FM Series — Up·Down Measure Counter

DIN W72×H72mm Up·Down Measure Counter

▪ Features

Shaded parts(▩) are changed and added functions from previous FM Series.

- Parameter Setting:
  Input/Output operation mode, Max. counting speed, Decimal point position, OUT1/2 time(0.01 to 99.99 sec), Selectable voltage input (PNP) method or no-voltage input (NPN) method, Selectable Multiply or Divide mode function
- Memory protection for 10 years
  (using non-voltage semiconductor)
- Power supply: 100-240VAC 50/60Hz
- Built-in Microprocessor

⚠ **Please read "Safety considerations" in operation manual before using.**

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▪ Ordering Information

FM	4	M	—	1P	4

Power supply	4	100-240VAC 50/60Hz
Output	1P	1-stage setting
	2P	2-stage setting
	I	Indicator
Function	M	Measure function
Display digit	4	9999 (4-digit)
	6	999999 (6-digit)
Size	FM	DIN W72×H72mm

▪ Specifications

Model	1-stage setting	**FM4M-1P4**	**FM6M-1P4**
	2-stage setting	**FM4M-2P4**	**FM6M-2P4**
	Indicator	**FM4M-I4**	**FM6M-I4**
Display digit		4-digit	6-digit
Character size (W×H)		6×10mm	4×8mm
Power supply		100-240VAC~ 50/60Hz	
Permissible voltage range		90 to 110% of rated voltage	
Power consumption		●1-stage: Max. 4.6VA ●2-stage: Max. 5.8VA ●Indicator: Max. 3.8VA	
Max. counting speed of CP1/CP2		Selectable 1cps/30cps/300cps/2kcps/5kcps	
Return time		Max. 500ms	
Min. signal width		RESET: approx. 20ms	
Input method		Selectable voltage input (PNP) method or no-voltage input (NPN) method [Voltage input (PNP) method]-input impedance: max. 10.8kΩ, [H]: 5-30VDC⎓, [L]: 0-2VDC [No-voltage input (NPN) method]-short-circuit impedance: max. 470Ω, short-circuit residual voltage: max. 1VDC, open-circuit impedance: min. 100kΩ	
One-shot output time		0.01 to 99.99 sec	
Control output	Contact	Type	●1-stage: Instantaneous SPDT (1c) ●2-stage: Instantaneous OUT1-SPST (1a), Instantaneous OUT2-SPST (1a)
		Capacity	250VAC~ 3A resistive load
	Solid state	Type	●1-stage: 1 NPN open collector ●2-stage: OUT1-1 NPN open collector, OUT2-1 NPN open collector
		Capacity	NPN open collector output ●Load voltage: max. 30VDC⎓ ●Load current: max. 100mA ●Residual voltage: max. 1VDC⎓
Relay life cycle	Mechanical		Min. 5,000,000 operations
	Electrical		Min. 100,000 operations (250VAC 3A resistive load)
Insulation resistance		Over 100MΩ (at 500VDC megger)	
External power supply		Max. 12VDC⎓ ±10% 50mA	
Memory retention		Approx. 10 years (non-volatile memory)	
Dielectric strength		2,000VAC 50/60Hz for 1 min (between all terminals and case)	
Noise immunity		±2kV the square wave noise (pulse width 1μs) by noise simulator	

FM Series

▣ Specifications

Model	1-stage setting	**FM4M-1P4**		**FM6M-1P4**
	2-stage setting	**FM4M-2P4**		**FM6M-2P4**
	Indicator	**FM4M-I4**		**FM6M-I4**
Vibration	Mechanical	0.75mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour		
	Malfunction	0.5mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 minutes		
Shock	Mechanical	300m/s^2 (approx. 30G) in each X, Y, Z direction for 3 times		
	Malfunction	100m/s^2 (approx. 10G) in each X, Y, Z direction for 3 times		
Environ-ment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃		
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH		
Protection structure		IP20 (front part, IEC standard)		
Approval		CE $_c \mathbf{\mathcal{R}_{L}}_{us}$		
Weight[1]	1-stage setting	Approx. 245g (approx. 180g)		
	2-stage setting	Approx. 265g (approx. 200g)		
	Indicator	Approx. 225g (approx. 160g)		

※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

● FM□M-2P4
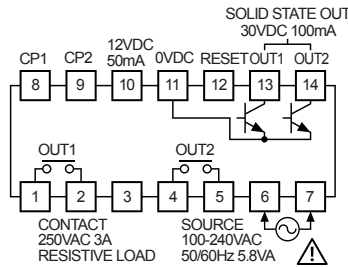
● FM□M-1P4
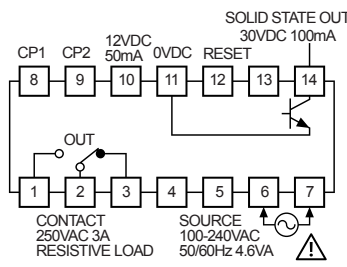
● FM□M-I4
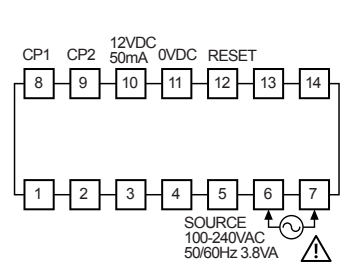
▣ Dimensions

※Nameplate design is changed and rear length is shorten than previous.
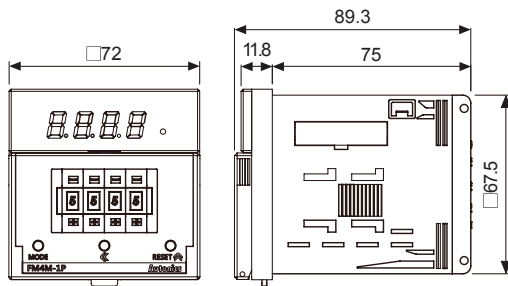
(unit: mm)

● Panel cut-out
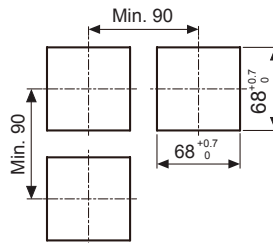
● Bracket
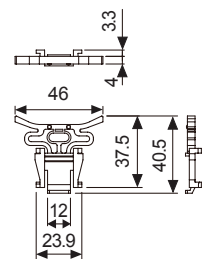
▣ Input Connections

◎ Voltage input (PNP)

● Solid-state input (standard sensor: PNP output type sensor)

(PNP output)

※CP1, CP2, RESET input part

(PNP open collector output)

● Contact input

※Counting speed : Set as 1 or 30cps

Autonics

Up·Down Measure Counter

(A)
Photoelectric
Sensors

(B)
Fiber
Optic
Sensors

(C)
Door/Area
Sensors

(D)
Proximity
Sensors

(E)
Pressure
Sensors

(F)
Rotary
Encoders

(G)
Connectors/
Connector Cables/
Sensor Distribution
Boxes/Sockets

(H)
Temperature
Controllers

(I)
SSRs / Power
Controllers

(J)
Counters

(K)
Timers

(L)
Panel
Meters

(M)
Tacho /
Speed / Pulse
Meters

(N)
Display
Units

(O)
Sensor
Controllers

(P)
Switching
Mode Power
Supplies

(Q)
Stepper Motors
& Drivers
& Controllers

(R)
Graphic/
Logic
Panels

(S)
Field
Network
Devices

(T)
Software

◎ No-voltage input (NPN)

● Solid-state input (standard sensor: NPN output type sensor)
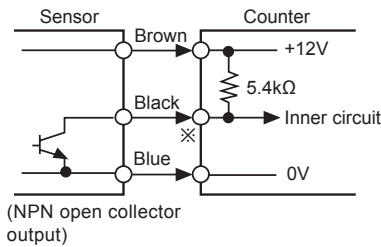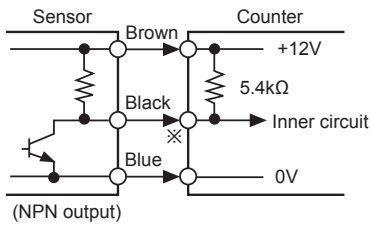
● Contact input
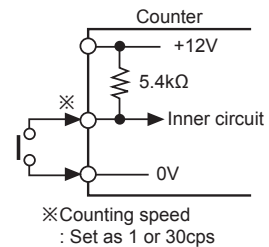
※CP1, CP2, RESET input part

▣ Input & Output Connections

◎ When operation load by sensor power

◎ When operating load by external power
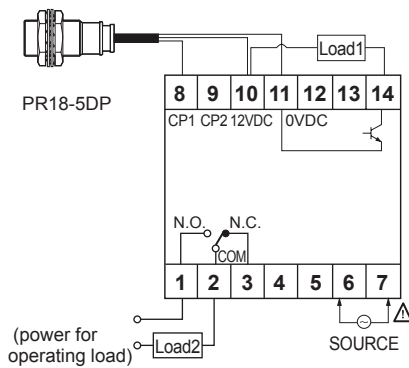
● The sum of operating current capacity of load 1 and sensor should not be over external power capacity (50mA).
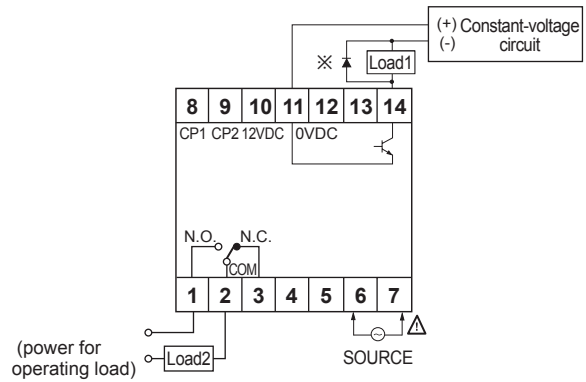
● The capacity of load 1 should not be over transistor switching capacity (max. 30VDC, 100mA)
● Do not supply the reverse polarity power.
※when using inductive load (relay, etc.), connector surge absorber at both ends of the load 1

FM Series

▣ Parameter Setting

※Hold the MODE key for 3 sec to save the setting value and return to RUN mode after changing the setting value.
※If there is no key input for 60 sec while setting the parameters, the new settings are ignored, and the unit returns to RUN mode with previous settings.
※Press the ⟨, ⟩ keys to select or set the desired value. Press the MODE key once after changing the setting value, to save the setting value and move to the next parameter.
※The dotted line parameters may not appear depending on output specifications or other parameter settings.
※1: Each parameter and corresponding setting value will flash alternately every 0.5 sec.

RUN mode

MODE 3 sec   MODE 3 sec

Input operation mode

$I n.\bar{n}$ ←→ $Ud-A$ Flashes alternately※1

Setting range: Refer to '▣ Input Operation Mode'.

MODE

Output operation mode

$oUt.\bar{n}$ ←→ F

Setting range: Refer to '▣ Output Operation Mode'.
※Does not appear in indicator model.

MODE

Max. counting speed

CPS ←→ 30

Setting range: $I, 30, 300, 2t$ (2,000), $5t$ (5,000)

MODE

OUT2 output time

$oUt2$ ←→ 00.50

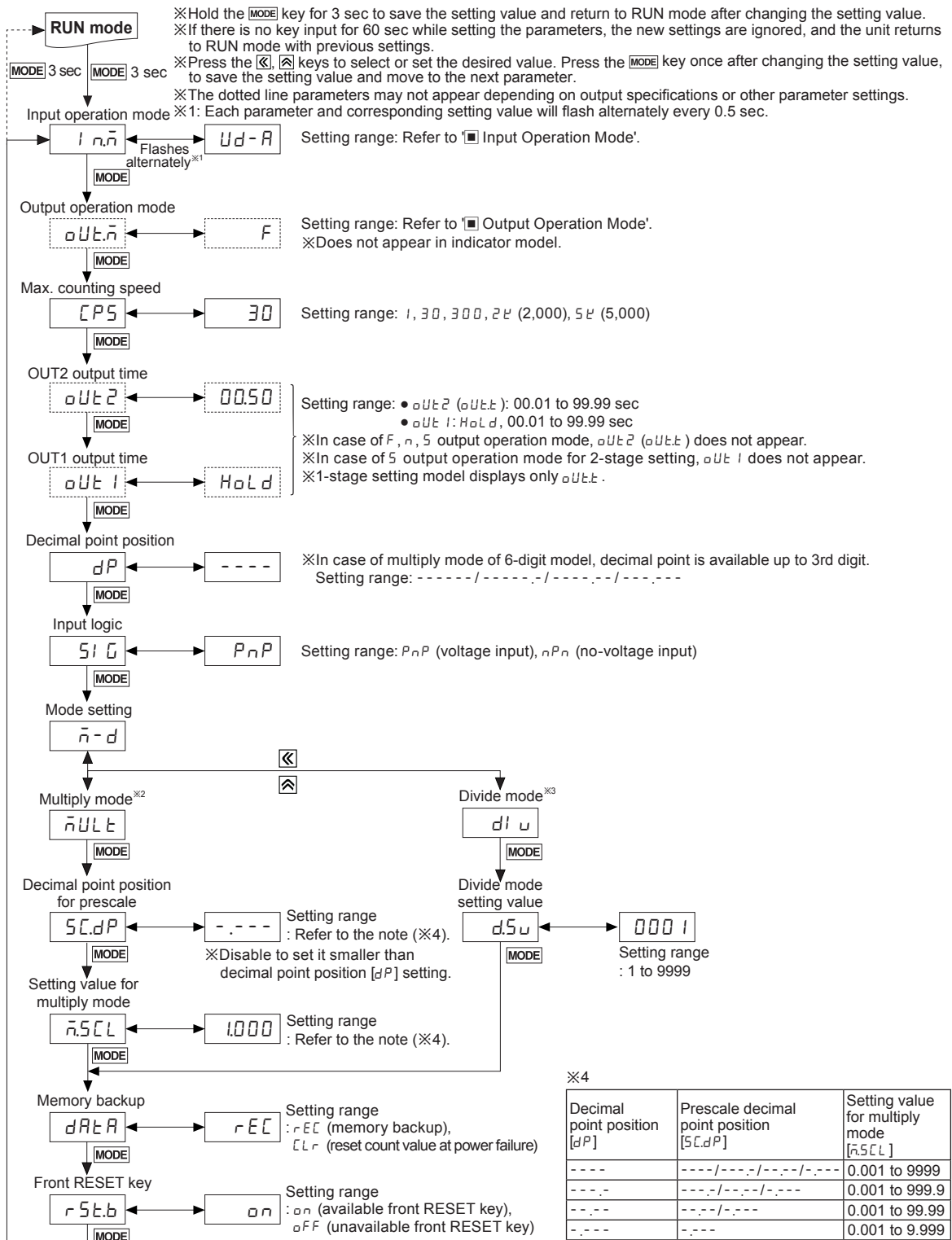Setting range: ● $oUt2$ ($oUt.t$): 00.01 to 99.99 sec
● $oUt I : HoLd$, 00.01 to 99.99 sec
※In case of $F, n, 5$ output operation mode, $oUt2$ ($oUt.t$) does not appear.
※In case of 5 output operation mode for 2-stage setting, $oUt I$ does not appear.
※1-stage setting model displays only $oUt.t$.

MODE

OUT1 output time

$oUt I$ ←→ $HoLd$

MODE

Decimal point position

dP ←→ $----$

※In case of multiply mode of 6-digit model, decimal point is available up to 3rd digit.
Setting range: $------ / -----.- / ----.-- / ---.---$

MODE

Input logic

$5I G$ ←→ PnP

Setting range: PnP (voltage input), nPn (no-voltage input)

MODE

Mode setting

$\bar{n}-d$

⟨
⟩

Multiply mode※2   **Divide mode**※3

$\bar{n}ULt$ $dI u$

MODE   MODE

Decimal point position for prescale   **Divide mode setting value**

$5C.dP$ ←→ $-.---$ $d.5u$ ←→ $000 I$

Setting range : Refer to the note (※4).
※Disable to set it smaller than decimal point position [dP] setting.

Setting range : 1 to 9999

MODE   MODE

Setting value for multiply mode

$\bar{n}.5CL$ ←→ 1.000

Setting range : Refer to the note (※4).

MODE

Memory backup

$dAtA$ ←→ rEC

Setting range : rEC (memory backup), CLr (reset count value at power failure)

MODE

Front RESET key

$r5t.b$ ←→ on

Setting range : on (available front RESET key), oFF (unavailable front RESET key)

MODE

※4

Decimal point position [dP]	Prescale decimal point position [$5C.dP$]	Setting value for multiply mode [$\bar{n}.5CL$]
$----$	$----/---.-/--.--/-.---$	0.001 to 9999
$---.-$	$---.-/--.--/-.---$	0.001 to 999.9
$--.--$	$--.--/-.---$	0.001 to 99.99
$-.---$	$-.---$	0.001 to 9.999

※2: Multiply mode [$\bar{n}ULt$]: Displayed by multiplying input signal and setting value.
Input signal×Setting value=Display value (input signal: 1, setting value: 4, it displays 4(1×4))
※3: Divide mode [$dI u$]: Displays 1 when input signals are input as the setting value.
Input signal/Setting value=Display value (input signal: 4, setting value: 4, it displays 1(4/4))

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◨ Measure Counter

Measure counter sets multiply or divide integer per 1 pulse input.

● Multi Mode

It multiplies the inner SW3 setting value at a count input signal and displays it.

Input signal (N)×Multi Mode preset value=Indication value

∴ N × 4 = 4, 8, 12 … (N=1, 2, 3 ..)

● Divide Mode

It displays as 1 when the count input signal is entered as preset value of inner SW3.

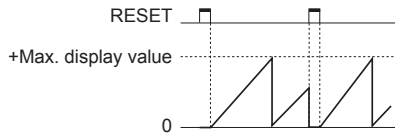$$\frac{\text{Input signal (N)}}{\text{Divide Mode preset value}} = \text{Indication value}$$

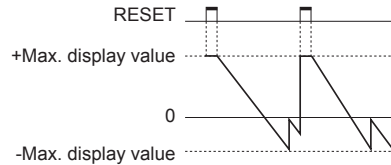$$\therefore \ \frac{N}{5} \ = 1, 2, 3 \ … \ (N=5, 10, 15 ..)$$

※Please be cautious the error can occur when down count is executed during up count.

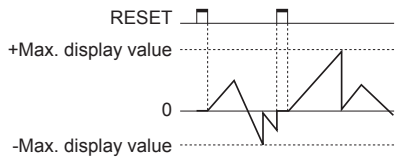## ◨ Counting Operation For Indicator (FM□M-I4)
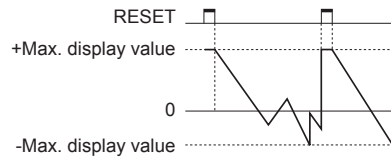
● Input mode: Up

● Input mode: Down

● Input mode: Up / Down-A, B, C

● Input mode: Up / Down-D, E, F

※- display is only for F, K, Q, S output operation mode and it cannot be set.

◨ Factory Default

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
I n.m̄	Ud-A	oUt2	00.50	SI G	PnP	m̄.SCL	1.000
oUt.m̄	F	oUt I	HoLd	m̄-d	m̄ULt	dAtA	rEC
CPS	30	dP	- - - -	SC.dP	-.- - -	r5t.b	on

(A)
Photoelectric
Sensors

(B)
Fiber
Optic
Sensors

(C)
Door/Area
Sensors

(D)
Proximity
Sensors

(E)
Pressure
Sensors

(F)
Rotary
Encoders

(G)
Connectors/
Connector Cables/
Sensor Distribution
Boxes/Sockets

(H)
Temperature
Controllers

(I)
SSRs / Power
Controllers

(J)
Counters

(K)
Timers

(L)
Panel
Meters

(M)
Tacho /
Speed / Pulse
Meters

(N)
Display
Units

(O)
Sensor
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Switching
Mode Power
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(S)
Field
Network
Devices

(T)
Software

FM Series

▣ Input Operation Mode

※CP: Clock Pulse

Input mode	Voltage input (PNP) method	No-voltage input (PNP) method
Up/Down-A command input [Ud-A]		
Up/Down-B individual input [Ud-b]		
Up/Down-C phase difference input [Ud-C]		
Up adding input [UP]		
Up/Down-D command input [Ud-d]		
Up/Down-D individual input [Ud-E]		
Up/Down-F phase difference input [Ud-F]		
Down subtracting input [dn]		

※A: over min. signal width, B: over than 1/2 of min. signal width. If the signal is smaller than these width, it may cause counting error (±1).

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Up·Down Measure Counter

J

Counters

■ Output Operation Mode

■■ ← One-shot output of OUT2 (0.01 to 99.99 sec)
■■ ← Self-holding output / One-shot output of OUT1 (0.01 to 99.99 sec)
▭ ← Self-holding output

Output mode	Input mode — Up, Up/Down-A, B, C	Input mode — Down, Up/Down-D, E, F	Operation
F [F]	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	After count-up, counting display value increases or decreases until reset signal input is applied and self-holding output is maintained.
N [n]	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	After count-up, counting display value and self-holding output are maintained until reset signal input is applied.
C [C]	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	When count-up, counting display value is reset and it counts simultaneously. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
R [r]	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	After count-up, counting display value is reset after one-shot output time of OUT2 and it counts simultaneously. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
K [K]	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	After count-up, counting display value increases or decreases until reset signal input is applied. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
P [P]	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	After count-up, counting display value is maintained while OUT2 output is ON. Counting value is internally reset and it counts simultaneously. When OUT2 output is OFF, displays counting value while OUT2 output is ON, and it increases or decreases. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2.
Q [q]	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	RESET, 2nd setting, 1st setting, 0, OUT1, OUT2 (OUT)	After count-up, counting display value increases or decreases during one-shot time of OUT2. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
S [5]	**Up** / **Up/Down-A, B, C**	**Down** / **Up/Down-D, E, F**	● Up, Up/Down-A, B, C input mode : OUT1 output maintains ON when counting display value is larger or equal than 1st setting value. : OUT2 output maintains ON when counting display value is larger or equal than 2nd setting value. ● Down, Up/Down-D, E, F input mode : OUT1 output maintains ON when counting display value is smaller or equal than 1st setting value. : OUT2 output maintains ON when counting display value is smaller or equal than 2nd setting value.

(A) Photoelectric Sensors
(B) Fiber Optic Sensors
(C) Door/Area Sensors
(D) Proximity Sensors
(E) Pressure Sensors
(F) Rotary Encoders
(G) Connectors/ Connector Cables/ Sensor Distribution Boxes/Sockets
(H) Temperature Controllers
(I) SSRs / Power Controllers
(J) Counters
(K) Timers
(L) Panel Meters
(M) Tacho / Speed / Pulse Meters
(N) Display Units
(O) Sensor Controllers
(P) Switching Mode Power Supplies
(Q) Stepper Motors & Drivers & Controllers
(R) Graphic/ Logic Panels
(S) Field Network Devices
(T) Software

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J-77

FM Series

▣ Proper Usage

◎ Reset function

● Reset
In case of changing the input mode after supplying the power, please take an external reset or manual reset.
If reset is not executed, the counter will be working as previous mode.
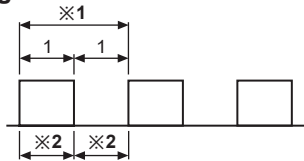
● Reset signal width
It is reset perfectly when the reset signal is applied during **min. 20ms** regardless of the contact input & solid-state input.
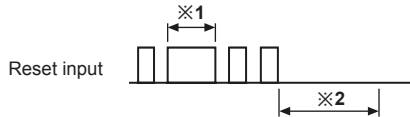
※1: In case of a contact reset, it is reset perfectly if the ON time of reset signal is applied during min. 20ms even though a chattering occurs.
※2: It can be input the signal of CP1 & CP2 after min. 50ms from closing time of reset signal.
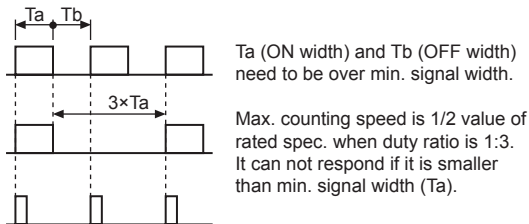
◎ Min. signal width

※1: Please make duty ratio (ON/OFF) 1:1.

※2: Min. signal width
- 1cps: Min. 500ms
- 30cps: Min. 16.7ms
- 2kcps: Min. 0.25ms
- 5kcps: Min. 0.1ms

◎ Max. counting speed
This is a response speed per 1 sec when the duty ratio (ON:OFF) of input signal is 1:1. If the duty ratio is not 1:1, the width between ON and OFF should be over min. signal width and the response speed is getting slower against input signal. If either ON or OFF signal is shorter than minimum signal width, this product may not respond.

Ta (ON width) and Tb (OFF width) need to be over min. signal width.

Max. counting speed is 1/2 value of rated spec. when duty ratio is 1:3. It can not respond if it is smaller than min. signal width (Ta).

◎ Error

| Display	Error	Troubleshooting
$Err0$	Setting value is 0.	Change the setting value anything but 0.

※If error occurs, the output turns OFF.
※In case of 2-stage setting model, error displays when 2nd setting value is 0 (zero).
※1st setting value is set as 0 (zero), OUT1 maintains OFF. 2nd setting value is smaller than 1st setting value, 1st setting value is ignored and only OUT2 output operates.
※Indicator model does not have error display function.

◎ Power
● The inner circuit voltage rises within 100ms after supplying the power to the unit. The input may be unavailable at this period. Be sure that the inner circuit voltage drops within 500ms after turning OFF the power.
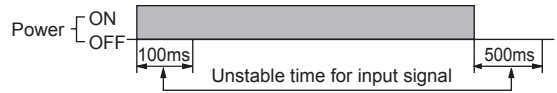
● Use the unit within the rated power supply.
When supplying or cutting the power, use a switch not to occur chattering.

◎ Input signal line
● Shorten the cable from the sensor to the unit.
● Use shield cable when input cable is longer.
● Wire the input signal line separately from power line.

◎ Testing dielectric voltage or insulation resistance when the unit is installed at control panel
● Isolate the unit from the circuit of control panel.
● Short all terminals of the unit.

◎ Do not use the unit in the following environments.
● Environments with high vibration or shock.
● Environments with strong alkali or strong acid materials
● Environments with exposure to direct sunlight
● Near machinery which produces strong magnetic force or electric noise

◎ This product may be used in the following environments.
● Indoor
● Altitude max. 2,000m
● Pollution degree 2
● Installation category II

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