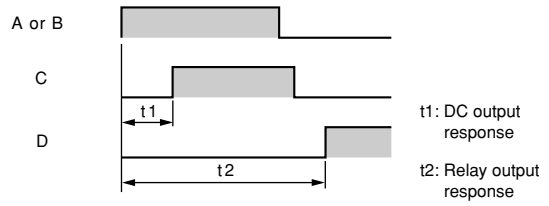
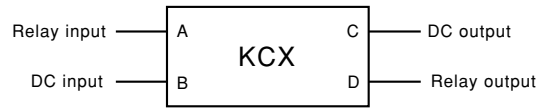
● Negative load



When connected to 24V



- * 3. Time required for the counter to generate signal after the last pulse is counted at the rising edge.



- * 4. Time required for the included battery to be fully charged.
- * 5. Time for an internal circuit to disable pulse input and reset input after it detects power failure. Until this time, these signal inputs remain active.
- * 6. Time for an internal circuit to enable pulse input and reset input after it detects power recovery.
- * 7. Noise tests also include static discharge, induced load switching, electromagnetic switch oscillation and other tests defined by KOYO.

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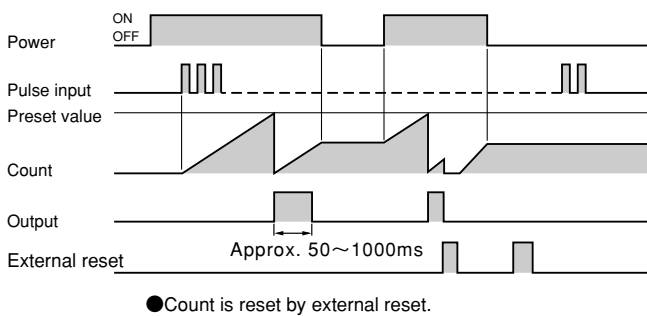
KCM

Output modes

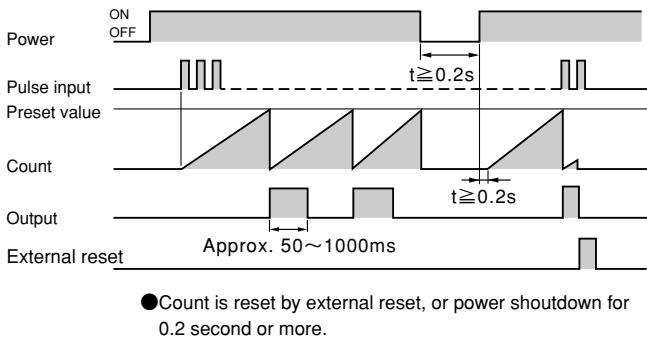
Type A (One shot) output

- The counter generates a signal upon countup, or when the number of input pulses has reached the preset value.
- Using a dial, the output duration can be adjusted between 50ms and 1,000ms.
- Upon countup, both the count and signal output are automatically reset.
- Count is reset to zero when the external reset terminal is activated.

With memory backup



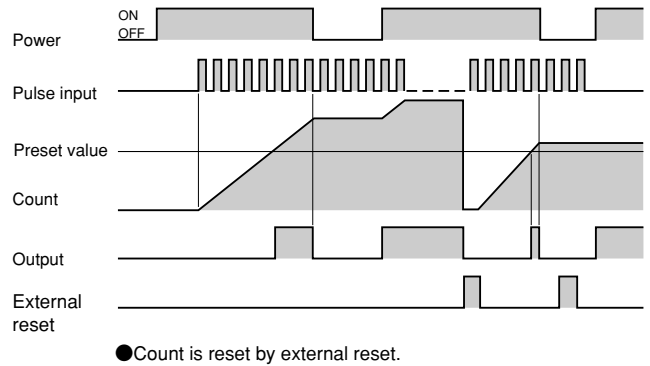
Standard models



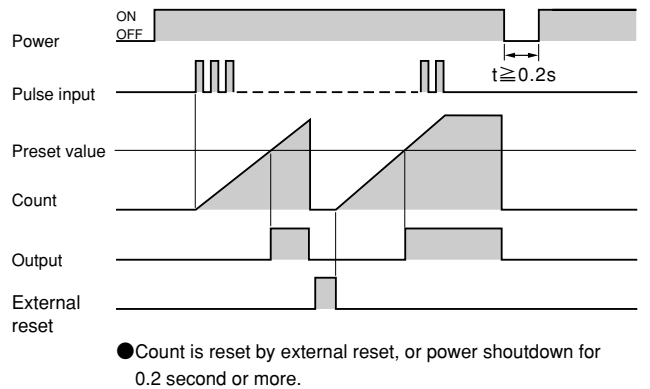
Type B (Hold) output

- The counter generates and holds a signal upon countup, or when the number of input pulses has reached the preset value.
- On the counters with numerical displays, the terminals ④, ⑤ and ⑥ can be connected. In this case, the count is not reset upon countup, but continues to be incremented for each pulse input.
- When the terminal ④ and ⑤ are connected, the count is upon countup. (See "Switching between Type A and Type B" below.)

With memory backup

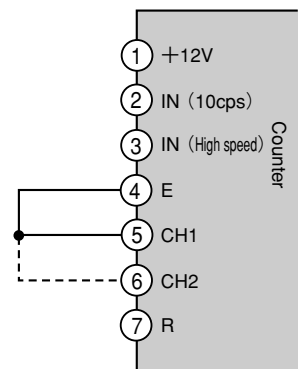


Standard models



Switching between Type A and Type B

Connect terminals ④ and ⑤ to select the Type B operation. The count is reset upon countup. If the terminals ④, ⑤ and ⑥ are connected, the count is not reset upon countup. It continues to be incremented for each pulse input.



Type B operation

Terminal Assignment

●With I/O indicators

Terminal number	Name	Description
1	+12V	Sensor power output
2	IN(10cps)	Count input
3	IN	High speed count input*1
4	E	Grounding *2(capacitor ⊖)
5	CH	One shot output/Hold switch (capacitor ⊕)
6	—	Not connected
7	R	External reset input
8	OUT	DC output
9	COM.	Relay output
10	N.O.	
11	N.C.	
12	AC180~264V	AC power input
13	AC90~132V	
14	AC0V	

●With numerical display

Terminal number	Name	Description
1	+12V	Sensor power output
2	IN(10cps)	Count input
3	IN	High speed count input * 1
4	E	Grounding *2(capacitor ⊖)
5	CH1	One shot output/Hold switch (capacitor ⊕)
6	CH2	Auto reset/Not auto reset switch
7	R	External reset input
8	OUT	DC output
9	COM.	Relay output
10	N.O.	
11	N.C.	
12	AC180~264V	AC power input
13	AC90~132V	
14	AC0V	

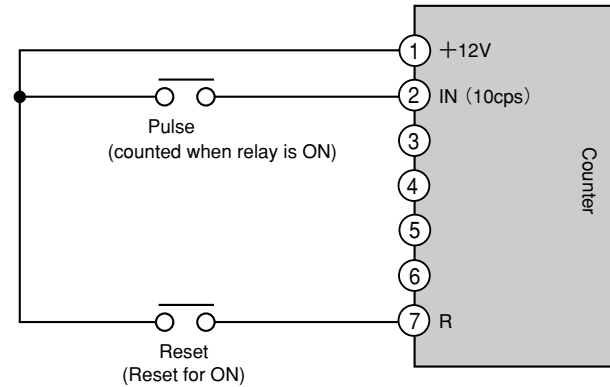
*1. See Specifications.

*2. Capacitor for output time extension

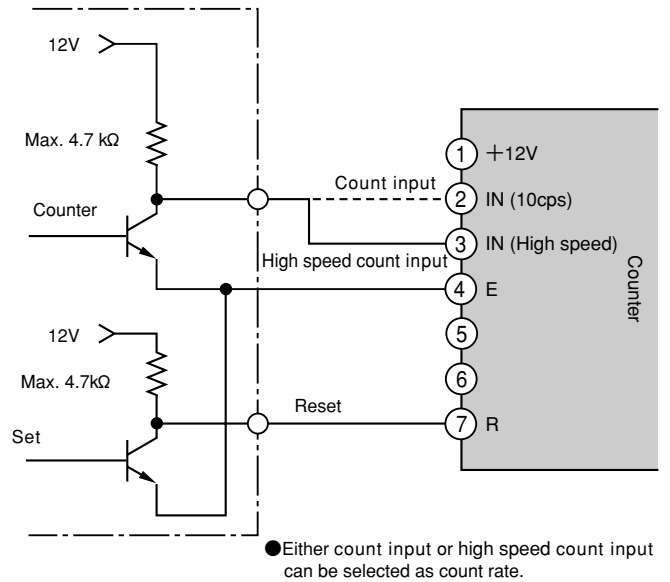
Wiring Diagrams

■Pulse input

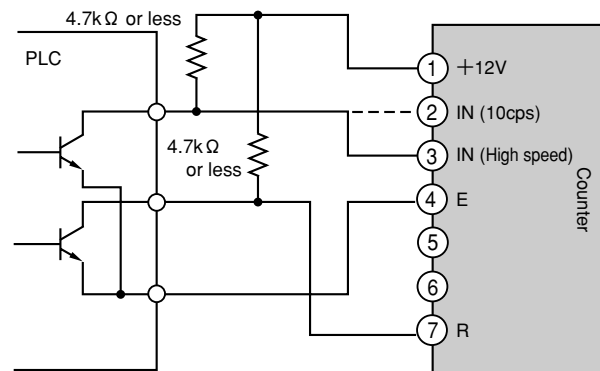
1. Relay input



2. DC input

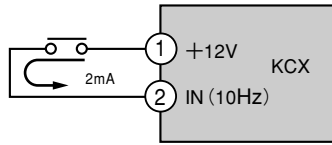


3. Connection to open collector output

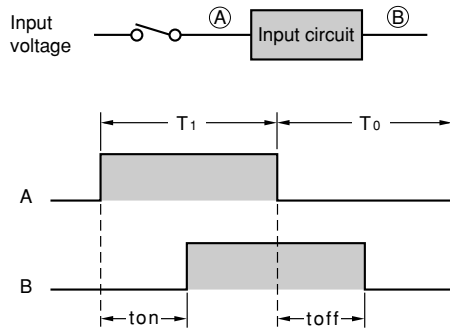


Notes on relay input

(1) On the circuit shown on the right, the input current to the relay is less than 2mA. Use a reliable relay that responds to such small current. Do not use an electromagnetic switch contact designed for large current and voltage.



(2) The following table lists the standard responses of Terminal ② at the pulse rate of 10 cps:

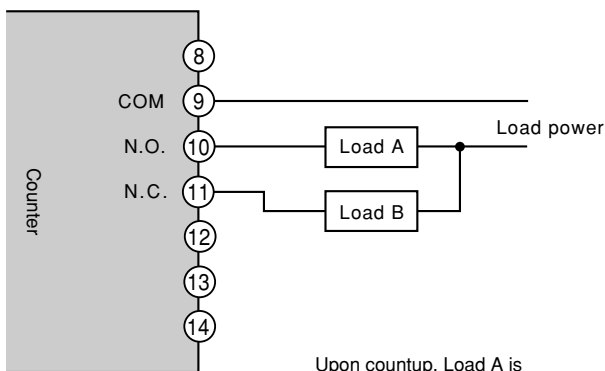


Input voltage	On delay (ton)	Off delay (toff)
6V	16ms	4ms
12V	8ms	8ms
30V	3ms	23ms

These are the standard values. T1 and T0 should be at least three times longer than ton and toff. For example, when using the DC12V sensor power, T1 and T0 should be 24ms or more.

Output Connection

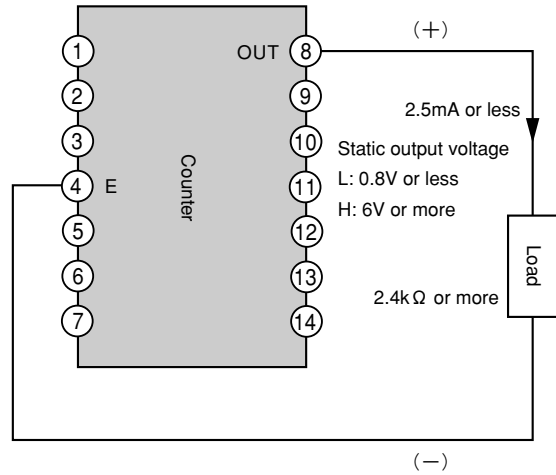
1. Relay output



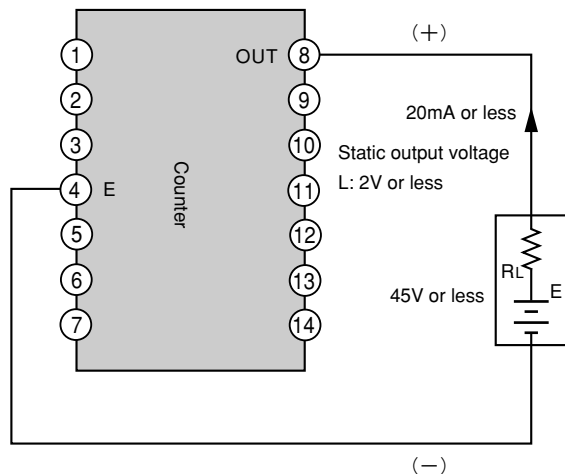
Upon countup, Load A is activated and Load B is deactivated.

2. DC output

● Source load



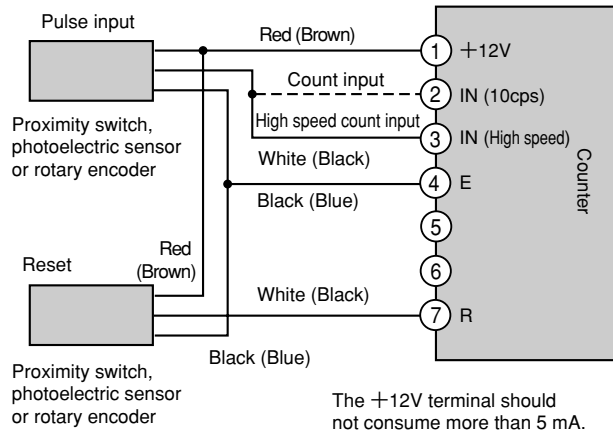
● Sink load



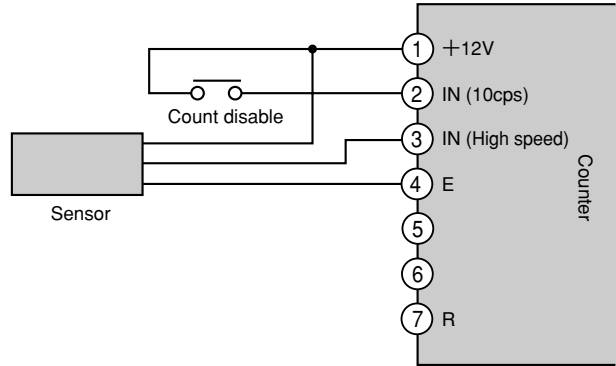
Electric current flows into the circuit when the output voltage falls to "L" level. Contrary to the open collector, the output rises to "H" level upon countup.

Connection Examples

Direct connection to a sensor



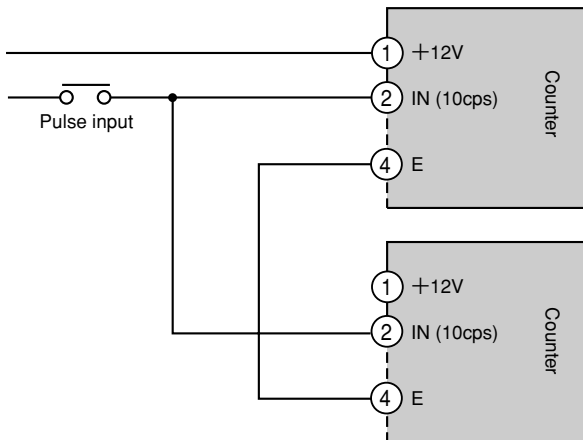
Count disable using a free terminal



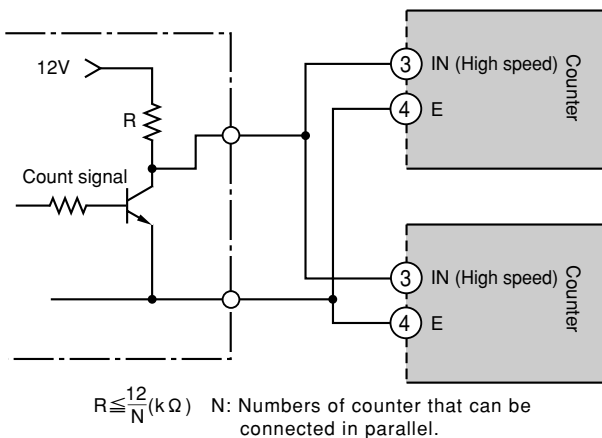
Pulse count is disabled when the contact is closed to force input to the terminal ②. However, the count increments by 1 when the sensor (terminal ③) output is at "L" level.

Parallel Counters

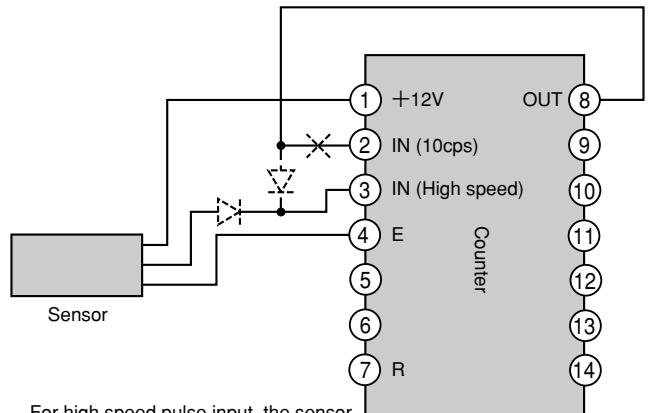
1. Relay input



2. DC input

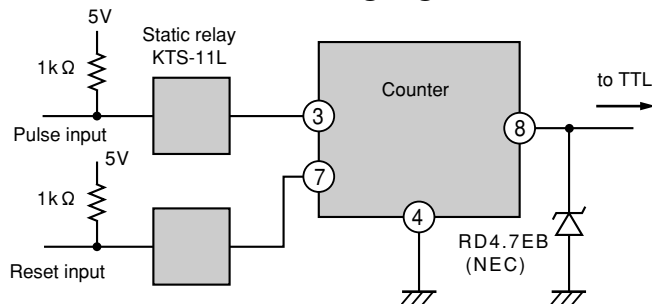


Count disable during signal output



For high speed pulse input, the sensor should be connected as shown by the dashed lines. Use Hitachi diodes IS2076 or equivalent.

Connection to TTL logic gate



Pull-in current is 4mA on the KCX counter side (0.4V residual voltage).

List of Counter Modes One of the following six combinations can be selected for the numerical display counters.

	Output		Upon countup		Count disable	Timing chart	Connection
	Held	One shot	Reset	Not reset			
		●	●			Type A operation 	
	●			●		Type B Operation 	④-⑤-⑥
	●		●				④-⑤
		●	●		●		②-⑧* or ③-⑧
	●			●	●		②-⑧* or ③-⑧ ④-⑤-⑥
	●		●		●		②-⑧* or ③-⑧ ④-⑤

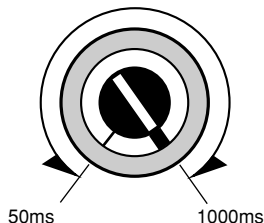
*When Terminal ⑧ is connected to Terminal ②, the time for the count disable to be activated is the same as the response time of Terminal ②.

For optimum performance(KCX-□,□M,□D,□DM/□W,□WM/□T/B/B6T)

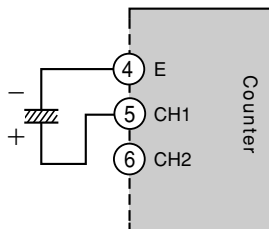
■ Changing the duration of Type A output

In the One shot mode, output duration can be changed from 50ms to 1,000ms. For adjustment, use the dial on the front panel. (On the KCX-□W and KCX-□WM counters, the dial is located on the rear panel.)

Turn the dial counterclockwise or clockwise to decrease or increase the duration. Turn it fully to either direction to select the minimum or maximum time.



On the KCX single preset counters, you can extend the output time by adding a capacitor between the terminals ④ and ⑤.



Electrolytic capacitor	Output duration	
	Minimum	Maximum
None	50ms	~ 1s
2.2 μ F 16V	100ms	~ 2s
4.7 μ F 16V	150ms	~ 3s
10 μ F 16V	250ms	~ 5s
22 μ F 16V	500ms	~ 10s

■ Memory backup at power shutdown

In some counters, a second battery is integrated to backup the count memory upon power shutdown. The battery can be fully charged in 50 hours. With only one hour charging, it can supply power for 40 hours, or 100 hours on the KCX-□WM and KCX-□T models.

Notes on memory backup

1. When power is shut down, the count display is cleared, and the sensor power drops to 0 V.
2. During Type B (Hold mode) operation, DC output also drops to 0V resulting in random signal. Upon the recovery of power, the signal output returns to the status before the power shutdown.
3. If the power is turned off during pulse input, the counter uses the battery to continue correct count.
4. You cannot reset the count by shutting power down.
5. During power shutdown, the count is not reset by any external reset signal.

6. In the following cases, 100 hours are required for charging the battery:

- When the counter is used for the first time
- When the battery is unused for a long time

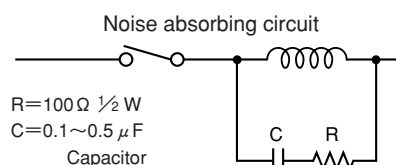
7. Service life of battery

When fully charged, the battery should be able to support memory for 2,000 hours (5,000 hours on the KCX-□WM and KCX-□T models). It should be replaced when this period is reduced to 50%. Normally, the battery can be used for five years. It can serve longer if the ambient temperature is kept at 5 to 30°C.

■ Protection against noise

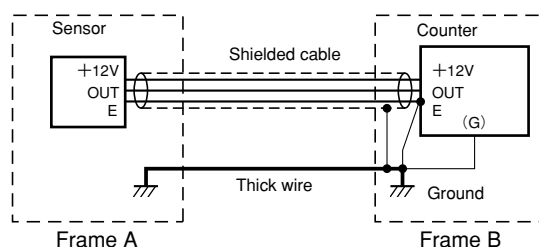
All of the KOYO electronic counters are tested for noise resistance. In addition to the standard tests, we perform special inspections to assure reliable performance. Use the following procedures for additional enhancement:

1. When you use a solenoid valve, clutch or brake near the counter, connect a surge absorbing circuit in parallel with its drive coil. This circuit should consist of a capacitor serially connected with a resistance of 100 Ω (1/2W). Use an oil-impregnated capacitor or an MP capacitor of 0.1 to 0.5 μ F.



2. In a noisy area, do not share the power line with a device that uses large electric current. Always shield the I/O signal cables, and connect the shielded cables between the sensor and the counter.

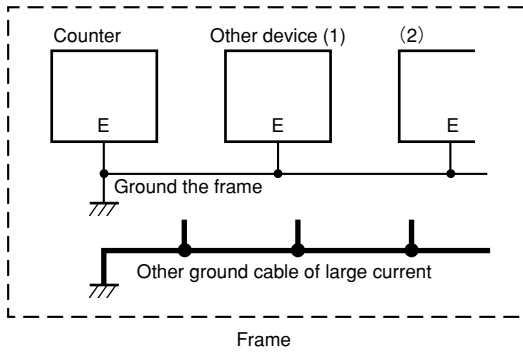
If they are installed on separate frames, use a thick wire of at least 0.5mm² to connect the frames.



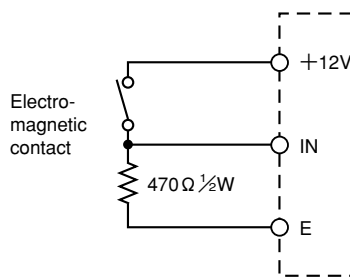
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3. Keep the minimum distance between Terminal E and the frames.

If you use a common ground for the counter and other devices, connect the ground cable to the counter frame. Use a thick and short ground cable, and isolate it from any other cable that grounds a large current.



4. Use a resistor of $470\ \Omega$ ($1/2W$) if you add an electromagnetic relay to the slow pulse count terminal. Insert the resistor between the input terminal and the ground cable. This prevents incomplete contact, and helps improve reliability.



Changing the preset value

During operation, a change to the preset value may cause the counter to generate a false signal. Before you make a change, always turn the power off, or reset the counter. Otherwise, the counter generates no signal upon countup, or erroneously generates a signal before or after the count has reached the new value.

Presetting to zero

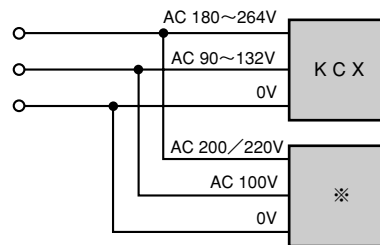
The counter may be preset to zero (for example, to "000" on a 3-digit counter). This may cause the counter to act as follows:

- It may generate a signal unless the input pulse is at "L" level and the reset signal is at "H" level.
- In the Type B mode, the counter may display 0,1,2,3 if a sequence of pulse signals are entered while the reset signal is at "L" level.

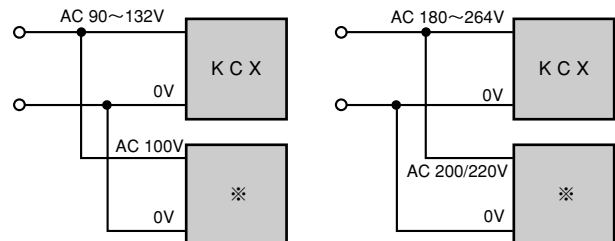
Connecting the power

On the KCX Series counters, the power transformer is set to 110V or 220V. Avoid the following connection:

Wrong



Correct

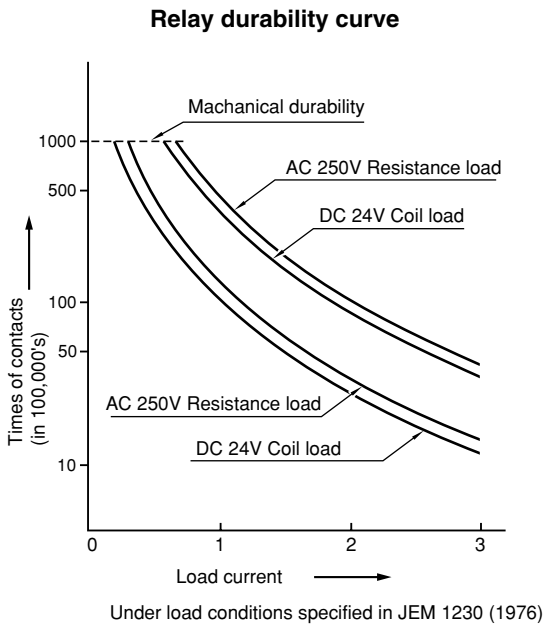


※Other counters

Cautions

●Output relay contact

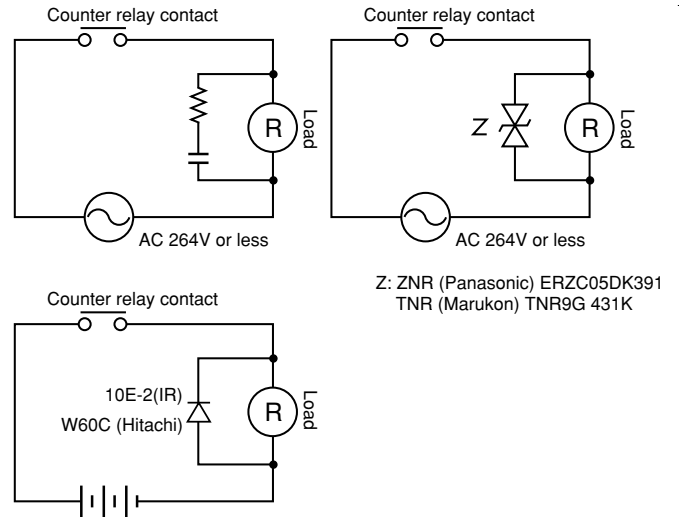
The counter can be connected to an induced load. It may be an electromagnetic switch, control relay, AC solenoid or electromagnetic valve. The counter contains an output relay contact. Its service life is reduced if higher current or voltage flows to the contact. The following graph shows the relation between the durability of the contact and the magnitude of load:



On the contact surface, carbide is produced by glow discharge of induced load being switched. This increases the contact resistance. The carbide produced can be eliminated by arc discharge that occurs at higher current. It keeps the contact surface clean with minimum resistance. At lower current or voltage, the contact cannot be switched properly because of the carbide. It becomes unserviceable before the number of contacts reaches the normal limit. Its life can be reduced to as short as one tenth or one hundredth of the time estimated from the above curve. If you use small voltage or current, action should be taken to prevent glow discharge.

An effective means is to use a CR surge absorber or varistor. Connect such element in parallel with the load as shown below.

Surge absorbing circuit

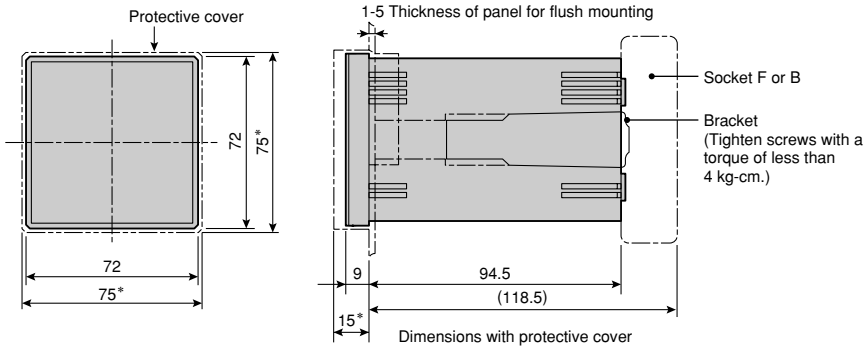


- The induced load of the relay contact is 10% to 20% of the resistance load. The smaller the load is, the longer the contact can serve.
- With or without the memory backup, the status of DC output during power shutdown is undefined. That is, the output can randomly change between "1" and "0".
- On some models, certain numbers are displayed in different shapes as shown below. This is normal for such models.

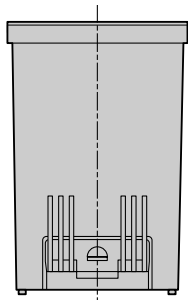
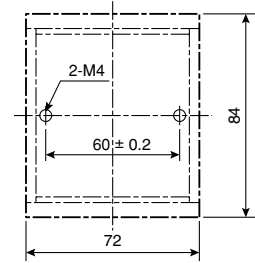
KCX-1D/2D/3D/4D KCX-B/KCX-B6T	Other models
6	6
9	9

External Dimensions

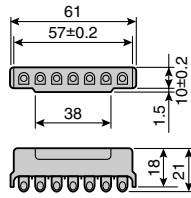
(in mm)



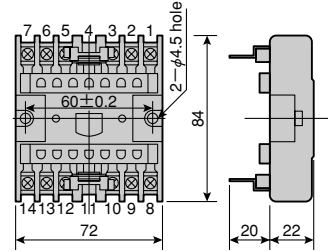
● Boring dimensions for wall surface mounting using Socket F



● Specified connector: KA-01

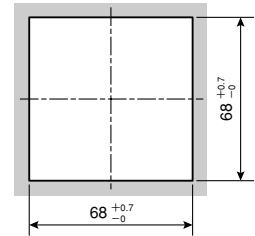


● Socket F (KF-03) for wall surface mounting



- External dimensions of Socket B (KB-03): Same as Socket F.
- KA-01, KF-03 and KB-03 are options.

● Boring dimensions for flush mounting



Notes:

- Use the screws provided to install the counter on Socket F (KF-03) or Socket B (KB-03).
 - For the connector kit KA-01 and Socket B (KB-03), use screws sized as follows:
 For the connector kit (KA-01): 12mm or less
 For Socket B (KB-03): 30mm or less
- Do not use longer screws, as they may break the internal elements.

Mounting hole dimensions

