

Multi Pulse Meters



MP5S / MP5Y / MP5W Series PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Features

- 16 operation modes
 - Frequency / revolutions / speed, passing speed, cycle, passing time, time interval
 - Time differential, absolute ratio, error ratio, density, error, length measurement 1 / 2, interval
 - Accumulation, addition / subtraction (individual input), addition / subtraction (phase difference input)
- Various output models
 - Relay triple / quintuple output, NPN / PNP open collector quintuple output
 - BCD Dynamic output, PV transmission output (current output)
 - RS485 communication output (Modbus RTU)
- Various function
 - Prescale, delay monitoring, hysteresis, auto-zero, parameter lock, data bank (MP5W only)
- Display range: -19999 to 99999
- Various display units

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

- 01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime / disaster prevention devices, etc.)**
Failure to follow this instruction may result in personal injury, economic loss or fire.
- 02. Do not use or store the unit in the place where flammable / explosive / corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
Failure to follow this instruction may result in explosion or fire.
- 03. Install on a device panel to use.**
Failure to follow this instruction may result in fire or electric shock.
- 04. Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire or electric shock.
- 05. Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.
- 06. Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire or electric shock.

⚠ Caution Failure to follow instructions may result in injury or product damage.

- 01. When connecting the power / measurement input and relay output, use AWG 24 (0.20 mm²) to AWG 15 (1.65 mm²) cable and tighten the terminal screw with a tightening torque of 0.98 to 1.18 N m.**
Use the wiring suitable for the load current capacity.
Failure to follow this instruction may result in fire or malfunction due to contact failure.
- 02. Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- 03. Use dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire or electric shock.
- 04. Keep the product away from metal chip, dust, and wire residue which from flowing into the unit.**
Failure to follow this instruction may result in fire or product damage.

Cautions during Use

- Follow instructions in 'Cautions during Use'.
Otherwise, it may cause unexpected accidents.
- Power supply should be insulated and limited voltage / current or Class 2, SELV power supply device.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Use twisted pair wire for communication line.
- Keep away from high voltage lines or power lines to prevent inductive noise.
In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line. Do not use near the equipment which generates strong magnetic force or high frequency noise.
- This unit may be used in the following environments.
 - Indoors (in the environment condition rated in 'Specifications')
 - Altitude max. 2,000 m
 - Pollution degree 2
 - Installation category II

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

MP 5 ① - ② ③

① Size

S: DIN W 48 × H 48 mm
Y: DIN W 72 × H 36 mm
W: DIN W 96 × H 48 mm

② Power supply

2: 24 VAC ~ 50 / 60 Hz, 24 - 48 VDC=
4: 100 - 240 VAC ~ 50 / 60 Hz

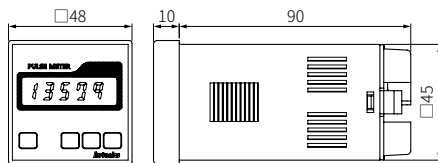
③ Output

Output	Main (comparative value) output	Sub (display value) output
MP5S	N Indicator	-
MP5Y	N Indicator	-
	1 NPN open collector quintuple	-
	2 PNP open collector quintuple	-
	3 Indicator	BCD Dynamic
	4 Indicator	PV transmission (current)
	5 Indicator	RS485 comm.
MP5W	6 Relay triple (H, GO, L)	-
	N Indicator	-
	A Relay quintuple (HH, H, GO, L, LL)	-
	1 Relay triple (H, GO, L)	-
	2 NPN open collector quintuple	BCD Dynamic
	4 NPN open collector quintuple	PV transmission (current)
	5 PNP open collector quintuple	PV transmission (current)
	8 NPN open collector quintuple	RS485 comm.
	9 PNP open collector quintuple	RS485 comm.

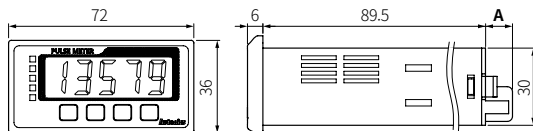
Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.
- This dimensions shows the indicator. The connector (side length) is different according to the output specification.

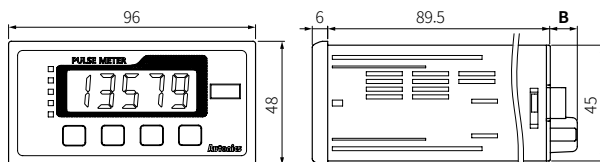
■ MP5S



■ MP5Y



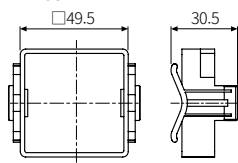
■ MP5W



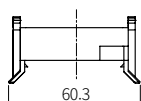
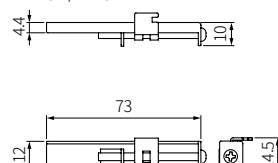
	MP5Y-□N	MP5Y-□1/2/3/4/5	MP5Y-□6	MP5W-□N	MP5W-□A/1	MP5W-□2/4/5/8/9
A	10.5	14.5	15.3	-	-	-
B	-	-	-	10.5	10.5	14.5

■ Bracket

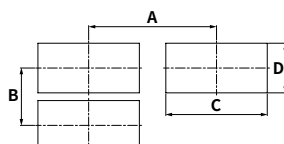
- MP5S



- MP5Y / MP5W



■ Panel cut-out



	A	B	C	D
MP5S	≥ 65	≥ 65	45 ^{+0.5} ₋₀	45 ^{+0.5} ₋₀
MP5Y	≥ 91	≥ 40	68 ^{+0.5} ₋₀	31.5 ^{+0.5} ₋₀
MP5W	≥ 116	≥ 52	92 ^{+0.5} ₋₀	45 ^{+0.5} ₋₀

Sold Separately

- [MP5W] Terminal protection cover: M6P / M9P-COVER

Manual

For proper use of the product, refer to the manuals and be sure to follow the safety considerations in the manuals.

Download the manuals from the Autonics website.

Software

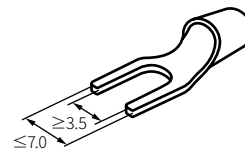
Download the installation file and the manuals from the Autonics website.

■ DAQMaster

It is the comprehensive device management program for Autonics' products, providing parameter setting, monitoring and data management.

Cautions during Wiring

- Unit: mm, Use terminals of size specified below.



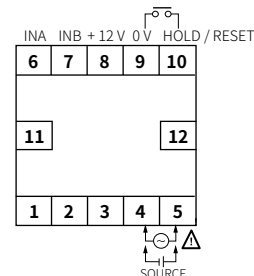
- Contact the manufacture for the socket and cable.

Model	Specification	Manufacture
MP5Y-□1/2/3/4/5	Hirose connector	HIF3BA-10PA-2.54DS
	Applied connector socket	HIF3BA-10D-2.54R
MP5W - □2/4/5/8/9	Hirose connector	HIF3BA-20PA-2.54DS
	Applied connector socket	HIF3BA-20D-2.54R
	I / O cable (sold separately)	CO20-HP□-□
		Autonics

Connections

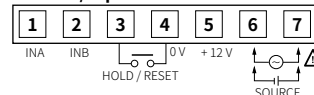
- Indicator model supports only power / input terminals.
- Connector or terminal block support varies by model. Refer to the cautions during wiring.
- HOLD / RESET terminal function is different depending on the operation mode. (F1 to F12: HOLD, F13 to F16: RESET)

■ MP5S



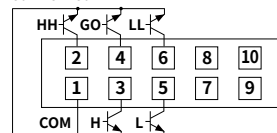
■ MP5Y

- Power / input terminal



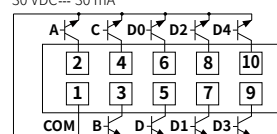
- 1: NPN open collector output

MAIN OUT (NPN OPEN COLLECTOR)
30 VDC = 30 mA

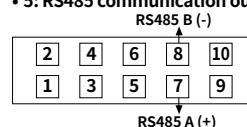


- 3: BCD Dynamic output

BCD OUT (NPN OPEN COLLECTOR)
30 VDC = 30 mA

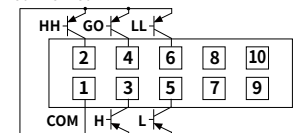


- 5: RS485 communication output



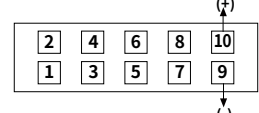
- 2: PNP open collector output

MAIN OUT (PNP OPEN COLLECTOR)
30 VDC = 30 mA

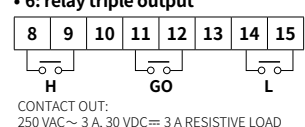


- 4: PV transmission output

DC 4 - 20 mA / DC 0 - 20 mA
Load 500 Ω Max.



- 6: relay triple output



- Power / input terminal



- **1: relay triple output**

- 2: NPN open collector + BCD Dynamic output

- POL signal turns ON when the display value is a minus (-) value

- 4: NPN open collector + PV transmission output

- 5: PNP open collector + PV transmission output

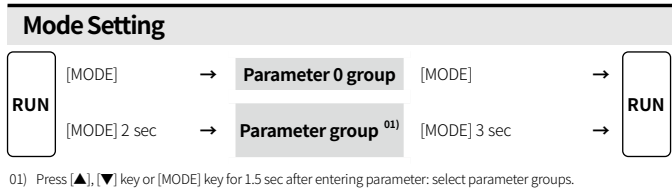
- 8: NPN open collector + RS485 comm.

- 9: PNP open collector + RS485 comm.

01) Only for MP5W

■ RS485

Comm. protocol	Modbus RTU (16-bit CRC)
Application standard	Compliance with EIA RS485
Max. connection	31-unit (address: 1 to 127)
Comm. synchronous method	Asynchronous
Comm. method	2-wire half duplex
Comm. distance	≤ 800 m
Comm. speed	2,400 / 4,800 / 9,600 (default) / 19,200 / 38,400 bps
Comm. response time	5 to 99 ms (default: 20 ms)
Start bit	1-bit (fixed)
Data bit	8-bit (fixed)
Parity bit	None (default), Even, Odd
Stop bit	1-bit, 2-bit (default)



Output Mode

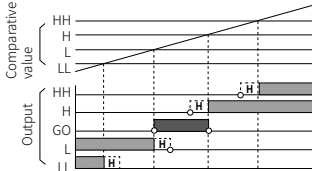
Output mode is available to set. (Indicator does not support output mode.)

ON: **OFF:** **H:** hysteresis

■ S (Standard) output mode

- Comparative value setting condition:
individual output operation regardless of size or order of set comparative values

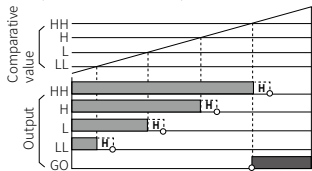
HH output: Display value $\geq$ Comparative value HH
H output: Display value $\geq$ Comparative value H
L output: Display value $\leq$ Comparative value L
LL output: Display value $\leq$ Comparative value LL
GO output: No HH, H, L, LL output



■ L (Low) output mode

- Comparative value setting condition:
individual output operation regardless of size or order of set comparative values

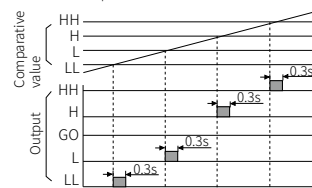
HH output: Display value $\leq$ Comparative value HH
H output: Display value $\leq$ Comparative value H
L output: Display value $\leq$ Comparative value L
LL output: Display value $\leq$ Comparative value LL
GO output: No HH, H, L, LL output



■ I (One-shot) output mode

- Comparative value setting condition:
individual output operation regardless of size or order of set comparative values
- One-shot output time: 0.3 sec (fixed)
- No GO output.
- No hysteresis.

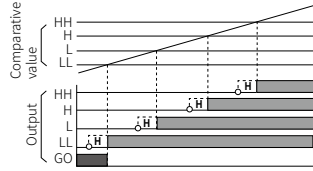
HH output: Display value $\geq$ Comparative value HH
H output: Comparative value HH > Display value $\geq$ Comparative value H
L output: Comparative value H > Display value $\geq$ Comparative value L
LL output: Comparative value L > Display value $\geq$ Comparative value LL



■ H (High) output mode

- Comparative value setting condition:
individual output operation regardless of size or order of set comparative values

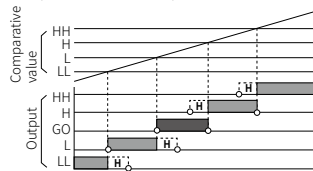
HH output: Display value $\geq$ Comparative value HH
H output: Display value $\geq$ Comparative value H
L output: Display value $\geq$ Comparative value L
LL output: Display value $\geq$ Comparative value LL
GO output: No HH, H, L, LL output



■ B (Block) output mode

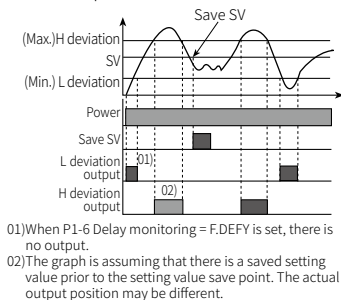
- Comparative value setting condition:
LL < L < H < HH

HH output: Display value $\geq$ Comparative value HH
H output: Comparative value HH > Display value $\geq$ Comparative value H
L output: Comparative value LL < Display value $\leq$ Comparative value L
LL output: Display value $\leq$ Comparative value LL
GO output: No HH, H, L, LL output



■ F (Deflection) output mode

- Transmits outputs when the saved setting value exceeds H deviation or L deviation.
- Comparative value setting:
Based on the set value, set the H / L deviation in the P0-2, P2-7 H comparative value and P0-3, P2-8 L comparative value parameters.
(The set deviation value is saved during Power OFF until it is re-set.)
- Comparative value setting range:
: 0.0001 to 99999
The setting range is different according to the P2-2 Decimal point position of display value setting.
E.g.) In case of P2-2 Decimal point position of display value = 0000.0, setting range = 0.1 to 9999.9
- Saving setting value: [MODE] + **▲**
- Checking setting value: **▲**
- No HH, GO, LL output.
- The deviation can be set to "0" but the actual operation will be the same as "1".



01) When P1-6 Delay monitoring = F.DEFY is set, there is no output.
02) The graph is assuming that there is a saved setting value prior to the setting value save point. The actual output position may be different.

Operation Mode

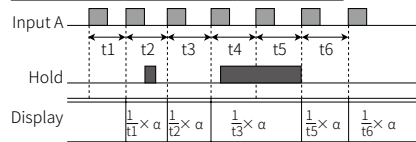
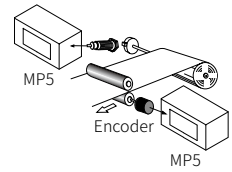
■ F1: frequency / revolutions / speed

Measures the frequency of input A and displays the calculated frequency, revolutions, and speed.

Frequency (Hz)	$= f \times \alpha$	($\alpha = 1$ [sec])
Revolutions (rpm)	$= f \times \alpha$	($\alpha = 60$ [sec])
Speed (m / min)	$= f \times \alpha$	($\alpha = 60$ L [sec])

- L: travel distance of conveyor belt of 1 cycle [m]
- α : prescale value
(For multiple objects, $\alpha = 60L / N$)

Display value	Display unit	α
Frequency	Hz	1
	kHz	0.001
Revolutions	rps	1
	rpm (default)	60
	mm / sec	1,000 L
	cm / sec	100 L
Speed	m / sec	1 L
	m / min	60 L
	km / hour	3.6 L



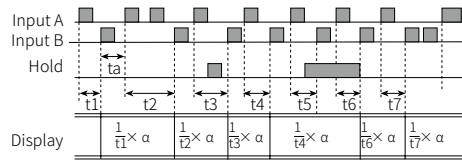
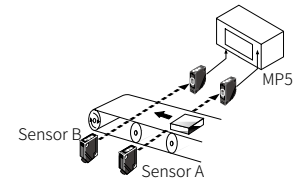
■ F2: passing speed

Displays the passing speed between input A ON and input B ON.

Passing speed (V)	$= f \times \alpha$	($\alpha = L$ [m])
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- f: reciprocal of time [sec] between input A (sensor) ON and input B (sensor) ON.
- L: distance between input A (sensor) and input B (sensor) [m]
- α : prescale value

Display value	Display unit	α
Passing speed	mm / sec	1,000 L
	cm / sec	100 L
	m / sec (default)	1 L
	m / min	60 L
	km / hour	3.6 L



• ta: Return time (≥ 20 ms)

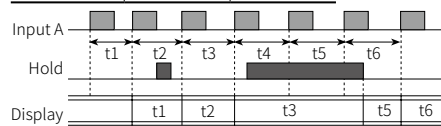
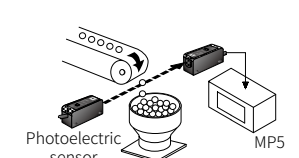
■ F3: cycle

Displays the measured time from input A ON to the next ON.

Cycle (T)	$= t$
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- t: measurement time [sec]

Display value	Display unit
Cycle	SEC
	MIN
	999.99 s (default)
	999.99 m
	9999.9 s
	9999.9 m
	99 m 59.9 s
	99 h 59.9 m
	9 h 59 m 59 s
	999 h 59 m
	9999 s
	99999 m



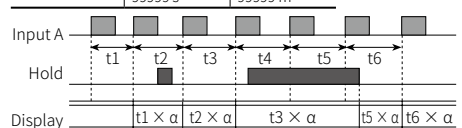
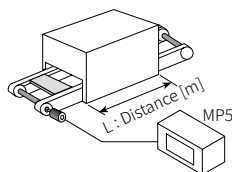
■ F4: passing time

Measure the time from input A ON to the next ON, and displays the passing time of the arbitrary distance.

Passing time [sec]	$= t \times \alpha$
	($\alpha = \frac{L \text{ [m]}}{\text{Distance advanced in 1 pulse cycle [m]}}$)

- t: measurement time [sec]
- L: arbitrary distance [m]
- α : prescale value

Display value	Display unit
Passing time	SEC
	MIN
	999.99 s (default)
	999.99 m
	9999.9 s
	9999.9 m
	99 m 59.9 s
	99 h 59.9 m
	9 h 59 m 59 s
	999 h 59 m
	9999 s
	99999 m



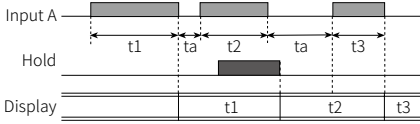
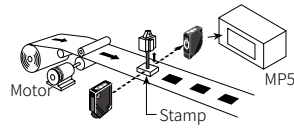
■ F5: time interval

Displays measured time of input A ON.

Time interval (T) = t

• t: measured time of input A ON [sec]

Display value	Display unit	
	SEC	MIN
	999.99 s (default)	999.99 m
Time interval	9999.9 s	9999.9 m
	99 m 59.9 s	99 h 59.9 m
	9 h 59 m 59 s	999 h 59 m
	99999 s	99999 m



• ta: Return time (≥ 20 ms)

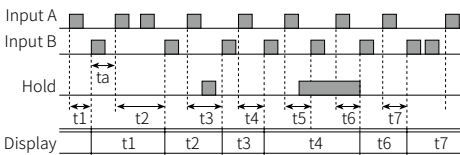
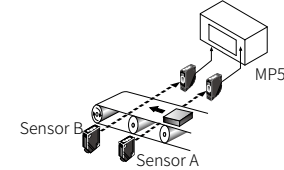
■ F6: time differential

Displays measured time from Input A ON to Input B ON.

Time differential (T) = t (ta to tb)

• t (ta to tb): measured time from input A ON to input B ON [sec]

Display value	Display unit	
	SEC	MIN
	999.99 s (default)	999.99 m
Time differential	9999.9 s	9999.9 m
	99 m 59.9 s	99 h 59.9 m
	9 h 59 m 59 s	999 h 59 m
	99999 s	99999 m



• ta: Return time (≥ 20 ms)

■ F7: absolute ratio

Measures and displays relative speed, amount, speed, etc. of input B against input A in percentage (%).

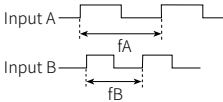
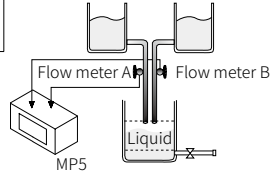
$$\text{Absolute ratio} = \frac{\text{Input B}}{\text{Input A}} \times 100 \%$$

$$\text{Absolute ratio} = \frac{\text{Frequency of input B [Hz]} \times \text{Ba}}{\text{Frequency of input A [Hz]} \times \text{Aa}} \times 100 \%$$

• Aa: prescale value of input A
• Ba: prescale value of input B

Display value	Display unit
Absolute ratio	%

$$\text{Display} = \frac{\text{Frequency of input B [Hz]} \times \text{Ba}}{\text{Frequency of input A [Hz]} \times \text{Aa}} \times 100 \%$$



• Hold
When the hold signal turns ON, the display value is maintained until the display cycle turns to hold OFF.

■ F8: error ratio

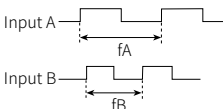
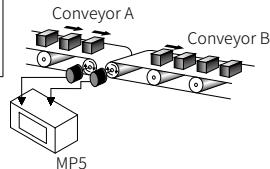
Measures and displays the relative rate of input B against the reference value of input A in percentage (%).

$$\text{Error ratio} = \frac{\text{Input B} - \text{Input A}}{\text{Input A}} \times 100 \%$$

$$\text{Error ratio} = \frac{(\text{frequency of input B [Hz]} \times \text{Ba}) - (\text{frequency of input A [Hz]} \times \text{Aa})}{\text{Frequency of input A [Hz]} \times \text{Aa}} \times 100 \%$$

• Aa: prescale value of input A
• Ba: prescale value of input B

Display value	Display unit
Error ratio	%



• Hold
When the hold signal turns ON, the display value is maintained until the display cycle turns to hold OFF.

■ F9: density

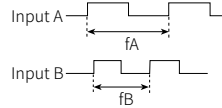
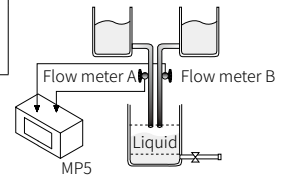
Measures and displays the density ratio (%) of input B against the total sum of input A and input B.

$$\text{Density} = \frac{\text{Input B}}{\text{Input A} + \text{Input B}} \times 100 \%$$

$$\text{Density} = \frac{\text{Frequency of input B [Hz]} \times \text{Ba}}{(\text{frequency of input A [Hz]} \times \text{Aa}) + (\text{frequency of input B [Hz]} \times \text{Ba})} \times 100 \%$$

• Aa: prescale value of input A
• Ba: prescale value of input B

Display value	Display unit
Density	%



• Hold
When the hold signal turns ON, the display value is maintained until the display cycle turns to hold OFF.

■ F10: error

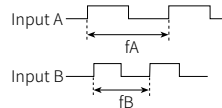
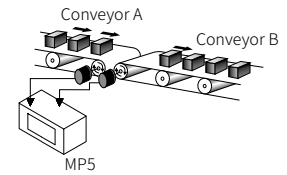
Measures and displays the error of input B against reference value of input A.

$$\text{Error} = \text{Input B} - \text{Input A}$$

$$\text{Error} = (\text{frequency of input B [Hz]} \times \text{Ba}) - (\text{frequency of input A [Hz]} \times \text{Aa})$$

• Aa: prescale value of input A
• Ba: prescale value of input B

Display value	Display unit
Error	END User setting unit



• Hold
When the hold signal turns ON, the display value is maintained until the display cycle turns to hold OFF.

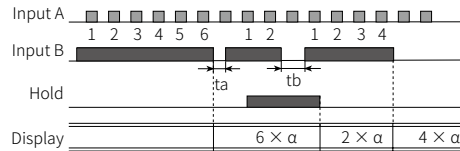
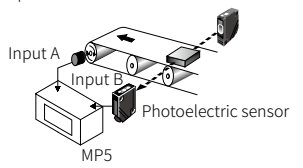
■ F11: length measurement 1

Measure and display the number of input A pulses during input B ON.

Length measurement 1 = P × α

• P: number of input A pulses
• α: prescale value

Display value	Display unit
Length measurement 1	Quantity [EA] (default)
	mm
	cm
	m



• ta, tb: Return time (≥ 20 ms)

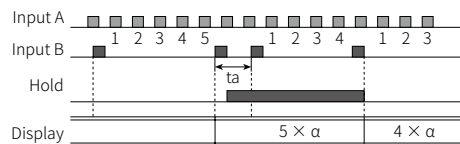
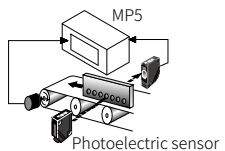
■ F12: interval

Measures and displays the number of input A pulses from input B ON to the next ON.

Interval = P × α

• P: number of input A pulses
• α: prescale value

Display value	Display unit
Interval	Quantity [EA] (default)
	mm
	cm
	m



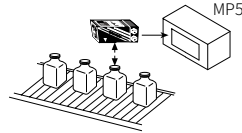
• ta: Return time (≥ 20 ms)

F13: accumulation

Measures and displays the counted value of input A pulses.

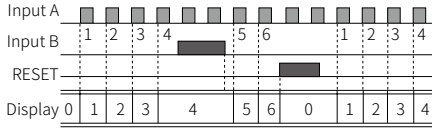
$$\text{Accumulation} = P \times \alpha$$

- P: number of input A pulses
- α : prescale value



• Operation

- ① Counts the number of input A pulses.
- ② Input B is an enable input signal. During ON, the quantity and display value of input A will be held, and during OFF input A will be recounted.
- ③ When RESET input is ON, the integrated counted value will be reset to "0"



• α = display value for 1

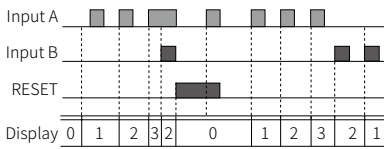
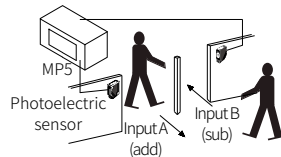
F14: addition / subtraction-individual input

Displays the counted value from added input A pulses and subtracted input B pulses. When there are two inputs simultaneously, it will not count.

$$\text{Add / Sub (individual)} = \text{input A} \times \alpha - \text{input B} \times \alpha$$

- α : prescale value of input A

Display value	Display unit
Addition / Subtraction (individual)	Quantity [EA]



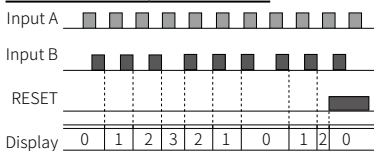
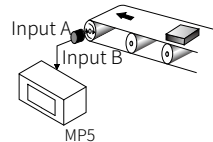
• α = display value for 1

F15: addition / subtraction-phase difference input

When input A is Low, counting is added to the low of input B.
When input A is Low, counting is subtracted from the high of input B.

$$\text{Add / Sub (phase difference)} = \text{Detects position and speed using A and B phases of encoder outputs as input.}$$

Display value	Display unit
Addition / Subtraction (phase difference)	Quantity [EA]



F16: length measurement 2

Measures and displays the number of pulses from input A until the value of input B reaches the setting value.

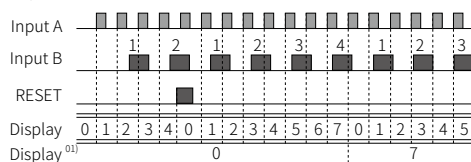
$$\text{Length measurement 2} = P \times \alpha \quad (\text{until the setting value of input B})$$

- P: number of input A pulses
- α : prescale value

Display value	Display unit
Length measurement 2	Quantity [EA]

- If input A and input B are ON during initial power supply, it will not count and only count the number of rising edge.
- Display value is renewed depending on the P2-13. Display cycle.

(e.g.: input B = 4)

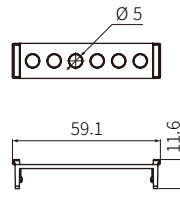


01) When P2-13 Display cycle is OFF, it will maintain the quantity of input A until the value of input B reaches the setting value of P2-14 Input B setting value (INB).

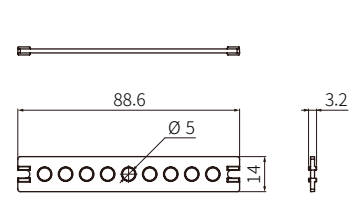
Sold Separately: Terminal Protection Cover

- Unit: mm

M6P-COVER



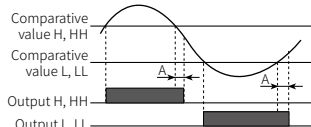
M9P-COVER



Functions

Hysteresis

Near the comparative setting value, the output may turn ON / OFF frequently and unstably. To prevent this, hysteresis value is set based on the comparative setting value.

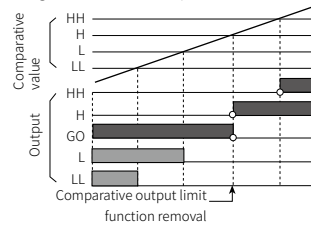


- A: hysteresis
- The hysteresis value can be set to "0" but the actual operation value is "1"

Delay monitoring: limit comparative output

After supplying power, the starting current of motors and other inputs are changeable. This function allows stable control by limiting all outputs for a certain period of time, until the target measurement unit stabilizes. It may also control L,LL outputs until a specific output is reached.

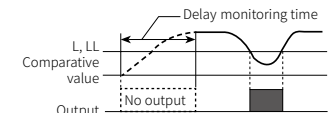
- After supplying power, there is no initial L, LL comparative outputs.
- Each setting value of HH, H, LL, L is not related to their relative sizes.
- E.g.: S (Standard) output mode



E.g.: F (Deflection) output mode
The comparative output limiting function is removed at the set value (standard setting).
Comparative output limit
(Max.)H deviation
SV
(Min.) L deviation
Output H
L

Delay monitoring: Start compensation timer

Set monitoring delay time so that there is no output during the delay time.



Auto-zero time

When there is no input signal during auto-zero setting time, the display value is automatically set to 0(zero). Please set the auto-zero setting time so that it is longer than the interval of the slowest input signal. If the setting time is too long and there is no input signal, the rate at which the display value falls to 0(zero) decrease, and output response rate may slow down.

Data bank

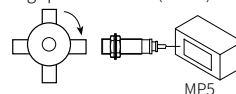
Comparative setting value and prescale value are saved as two types(data bank 1, 2) and can be selected for use by opening or shorting of terminals.

- Terminal 3, 5 open: use value of data bank 1
- Terminal 3, 5 short: use value of data bank 2

Prescale

Displays values in required units or specific multiples by counting the number of input pulses, then multiplying the number of pulses or the length of pulses by variables (X×10y).

- E.g.: prescale value (α = 15) setting



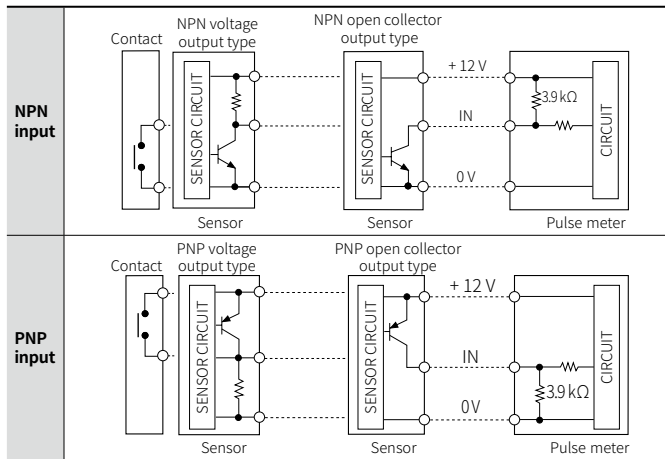
- f: the number of input pulses per second [Hz]
- α : prescale value
- N: the number of pulses per revolution

Set mantissa(X) as 1.5000, and exponent(Y) as 1 for prescale value(α)=15.

The same display value can be obtained with α value set as X=0.1500, and Y=2

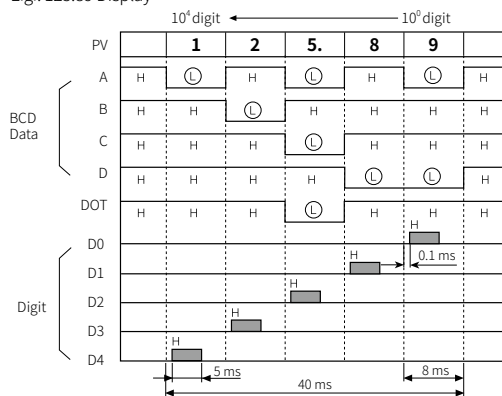
$$\begin{aligned} \text{Revolutions (rpm)} &= f \times \alpha \\ &= f \times 60 \times (1 / N) \\ &= f \times 60 \times (1 / 4) \\ &= f \times 60 \times 0.25 \\ &= f \times 15 \end{aligned}$$

Example of Input Connection



BCD Dynamic Output (negative logic)

- BCD Data (A, B, C, D, DOT) ← A: lowest bit, DOT: highest bit
- Digit Data (D0, D1, D2, D3, D4) ← D0: lowest digit, D4: highest digit
- E.g.: 125.89 Display



Segment Table

The segments displayed on the product indicate the following meanings. It may differ depending on the product.

7 segment	11 segment	12 segment	16 segment
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
A	A	A	A
b	b	b	b
c	c	c	c
d	d	d	d
E	E	E	E
F	F	F	F
G	G	G	G
H	H	H	H