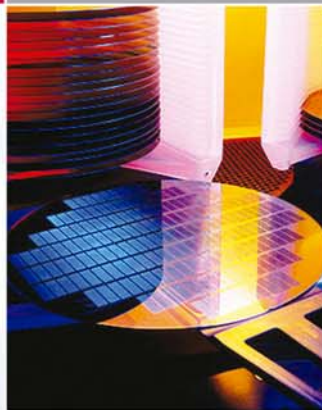


# Rotary Encoder

High performance and precise control



# Global FA Leading Company LS MECAPION



**Incremental Shaft Type**

- $\Phi 30 \sim \Phi 78$  Series 의 다양한 제품군 구성
- 광범위한 전원 전압, 다양한 종류의 분해능 및 빠른 납기 대응
- 국내외 타사 제품과의 광범위한 호환성
- 공작기계, 산업용 로봇, 엘리베이터, 유압실린더 등 산업용 기기 적용
- 제철용 특수품 대응

**Hollow Shaft Type**

- $\Phi 30 \sim \Phi 128$  Series 의 다양한 제품군 구성
- 광범위한 전원 전압, 다양한 종류의 분해능 및 빠른 납기 대응
- 보호 구조 강화, 내 노이즈 강화
- 엘리베이터, 무인운반차, 산업용 모터, 섬유용 기기 등 산업용 기기 적용

**Absolute Shaft Type**

- $\Phi 58$  Series Gray Code 출력
- 용이한 취부 구조
- 인덱스 테이블, 섬유기기 등 적용

**Manual Pluse Generator**

- 부착형 & Portable Type 구성
- 주문자 로보 부착 가능
- 국내외 타사 제품과의 광범위한 호환성
- NC 공작기계 등 산업용 기기 적용



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## The definition of Rotary Encoder

■ Encoder is light sensor that detects and converts mechanical transfer or displacement into electric signal. It detects the position, speed, angle of FA System by means of converting analog signal generated from a revolution of the shaft into digital signal by the internal fixed circuit.



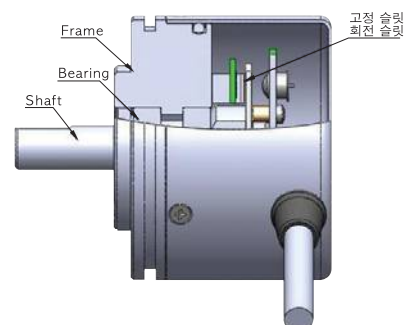
## The characteristics of Rotary Encoder

- High Resolution
  - We can provide the high resolution encoder because we make high-precision board of signs through Photo Etching method
- Easy to record the measuring value
  - It is easy to record measuring value because of digital output and safe from the error caused by careless of operator.
- High Stability
  - Since it can make a digital servo, it is not to be influenced by noise even if there is some time-delay.
- Various kinds of type
  - There are various kinds of rotary encoder with wide resolution, appearance. So the price is very cheap and any kind of type can be obtained as per the customer's request



## The Composition of Rotary Encoder

- Rotary Encoder is basically composed of equipment part, light-absorbing / light emitting part, circuit part but it may be different depending on the model.
- The equipment part is composed by shaft, frame, bearing. The light-absorbing / light emitting part are composed by light-absorbing element, light emitting element, disk/mask. The circuit part is composed by the circuit which formalizes the signal generated from light-absorbing element.





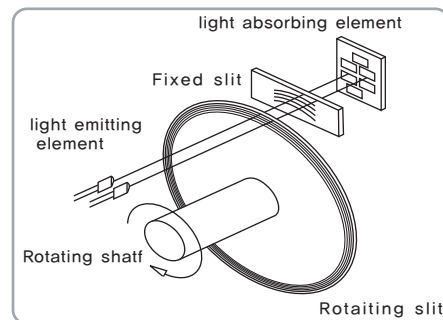
**LS** Mecapion

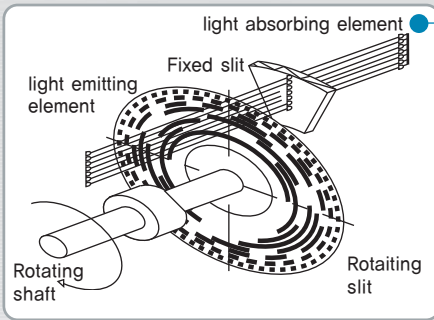


The principle of Rotary Encoder

☞ INCREMENTAL ENCODER

- The light generated from light emitting element passes through rotating and fixed slit. The light energy is converted into current through light-absorbing element and passes through fixed-waved circuit & output circuit and output as two spherical pulses which have different phase of 1/4 cycle.
- It is output as spherical wave depending on the amount of rotating displacement of the shaft.
- The external counter figures out the number of pulses and the amount of rotating displacement is detected.
- You have to set the origin to find a certain rotating displacement and add the number of pulse from the origin accumulatively.
- You can add the extra circuit to the output circuit of encoder and improve the electric resolution by increasing the output pulse 2times, 4times
- You have to find the origin newly when the power is re-provided after power failure.

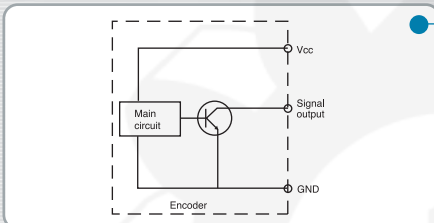




## Absolute Encoder

- The basic principle of absolute encoder is same as incremental encoder. In case of Incremental encoder, two spherical pulses which have different phase are Output, while in case of absolute encoder, it is output as digital code (Binary, BCD, Gray code)
  - The amount of rotating displacement is output as parallel  $2^n$  More the number of output code's bit is, higher the resolution is.
  - It detects the rotating position by reading the output code directly.
  - Once the origin of input rotating shaft is fixed, the rotating angle whose coordinates origin is always in the origin is output as digital code.
  - It always maintains the absolute position when the power is re-provided after power failure.

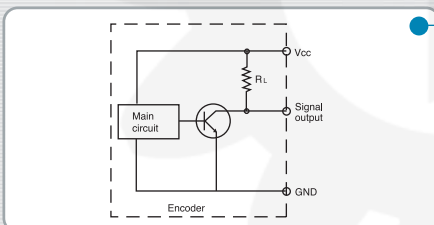
## The output circuit type of Rotary Encoder



## Open Collector

- The emitter terminal of transistor is connected to 0[V] by using NPN transistor in output side of encoder and open the collector terminal with + Vcc and use it for output terminal. It is recommended when encoder and collector does not coincide on the power voltage.

⟨Application⟩ FA for general use, Textile machine, Lubricator, Automation Machine, Injection machine, Cutting machine, Printing machine, Packaging machine

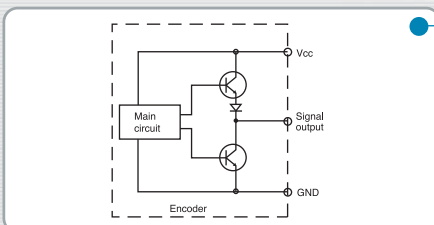


## Voltage Output

- The emitter terminal of transistor is connected to 0[V] by using NPN transistor in output side of encoder and the collector terminal is connected with + Vcc and load resistor and use it for output terminal.

It is recommended when the voltage of the applicable equipment is same as the voltage of encoder and no-load is applied to the input side of used machine.

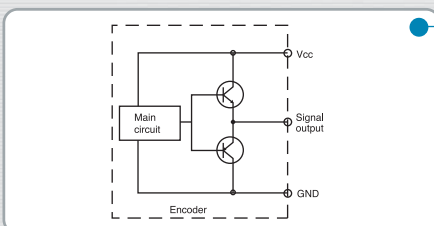
⟨Application⟩ FA for general use, Textile machine, Lubricator, Automation Machine Injection machine, Cutting machine, Printing machine, Packaging machine



## Totem Pole

- Totem pole is composed of two NPN transistor between +Vcc of encoder output circuit and 0[V], which is complement output type. If one transistor is ON, another should be OFF. The current inflows at both directions through two transistors of output side and output current flows all the time. So it has low impedance and is not much influenced by noise and deformed wave. It can be also used for voltage output and open collector type.

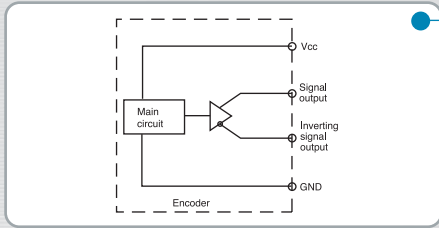
⟨Application⟩ FA for general use, Textile machine, Lubricator, Automation Machine Injection machine, Cutting machine, Printing machine, Packaging machine



## Complemental or Push-Pull Output

- It is composed of the upper PNP type transistor and the lower NPN type transistor. It is also complement output type just like Totem pole ; If one transistor is ON, another should be OFF. It has high input impedance and low output impedance so it is possible to provide large-scale power even under low impedance and is suitable for long-distance transmission because it has same phase of input/output signal and wide frequency area.

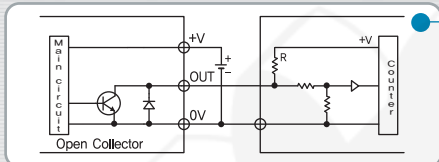
⟨Application⟩ Elevator (special customized)



### Line Driver

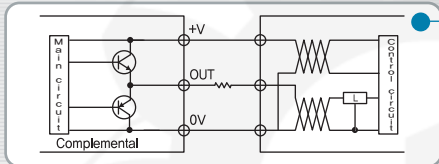
- It applies the exclusive IC(26LS31) for Line driver to the encoder output circuit. The exclusive IC for Line driver is suitable for long-distance transmission because it has high-speed response and good noise-proof. For the receiver of controller which receives the line driver output of encoder, IC(26LS32) which is corresponding to RS-422A should be used.  
(Application) AC Servo system, DC Servo System, Robot, A.G.V., NC Construction machine

## The example of output connection for Rotary Encoder



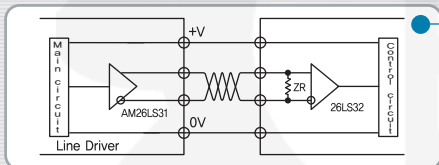
### The output connection with counter

- In case that open collector type of encoder is connected to the counter, you have to connect Pull up resistor to the receiving circuit and the resistor[R] should be set less than 5/1 of input impedance.



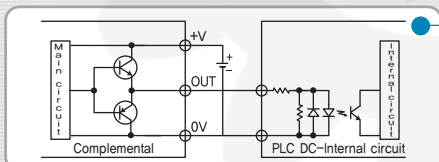
### The output connection of Complementary type

- In case of complementary output type, the current inflows all the time since two transistors complements each other. It is suitable for middle-distance transmission since it has good noise-proof and low distorted wave, which is mainly applied for elevator.



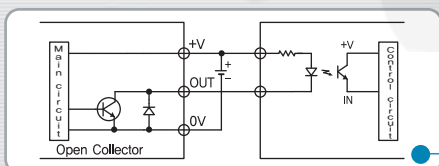
### The output connection of Line Driver type

- In case of Line driver output type, For the receiving circuit which receives the output of encoder, you have to use IC(26LS32) which is corresponding to RS422A. You have to also apply use Twist pair cable .



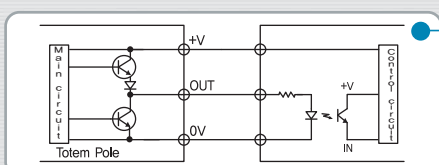
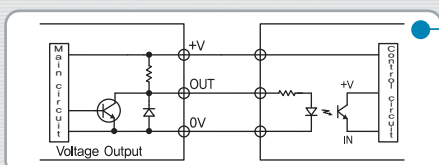
### The output connection of Encoder and PLC

- In case that you connect the encoder to the PLC, you can use them by connecting directly DC input unit of encoder and PLC. In this case, the input scanning frequency of DC input unit of PLC which receive the output of encoder should be higher than max. response frequency of encoder.(Approximately, more than 10 times)  
In case that the power is not stable when you apply the DC power of PLC to the encoder, the encoder may have malfunction so you have to use separately the stable DC power for encoder.

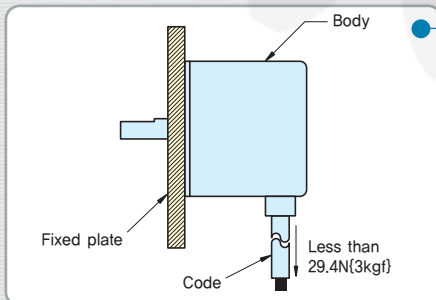
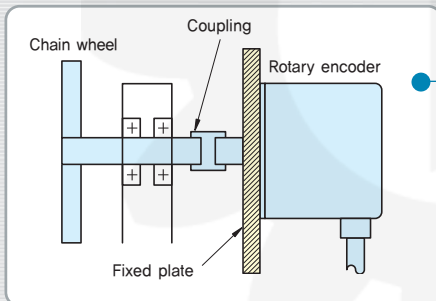
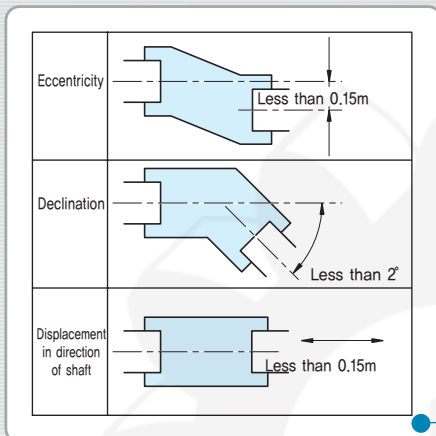


### The output connection with Photo coupler

- In case of connecting rotary encoder and photo coupler, the resistor[R] should not exceed the operating current of photo coupler and encoder's max. load current. The response of photo coupler should be more faster than max. response frequency of encoder to secure the allowance of response.



## Notice for applying Rotary Encoder



### ■ Circumstances

- Do not use rotary encoder in the below circumstances.
  - The place where the equipment may be defected due to the excessive vibration, shock
  - Nearby the equipment which emits strong magnetism, electric noise
  - The place which has inflammable, corrosive gas / the splashing water, oil / dirt
  - The place where the temperature, humidity exceeds the propriety
  - Nearby the strong alkali / acid materials
  - The place is exposed to a direct ray of light

### ■ Instructions to install encode

- Please don't splash water or oil to the body
- As rotary encoder is composed by precision components, you must handle it with care.
- In case of forward, reverse rotation, you have to check the installation direction and adjusting direction
- In case that you set the origin of the applicable equipment at Z phase of encoder, please make sure to check the position of Z phase.
- In case of gear connection, mind that you do not inflict the excessive load to the rotating shaft.
- In case of fixing with screw, please tighten with less than 0.49N.m[5kg .f.]
- In case of using coupling, make sure to install it within permitted limit.
- Please be noted that if installation error(partial disposition, declination) encoder may be broken or the life span may be shortened
- In case of connecting with chain timing belt or wheel, the extra bearing and coupling will be needed to connect encoder.

### ■ Instructions for wiring

- For Rotary encoder, please provide the power independently within the rated voltage.
- In case that you wire the coder after fixing the product, the power to pull the code should not exceed 29.4N[3kgf]
- Please check the connection to avoid the mis-wiring. In case of short, the product may be broken or damaged.
- Wiring work should be done after cutting off the power. In case that the power is on, the output circuit may be damaged.
- In case of wiring high-tension wire and power line at the same time, the malfunction caused by induction noise or damage may occur. So please use the separate wiring.
- In case that surge occurs at the used power, please suck surge by connecting surge observer between power.
- In case of no used output line, FG line, they should be insulated

### ■ Instructions in case of extending wiring

- Please make sure that you have to use Twist Pair Shield cable when you extend the rotary encoder cable.
  - Line Driver → Vcc-0V, A- $\bar{A}$ , B- $\bar{B}$ , Z- $\bar{Z}$
  - Open Collector, Voltage Output, Totem Pole, Complementary → Vcc-0V, A-0V, B-0V, Z-0V



- In case of extending the wiring, remaining voltage of output signal may be increased or the wave may be distorted due to phase to phase resistance or phase to phase capacity.
- The wiring work should be shortest to avoid induction noise.
- In case of extending the wiring, opening time of output wave will be extended and it may influence the phase difference of A, B phase.
- In case of extending the wiring, Line Driver output type is recommended. Please provide DC 5[V] of the power supply for Line Drive and be noted that the voltage drops by approximately 1[V] when you make it 100m longer.

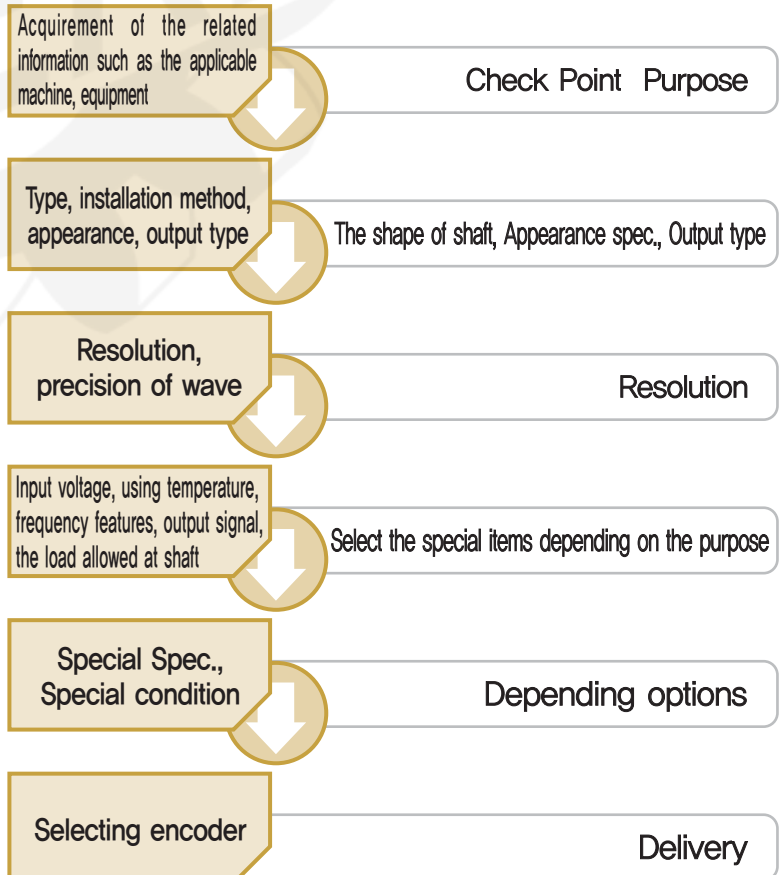
■ Instructions under vibration

- When you apply vibration to the rotary encoder, wrong pulse will occur and it leads to malfunction so you must handle it with care
- Please make sure that you do not transmit the vibration generated from rotation or stop to the encoder since higher encoder's resolution is, more wrong pulse is due to vibration.

■ Noise-control Measures

- You are requested to provide the power independently.
- In case that the transmitting distance is long, please insert a number of  $\mu F$  Condenser which is for noise filter between case ground circuit and ground
- Keep away from the source of noise and the wiring work for encoder should be shortest.

The procedures to select the rotary encoder



## Terms

### ■ Resolution[P/R]

- It means the number of pulse which is output from 1 revolution of the rotating shaft of rotary encoder. In case of Incremental encoder, it can be indicated in the number of rotating slits, in case of Absolute encoder, it can be indicated in number of division or bit.

### ■ Power voltage ( Symbol : [Vcc], Unit : [V])

- It means the voltage which is applied to the rotary encoder. Please make sure to check the power voltage of the related product and input the voltage within the limits of rated voltage

### ■ Consuming current(Symbol ; [Icc], Unit : [m A])

- It means the current which encoder consumes when the power is applied to the encoder. Please make sure to use it within rated consuming current.

### ■ Moving Torque ( Symbol : [Tr], Unit : [g-cm])

- It means the minimum power to rotate the rotation shaft when rotary encoder stops. Generally, the torque is less than the moving torque.

### ■ The max. response frequency ( Symbol : [fr], Unit : [kHz])

- It means the max output pulse which rotary encoder can response per 1 second.
- Max. response frequency = Max. rpm/60 x resolution
- Please make sure to use it within max. allowable rpm and determine the resolution within rated max. rpm.

### ■ Max. allowable rpm. ( Symbol ; [Nr], Unit : [rpm])

- It means the max. rpm which rotary encoder allows mechanically and it may affect the lifespan of encoder. Please make sure to use it within rated limits.

### ■ Allowable shaft load (Unit : [kgf])

- It indicates the allowed radial and axial load when the shaft is rotated.

### ■ Position deflection of allowable shaft (Unit : [mm])

- It indicates the position deflection when coupling or shaft is connected to the shaft of rotary encoder.

### ■ Bearing lifespan ( Symbol : [hs], Unit : [hrs])

- The bearing lifespan of rotary encoder is in inverse proportion to the load of rpm. In case that input rpm and shaft load are lower, it depends on the lifespan of grease.

### ■ Forward rotation ( Symbol : [CW])

- It means CW rotation in direction of rotating shaft. In case of Incremental encoder, A phase is output before B phase and absolute encoder indicates the direction to increase code.

### ■ A, B Phase

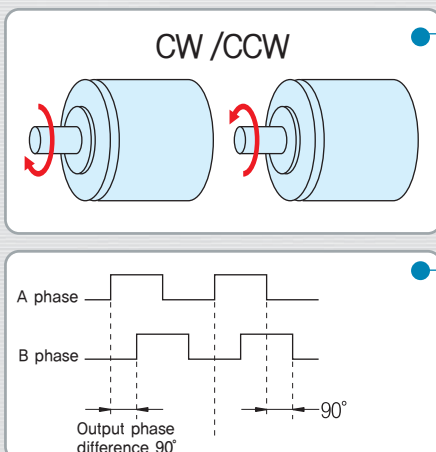
- The output signal of A, B phase are output with 90° of phase difference. It is the signal to discriminate the rotation direction.

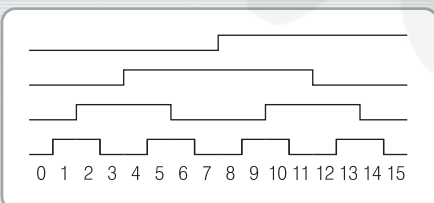
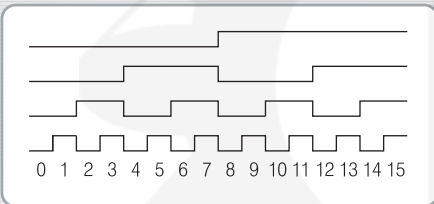
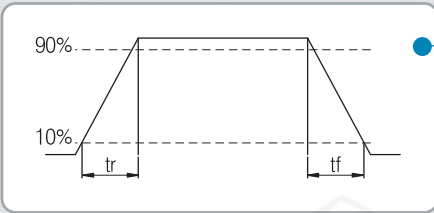
### ■ Z phase

- One Z phase is output per one rotation, which is called origin signal.

### ■ Isolation Resistor (Unit : [MΩ])

- It means the resistance between whole terminal of electric circuit and Case Ground





■ Vibration-proof (Unit : [G])

- It means the ability that rotary encoder is proof against the vibration, which is based on the vibration test

■ Impact-Proof (Unit : [G])

- It indicates the ability that rotary encoder is proof against the impact when it falls from height of 1m twice in direction of X, Y, Z axis

■ Rising(tr) / Decline(tf) Time

- Rising time : The time to reach the initial 10%~90% (When signal level is 100%)
- Decline time : The time to reach 90%~100% (When signal level is 100%)

■ Using temperature (Unit : [°C])

- It means the range of surrounding temperature to meet the performance of rotary encoder.

■ Maintaining Temperature (Unit : [°C])

- It means the range of temperature not to flame the performance of rotary encoder (suspension of power supply)

■ Bias Condenser

- It means the condenser which is connected between 0[V] of electric circuit of rotary encoder and encoder frame.

■ Binary Encoder

- It is one of output coder of Absolute encoder, which is the basic code to process digital signal. However, both 0 and 1 may be changed at the same time and the data may be mis-read due to time error.

| Decimal        | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|----------------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 2 <sup>3</sup> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1  | 1  | 1  | 1  | 1  | 1  |
| 2 <sup>2</sup> | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0  | 0  | 1  | 1  | 1  | 1  |
| 2 <sup>1</sup> | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1  | 1  | 0  | 0  | 1  | 1  |
| 2 <sup>0</sup> | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0  | 1  | 0  | 1  | 0  | 1  |

■ Gray Code

- It can avoid the same error as the binary coder to complement the weak point of it.  
In case of changing the number, either 0 or 1 may be changed.

| Decimal        | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|----------------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 2 <sup>3</sup> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1  | 1  | 1  | 1  | 1  | 1  |
| 2 <sup>2</sup> | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 0  | 0  | 0  | 0  |
| 2 <sup>1</sup> | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1  | 1  | 1  | 1  | 0  | 0  |
| 2 <sup>0</sup> | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1  | 0  | 0  | 1  | 1  | 0  |

■ BCD Code

- It is one of output coder of Absolute encoder, which indicates the number (up to 10) as the binary system. It can be usually used for controller of system and counter.

| Decimal                         | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---------------------------------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 2 <sup>3</sup> ×10 <sup>0</sup> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0  | 0  | 0  | 0  | 0  | 0  |
| 2 <sup>2</sup> ×10 <sup>0</sup> | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0  | 0  | 0  | 0  | 1  | 1  |
| 2 <sup>1</sup> ×10 <sup>0</sup> | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0  | 0  | 1  | 1  | 0  | 0  |
| 2 <sup>0</sup> ×10 <sup>0</sup> | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0  | 1  | 0  | 1  | 0  | 1  |

# INCREMENTAL SHAFT TYPE S30 Series

- Features : Small size and various resolution  
200~1024P/R(4 Class), Wide ranging power voltage,  
Customized design, Prompt delivery



## Model

INCREMENTAL  
SHAFT TYPE  
Outer Diameter Ø30

Shaft Size

4 : Ø4

**S30 - 4 -**     **-**   **-**

Resolution(P/R)

200 500 1000  
1024

Output Signal

**B** : A, B  
**Z** : A, B, Z  
**U** : A,  $\bar{A}$ , B,  $\bar{B}$   
**V** : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$

Output Form

**O** : Open Collector  
**V** : Voltage Output  
**L** : Line Driver

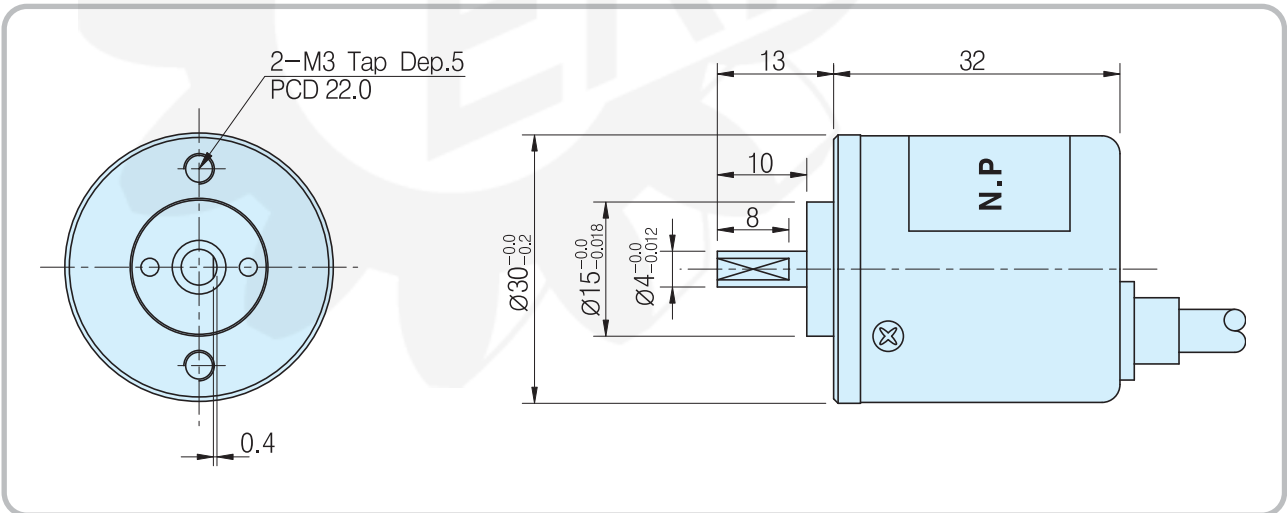
Cable Length

**1** : 1[M]  
**2** : 2[M]  
**3** : 3[M]  
**4** : 5[M]  
**5** : 10[M]

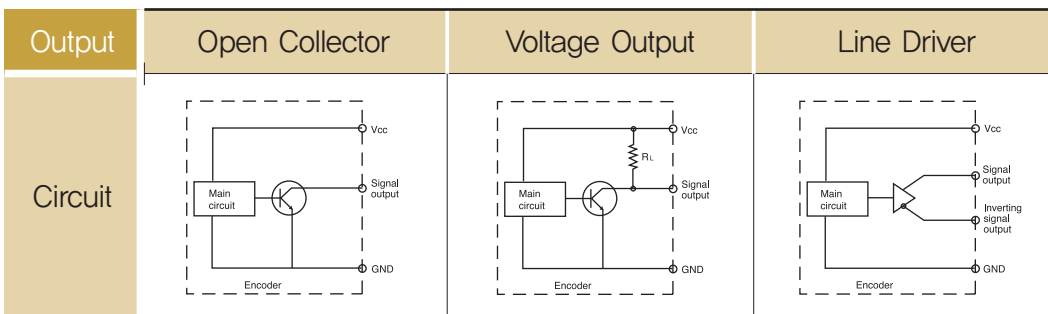


The sep(c) of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit



## Electrical Spec.

| Output type                              | Open Collector  | Voltage Output                                  | Line Driver                          |
|--|---|---|--------------------------------------|
| Power Supply                             | DC +12[V] ~ +15[V]<br>Ripple p-p : less than 5%   | DC +12[V] ~ +15[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p: less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 70mA Max  | 150mA Max                            |
| Maximum Response Frequency               | 150 KHz (200 ~ 1024 P/R)  |   |                                      |
| Output voltage                           | Less than $V_L$ 0.5[V] / More than $V_H$ 2.5[V] (In case of inputting +5V), /More than $V_H$ 10[V](In case of inputting +15V) |   |                                      |
| Output current                           | Less than 20mA  | Less than 20mA                                  | Less than 20mA                       |
| Rising, decline time                     | Less than 3 $\mu$ s   | Less than 3 $\mu$ s                             | Less than 1 $\mu$ s                  |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]                          |   |                                      |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 50g – cm Max  |
| Maximum number of revolution           | 3000 rpm  |
| Bearing lifetime                       | 20,000[hr](In case of rotating by 3000rpm)            |
| Allowable Shaft Load                   | Radial : 1.8kg Max<br>Axial : 0.9kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 120g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ +85% RH                  |
| Preserving Humidity   | 30% ~ +90% RH                  |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

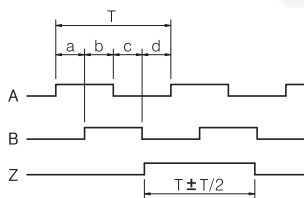
CW  $\Rightarrow$  Clockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/8$$

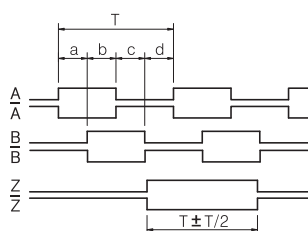
$$a, b, c, d = T/4 \pm T/8$$



## Open Collector, Voltage Output



## Line Driver



## Connection Table

| Cable's Color | Connection Table              |               |
|---------------|-------------------------------|---------------|
|               | Open Collector Voltage Output | Line Driver   |
| Red           | Vcc                           | Vcc           |
| Black         | GND                           | GND           |
| Green         | A Sig                         | A Sig         |
| Blue          | -                             | $\bar{A}$ Sig |
| White         | B Sig                         | B Sig         |
| Pink          | -                             | $\bar{B}$ Sig |
| Yellow        | Z Sig                         | Z Sig         |
| Orange        | -                             | $\bar{Z}$ Sig |
| Shield        | CASE Shield                   | CASE Shield   |

INCREMENTAL  
SHAFT TYPE

# S40 Series

- Features : Various resolution, 10~3600 P/R(29 Class)
- Wide ranging power voltage, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
SHAFT TYPE  
Outer Diameter  $\varnothing 40$

Shaft Size

6 :  $\varnothing 6$  ※Option : 5 :  $\varnothing 5$

**S40 - 6 -**             -       -   

| Resolution(P/R)          |
|--------------------------|
| 0010 0030 0048 0050 0060 |
| 0072 0075 0100 0120 0125 |
| 0192 0200 0250 0256 0300 |
| 0360 0400 0500 0512 0600 |
| 0720 1000 1024 1200 2000 |
| 2048 2500 3000 3600      |

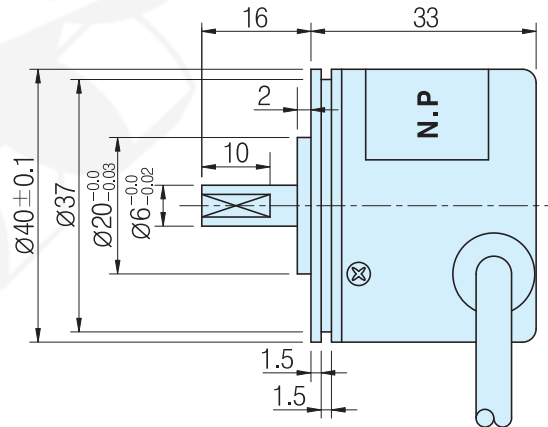
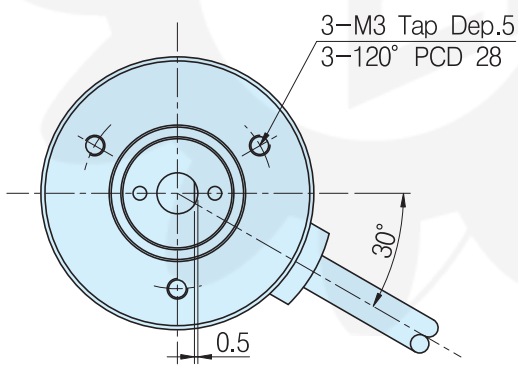
| Output Signal   |
|---|
| <b>B</b> : A, B                                       |
| <b>Z</b> : A, B, Z                                    |
| <b>U</b> : A, $\bar{A}$ , B, $\bar{B}$                |
| <b>V</b> : A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$ |

| Output Form               |
|---------------------------|
| <b>O</b> : Open Collector |
| <b>V</b> : Voltage Output |
| <b>C</b> : Complemental   |
| <b>T</b> : Totem Pole     |
| <b>L</b> : Line Driver    |

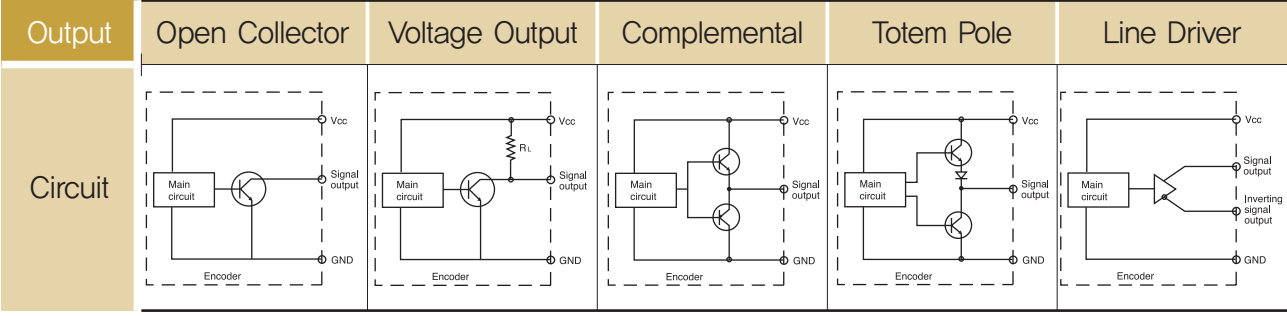
| Cable Length     |
|------------------|
| <b>1</b> : 1[M]  |
| <b>2</b> : 2[M]  |
| <b>3</b> : 3[M]  |
| <b>4</b> : 5[M]  |
| <b>5</b> : 10[M] |

The sepc) of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit



## Electrical Spec.

| Output type                              | Open Collector  | Voltage Output                                 | Complemental                                   | Totem Pole                                    | Line Driver                           |
|--|---|--|--|---|---------------------------------------|
| Power Supply                             | DC +5[V] ~ +24[V]<br>Ripple p-p : less than 5%  | DC +5[V] ~ +24[V]<br>Ripple p-p : less than 5% | DC +15[V], +24[V]<br>Ripple p-p : less than 5% | DC +5[V] ~ 24[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 70mA Max                                       | 150mA Max                                      | 150mA Max                                     | 150mA Max                             |
| Maximum Response Frequency               | 150 KHz (10 ~ 2048 P/R) / 300 KHz (2500 ~ 3600 P/R)   |  |  |   |                                       |
| Output voltage                           | Less than $V_i \cdot 0.5[V]$ / More than $V_i \cdot 2.5[V]$ (In case of inputting +5V), / More than $V_i \cdot 10[V]$ (In case of inputting +15V) / More than $V_i \cdot 18[V]$ (In case of inputting +24V) |  |  |   |                                       |
| Output current                           | Less than 20mA  | Less than 20mA                                 | Less than 10mA                                 | Less than 10mA                                | Less than 20mA                        |
| Rising, decline time                     | Less than 3 $\mu$ s   | Less than 3 $\mu$ s                            | Less than 1 $\mu$ s                            | Less than 1 $\mu$ s                           | Less than 0,1 $\mu$ s                 |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]  |  |  |   |                                       |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 50g – cm Max  |
| Maximum number of revolution           | 7000 rpm  |
| Bearing lifetime                       | 20,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 2,2kg Max<br>Axial : 1,1kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,05 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 150g  |

## Rigid Spec.

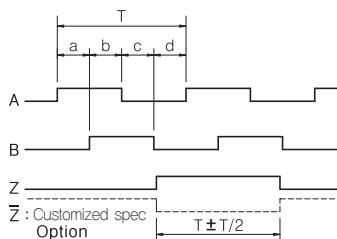
|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 85% RH                   |
| Preserving Humidity   | 30% ~ 90% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

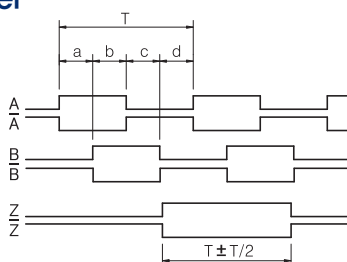
CW  $\Rightarrow$  Clockwise viewed from shaft end  
 $a + b, c + d = T/2 \pm T/10$   
 $a, b, c, d = T/4 \pm T/10$



## Open Collector, Voltage Output Complemental, Totem Pole



## Line Driver



## Connection Table

| Cable's Color | Connection Table   |               |
|---------------|--|---------------|
|               | Open Collector<br>Voltage Output<br>Complemental<br>Totem Pole | Line Driver   |
| Red           | Vcc  | Vcc           |
| Black         | GND  | GND           |
| Green         | A Sig  | A Sig         |
| Blue          | -  | $\bar{A}$ Sig |
| White         | B Sig  | B Sig         |
| Pink          | -  | $\bar{B}$ Sig |
| Yellow        | Z Sig  | Z Sig         |
| Orange        | -  | $\bar{Z}$ Sig |
| Shield        | CASE Shield  | CASE Shield   |

INCREMENTAL  
SHAFT TYPE

# S48 Series

- Features : Various resolution, 10~6000 P/R(31 class)  
Wide ranging power voltage, Customized design,  
Prompt delivery



## Model

INCREMENTAL  
SHAFT TYPE  
Outer Diameter  $\varnothing 48$

### Shaft Size

■ 8 :  $\varnothing 8$  ※Option : 6 :  $\varnothing 6$

**S48 - 8 -**         **-**     **-**   **-**  

| Resolution(P/R)          |
|--------------------------|
| 0010 0030 0048 0050 0060 |
| 0072 0075 0100 0120 0125 |
| 0192 0200 0250 0256 0300 |
| 0360 0400 0500 0512 0600 |
| 0720 1000 1024 1200 2000 |
| 2048 2500 3000 3600 5000 |
| 6000                     |

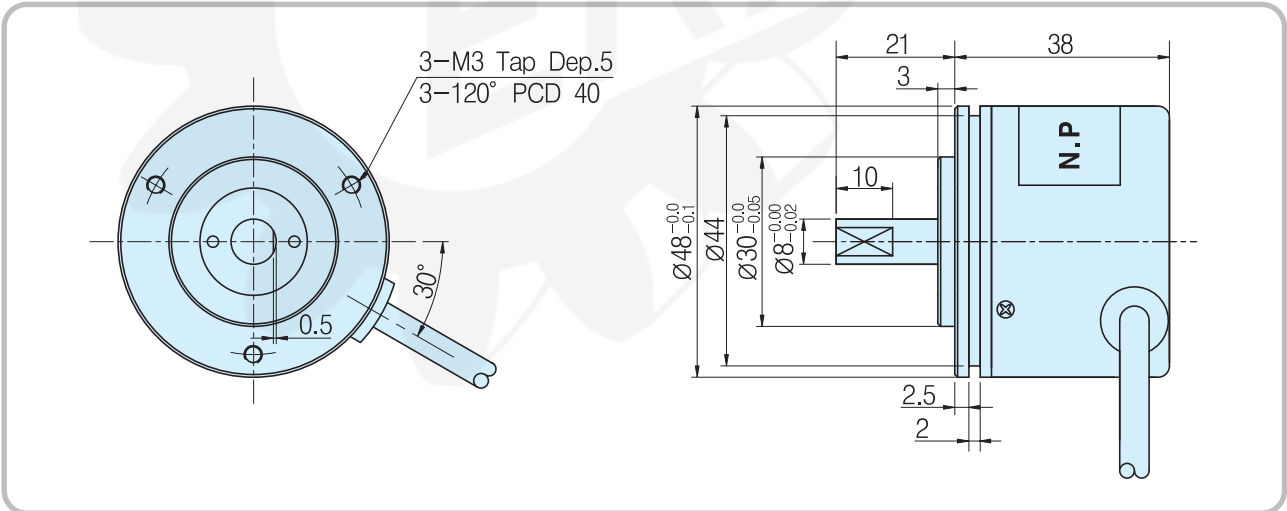
| Output Signal                                    |
|--|
| ■ B : A, B                                       |
| ■ Z : A, B, Z                                    |
| ■ U : A, $\bar{A}$ , B, $\bar{B}$                |
| ■ V : A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$ |

| Output Form          |
|----------------------|
| ■ O : Open Collector |
| ■ V : Voltage Output |
| ■ C : Complemental   |
| ■ T : Totem Pole     |
| ■ L : Line Driver    |

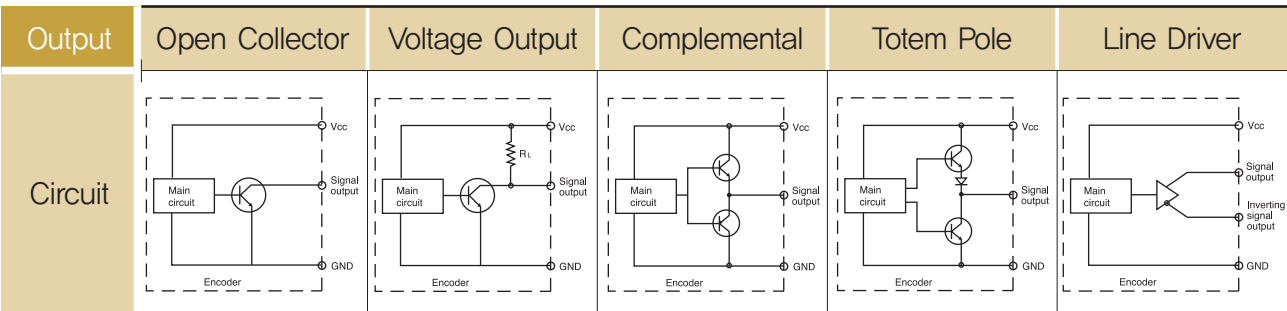
| Cable Length |
|--------------|
| ■ 1 : 1[M]   |
| ■ 2 : 2[M]   |
| ■ 3 : 3[M]   |
| ■ 4 : 5[M]   |
| ■ 5 : 10[M]  |

The sepl of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit





## Electrical Spec.

| Output type                              | Open Collector  | Voltage Output                                 | Complemental                                   | Totem Pole                                    | Line Driver                           |
|--|---|--|--|---|---------------------------------------|
| Power Supply                             | DC +5[V] ~ +24[V]<br>Ripple p-p : less than 5%  | DC +5[V] ~ +24[V]<br>Ripple p-p : less than 5% | DC +15[V], +24[V]<br>Ripple p-p : less than 5% | DC +5[V] ~ 24[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 70mA Max                                       | 150mA Max                                      | 150mA Max                                     | 150mA Max                             |
| Maximum Response Frequency               | 150 KHz (10 ~ 2048 P/R) / 300 KHz (2500 ~ 6000 P/R)   |  |  |   |                                       |
| Output voltage                           | Less than $V_i \cdot 0.5[V]$ / More than $V_i \cdot 2.5[V]$ (In case of inputting +5V), / More than $V_i \cdot 10[V]$ (In case of inputting +15V) / More than $V_i \cdot 18[V]$ (In case of inputting +24V) |  |  |   |                                       |
| Output current                           | Less than 20mA  | Less than 20mA                                 | Less than 10mA                                 | Less than 10mA                                | Less than 20mA                        |
| Rising, decline time                     | Less than 3 $\mu$ s   | Less than 3 $\mu$ s                            | Less than 1 $\mu$ s                            | Less than 1 $\mu$ s                           | Less than 0,1 $\mu$ s                 |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]  |  |  |   |                                       |

※ In case of more than 5,000P/R, the input power should be +5[V]~+15[V](Except Line driver)

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 80g – cm Max  |
| Maximum number of revolution           | 6000 rpm  |
| Bearing lifetime                       | 27,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 2.5kg Max<br>Axial : 1.3kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 206g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 85% RH                   |
| Preserving Humidity   | 30% ~ 90% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 100G                           |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

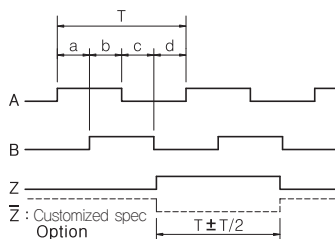
CW → Clockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

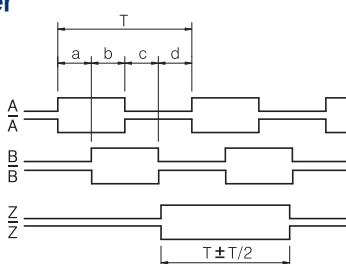
$$a, b, c, d = T/4 \pm T/10$$



## Open Collector, Voltage Output Complemental, Totem Pole



## Line Driver



## Connection Table

| Cable's Color | Connection Table   |               |
|---------------|--|---------------|
|               | Open Collector<br>Voltage Output<br>Complemental<br>Totem Pole | Line Driver   |
| Red           | Vcc  | Vcc           |
| Black         | GND  | GND           |
| Green         | A Sig  | A Sig         |
| Blue          | -  | $\bar{A}$ Sig |
| White         | B Sig  | B Sig         |
| Pink          | -  | $\bar{B}$ Sig |
| Yellow        | Z Sig  | Z Sig         |
| Orange        | -  | $\bar{Z}$ Sig |
| Shield        | CASE Shield  | CASE Shield   |

# INCREMENTAL SHAFT TYPE S58 Series

- Feature : Various resolution, 10~6000P/R
- Wide range of Power supply, Customized Design
- Prompt delivery



## Model

INCREMENTAL  
SHAFT TYPE

Shaft Size  
Ø6, Ø10

Resolution



- 1) Round Connector 8-Pin socket
- 2) Cable Output
- 3) Only for C & D of Connecting type this code will be issued.

**S58 - 10 -** [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]

### Resolution(P/R)

- 0010 0030 0048 0050 0060
- 0072 0075 0100 0120 0125
- 0192 0200 0250 0256 0300
- 0360 0400 0500 0512 0600
- 0720 1000 1024 1200 2000
- 2048 2500 3000 3600 5000
- 6000

### Output Signal

- B : A, B
- Z : A, B, Z
- U : A,  $\bar{A}$ , B,  $\bar{B}$
- V : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$

### Flange Type

- C : Clamping Flange
- S : Synchro Flange

### Output Form

- O : Open Collector
- V : Voltage Output
- C : Complemental
- T : Totem pole
- L : Line Driver

### Cable Connecting Type

- A : Circular Connector, radial<sup>1)</sup>
- B : Circular Connector, axial<sup>1)</sup>
- C : Cable, radial<sup>2)</sup>
- D : Cable, axial<sup>2)</sup>

### Power supply

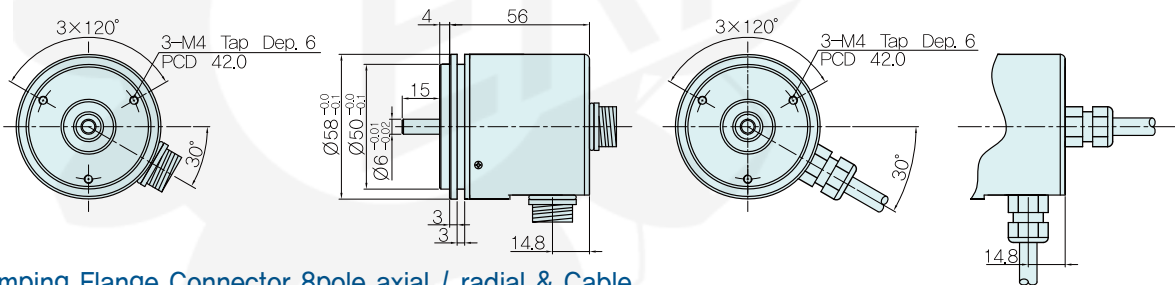
- 1 : 5~24V
- 2 : 15V
- 3 : 24V
- 4 : 5V

### Cable Length

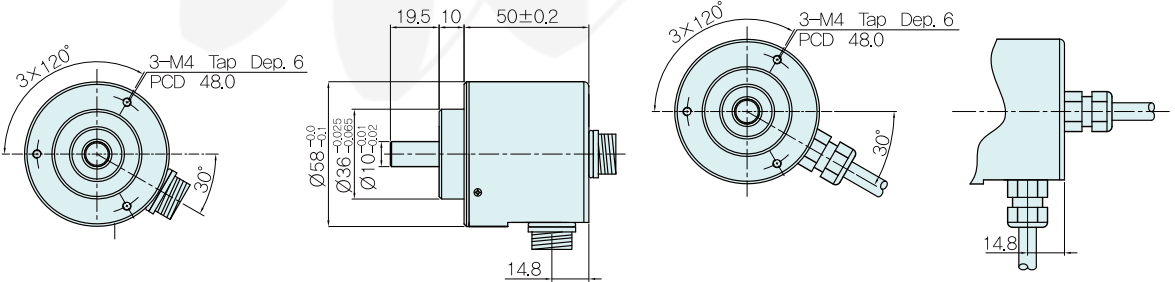
- 1 : 1.0m
- A : 10.0m

## External Dimension

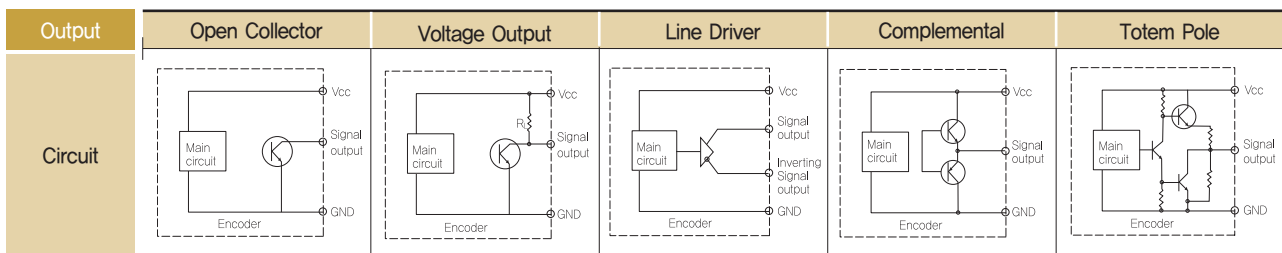
### Synchro Flange Connector 8pole axial / radial & Cable



### Clamping Flange Connector 8pole axial / radial & Cable



## Output Circuit



## Electrical Spec.

### • Electrical Spec.

|                            |  |              |                     |
|----------------------------|--|--------------|---------------------|
| Resolution                 |  | 10~6000P/R   |                     |
| Output Type                | Output Form  | Power Supply | Current Consumption |
|                            | Voltage Output, Open Collector, Complemental, Totem Pole | 5~24V        | 70mA                |
|                            | Line Driver  | 5V           | 1500mA              |
|                            | Line Driver <sup>(1)</sup>                               | 5~24V        | 300mA               |
| Maximum Response Frequency |  | 10~2048p/r   | 150kHz              |
|                            |  | 2500~6000p/r | 300kHz              |

※ The pulse is available up to 3,600P/R for Complemental type

※ In case of more than 5,000P/R, the input power should be +5[V]~+15[V](Except Line driver)



### • Rigid Spec.

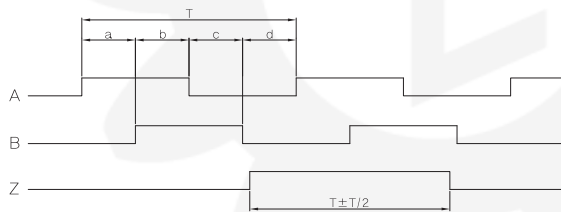
|                       |                            |
|-----------------------|----------------------------|
| Operating Temp. Range | -10°C ~+70°C (No Freezing) |
| Preserving Temp       | -20°C ~+85°C               |
| Using Temp            | 35%~85%RH                  |
| Preserving Humidity   | 35%~90%RH                  |
| Internal Vibration    | 5G                         |
| Internal Shock        | 100G                       |
| Degree of Protection  | IP 65                      |

### • Mechanical Spec.

|                      |                        |
|----------------------|------------------------|
| Starting Torque      | 100 gf-cm              |
| Max. No. of Rotation | 6000rpm                |
| Bearing Lifetime     | 30,000Hr(W/5000rpm)    |
| Allowable Shaft Load | Radial : 2,2kg Max.    |
|                      | Axial : 1,1kg Max.     |
| Cable Type           | 4P(AWG26) Shield Cable |

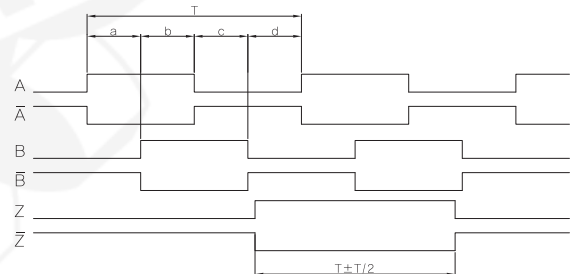
## Signal Spec.

Voltage output, Open collector, Complemental, Totem pole



- $T=360^\circ/N$  (N : Resolution)
- $a+b, c+d = T/2 \pm T/10$
- A, B Phase has  $90^\circ$  of Difference
- Z Phase is Origin signal

Line Driver



→ CW from shaft end

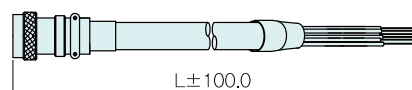
## Cable Spec.

| Cable color | Voltage output, Open collector, Complemental, Totem pole | Line driver   |
|-------------|--|---------------|
| □ Red       | DC+5~+24V  | DC+5V/+5~+24V |
| □ Black     | GROUND   | GROUND        |
| □ Green     | A  | A             |
| □ Blue      | -  | $\bar{A}$     |
| □ White     | B  | B             |
| □ Pink      | -  | $\bar{B}$     |
| □ Yellow    | Z  | Z             |
| □ Orange    | -  | $\bar{Z}$     |
| Shield      | CASE SHIELD  |               |

## Extended Cable

| Length(L) | Ordering Code |             |             |
|-----------|---------------|-------------|-------------|
|           | VL            | ZO/ZV/ZC/ZT | BO/BV/BC/BT |
| 1.0m      | OS05BAK01xA   | OS05BAK02xA | OS05BAK04xA |
| 3.0m      | OS05BAK01xB   | OS05BAK02xB | OS05BAK04xB |
| 5.0m      | OS05BAK01xC   | OS05BAK02xC | OS05BAK04xC |
| 7.0m      | OS05BAK01xD   | OS05BAK02xD | OS05BAK04xD |
| 10.0m     | OS05BAK01xE   | OS05BAK02xE | OS05BAK04xE |

Body : SCN16-8RN  
Extended Cable : SCN16-8P



# INCREMENTAL SHAFT TYPE S66 Series

- Features : Various resolution, 10~6000 P/R(31 class )
- Wide ranging power voltage, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
SHAFT TYPE  
Outer Diameter Ø66

Shaft Size

5 : Ø5

**S66 - 5 -**     **-**   **-**

### Resolution(P/R)

- 0010 0030 0048 0050 0060
- 0072 0075 0100 0120 0125
- 0192 0200 0250 0256 0300
- 0360 0400 0500 0512 0600
- 0720 1000 1024 1200 2000
- 2048 2500 3000 3600 5000
- 6000

### Output Signal

- B** : A, B
- Z** : A, B, Z
- U** : A,  $\bar{A}$ , B,  $\bar{B}$
- V** : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$

### Output Form

- O** : Open Collector
- V** : Voltage Output
- C** : Complemental
- T** : Totem Pole
- L** : Line Driver

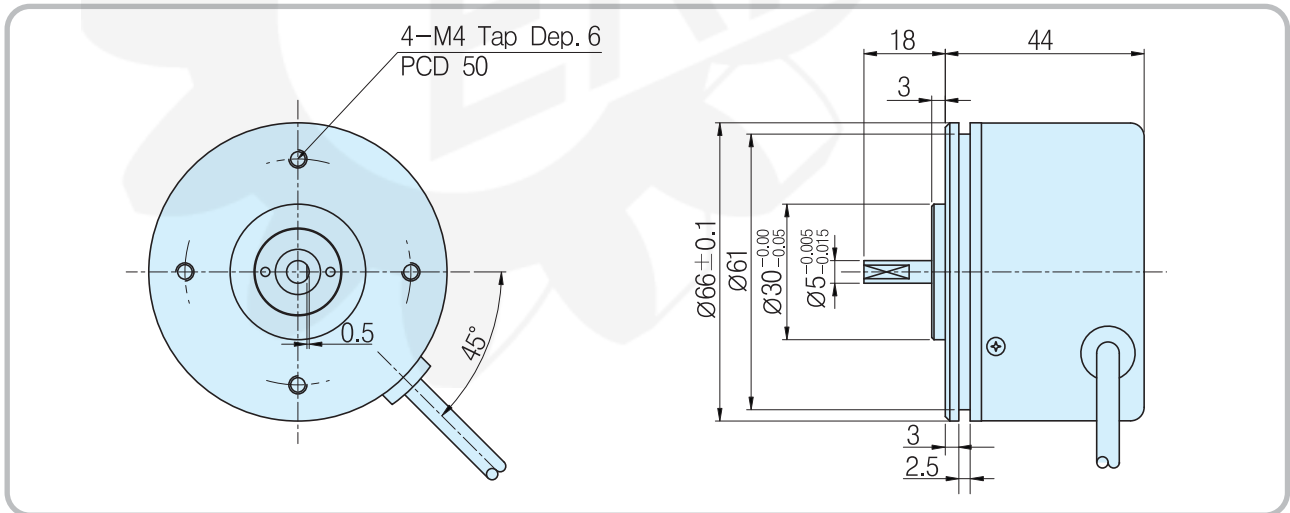
### Cable Length

- 1** : 1[M]
- 2** : 2[M]
- 3** : 3[M]
- 4** : 5[M]
- 5** : 10[M]

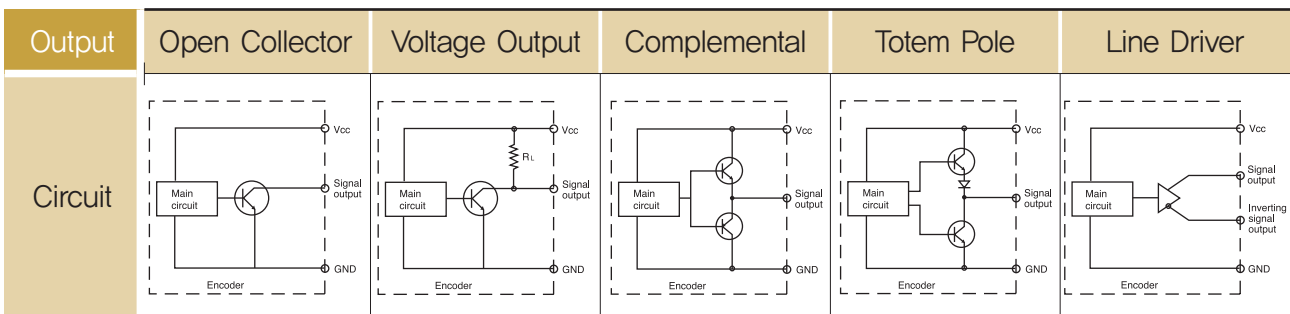


The sepl of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit



## Electrical Spec.

| Output type                              | Open Collector  | Voltage Output                                 | Complemental                                   | Totem Pole                                    | Line Driver                           |
|--|---|--|--|---|---------------------------------------|
| Power Supply                             | DC +5[V] ~ +24[V]<br>Ripple p-p : less than 5%  | DC +5[V] ~ +24[V]<br>Ripple p-p : less than 5% | DC +15[V], +24[V]<br>Ripple p-p : less than 5% | DC +5[V] ~ 24[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 70mA Max                                       | 150mA Max                                      | 150mA Max                                     | 150mA Max                             |
| Maximum Response Frequency               | 150 KHz (10 ~ 2048 P/R) / 300 KHz (2500 ~ 6000 P/R)   |  |  |   |                                       |
| Output voltage                           | Less than $V_i \cdot 0.5[V]$ / More than $V_i \cdot 2.5[V]$ (In case of inputting +5V), / More than $V_i \cdot 10[V]$ (In case of inputting +15V) / More than $V_i \cdot 18[V]$ (In case of inputting +24V) |  |  |   |                                       |
| Output current                           | Less than 20mA  | Less than 20mA                                 | Less than 10mA                                 | Less than 10mA                                | Less than 20mA                        |
| Rising, decline time                     | Less than 3 $\mu$ s   | Less than 3 $\mu$ s                            | Less than 1 $\mu$ s                            | Less than 1 $\mu$ s                           | Less than 0,1 $\mu$ s                 |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]  |  |  |   |                                       |

※ In case of more than 5,000P/R, the input power should be +5[V]~+15[V](Except Line driver)

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 80g – cm Max  |
| Maximum number of revolution           | 6000 rpm  |
| Bearing lifetime                       | 27,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 2,5kg Max<br>Axial : 1,3kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,05 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 250g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 85% RH                   |
| Preserving Humidity   | 30% ~ 90% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

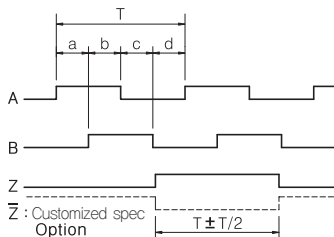
CW → Clockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

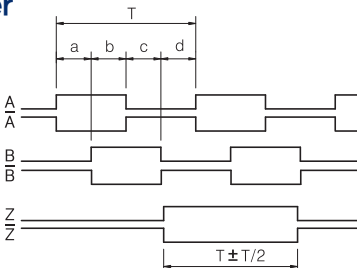
$$a, b, c, d = T/4 \pm T/10$$



## Open Collector, Voltage Output Complemental, Totem Pole



## Line Driver



## Connection Table

| Cable's Color | Connection Table   |               |
|---------------|--|---------------|
|               | Open Collector<br>Voltage Output<br>Complemental<br>Totem Pole | Line Driver   |
| Red           | Vcc  | Vcc           |
| Black         | GND  | GND           |
| Green         | A Sig  | A Sig         |
| Blue          | -  | $\bar{A}$ Sig |
| White         | B Sig  | B Sig         |
| Pink          | -  | $\bar{B}$ Sig |
| Yellow        | Z Sig  | Z Sig         |
| Orange        | -  | $\bar{Z}$ Sig |
| Shield        | CASE Shield  | CASE Shield   |

# INCREMENTAL SHAFT TYPE S68A Series

- Features : Machine tools, Industrial robot,  
Rigid shaft type (Industrial robot),  
Various resolution



## Model

INCREMENTAL  
SHAFT TYPE  
Outer Diameter Ø68

### Shaft Size

15 : Ø15 ※Option : 10 : Ø10

**S68A - 15 -**     -

### Resolution(P/R)

0100 0500 1000  
1024 2000 2048

### Output Signal

Z : A, B, Z  
U : A,  $\bar{A}$ , B,  $\bar{B}$   
V : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$

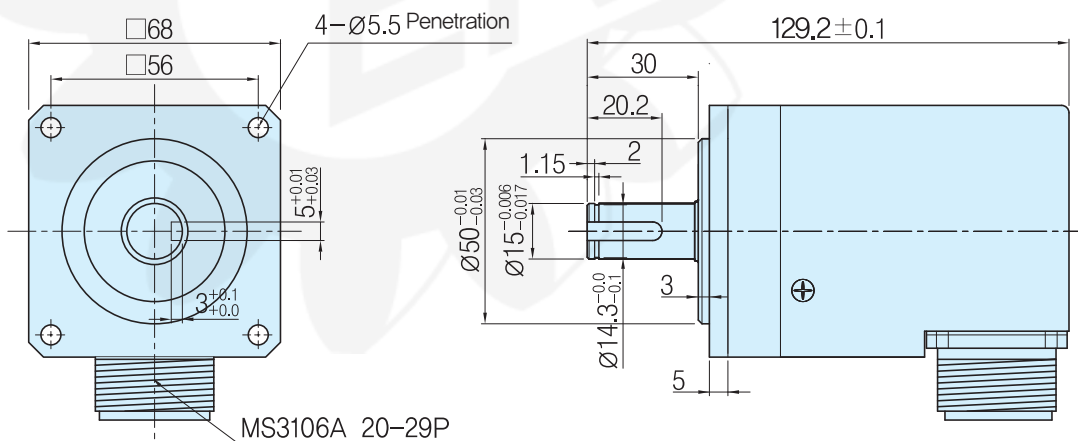
### Output Form

O : Open Collector  
V : Voltage Output  
T : Totem Pole  
L : Line Driver

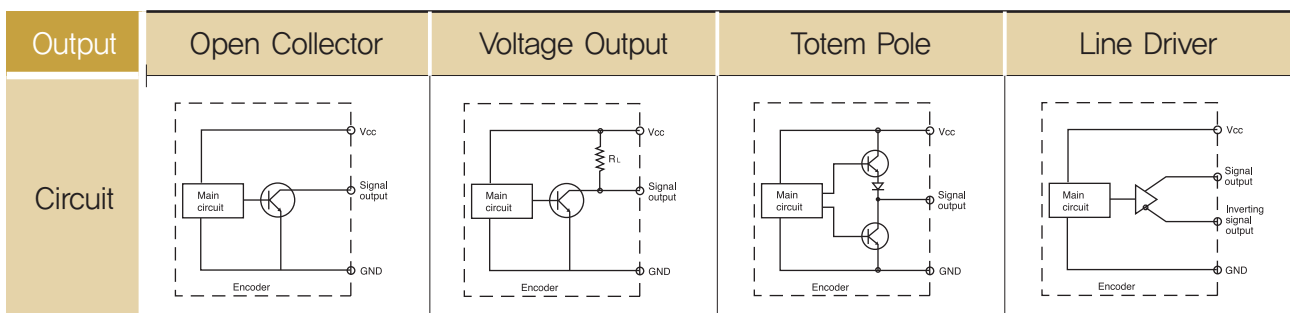


The sepl of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit



## Electrical Spec.

| Output type                              | Open Collector  | Voltage Output                         | Totem Pole                                    | Line Driver                           |
|--|---|--|---|---------------------------------------|
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%  | DC +15[V]<br>Ripple p-p : less than 5% | DC +5[V] ~ 24[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 70mA Max                               | 150mA Max                                     | 150mA Max                             |
| Maximum Response Frequency               | 150 KHz (100 ~ 2048 P/R)  |  |   |                                       |
| Output voltage                           | Less than $V_i \cdot 0.5[V]$ / More than $V_i \cdot 2.5[V]$ (In case of inputting +5V), / More than $V_i \cdot 10[V]$ (In case of inputting +15V) / More than $V_i \cdot 18[V]$ (In case of inputting +24V) |  |   |                                       |
| Output current                           | Less than 20mA  | Less than 20mA                         | Less than 10mA                                | Less than 20mA                        |
| Rising, decline time                     | Less than 3 $\mu$ s   | Less than 3 $\mu$ s                    | Less than 1 $\mu$ s                           | Less than 0.1 $\mu$ s                 |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]  |  |   |                                       |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 800g – cm Max   |
| Maximum number of revolution           | 8000 rpm  |
| Bearing lifetime                       | 100,000[hr](In case of rotating by 6000rpm)           |
| Allowable Shaft Load                   | Radial : 5kg Max<br>Axial : 5kg Max                   |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | MS3102A 20-29P  |
| weight                                 | 720g  |

## Rigid Spec.

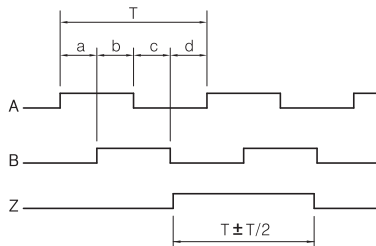
|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ +85% RH                  |
| Preserving Humidity   | 35% ~ +95% RH                  |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 54                          |

## Output Phase Shift

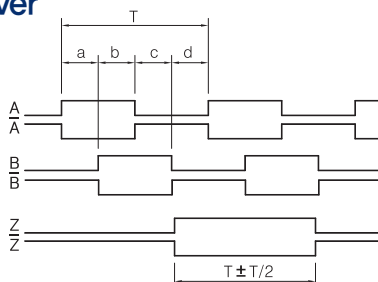
CW  $\Rightarrow$  Clockwise viewed from shaft end  
 $a + b, c + d = T/2 \pm T/10$   
 $a, b, c, d = T/4 \pm T/10$



## Open Collector, Voltage Output Totem Pole



## Line Driver



## Connection Table

| Cable's Color | Connection Table                               |               |
|---------------|--|---------------|
|               | Open Collector<br>Voltage Output<br>Totem Pole | Line Driver   |
| H             | Vcc  | Vcc           |
| K,M           | GND  | GND           |
| A             | A Sig  | A Sig         |
| N             | -  | $\bar{A}$ Sig |
| C             | B Sig  | B Sig         |
| R             | -  | $\bar{B}$ Sig |
| B             | Z Sig  | Z Sig         |
| P             | -  | $\bar{Z}$ Sig |
| T             | CASE Shield                                    | CASE Shield   |

# INCREMENTAL SHAFT TYPE S68B Series

- Features : Various resolution, 10~3600 P/R(32 class)  
Wide ranging power voltage, Customized design,  
Prompt delivery



## Model

INCREMENTAL  
SHAFT TYPE  
Outer Diameter  $\varnothing 68$

Shaft Size

10 :  $\varnothing 10$  ※Option : 15 :  $\varnothing 15$

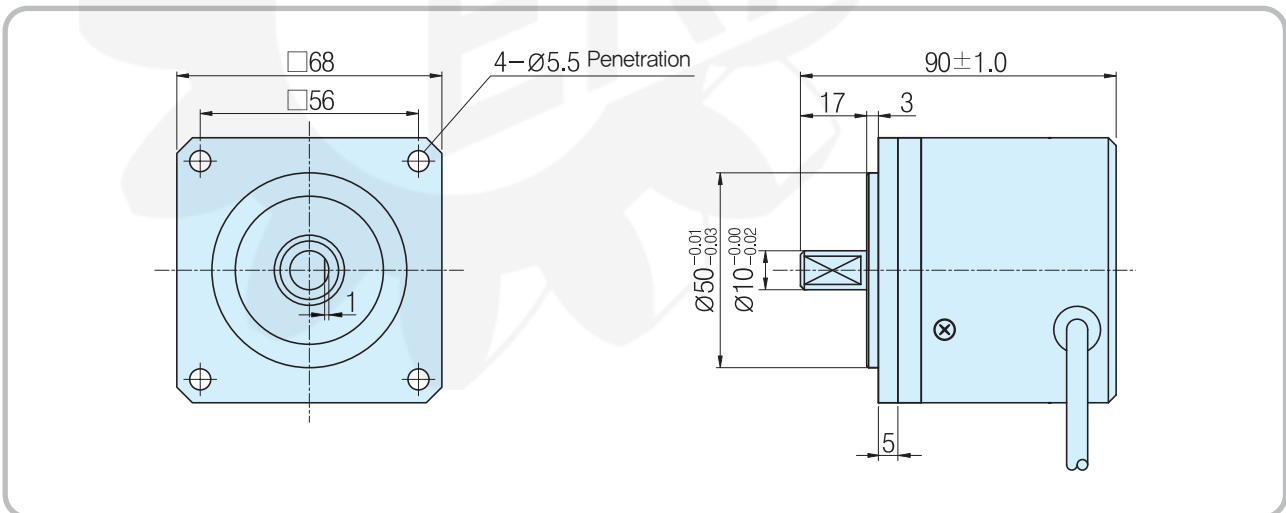
**S68B-10** - [ ] [ ] [ ] [ ] - [ ] [ ] - [ ]

| Resolution(P/R)                  | Output Signal  | Output Form   | Cable Length  |
|----------------------------------|--|---|---|
| 0100 0500 1000<br>1024 2000 2048 | <ul style="list-style-type: none"> <li>Z : A, B, Z</li> <li>U : A, <math>\bar{A}</math>, B, <math>\bar{B}</math></li> <li>V : A, <math>\bar{A}</math>, B, <math>\bar{B}</math>, Z, <math>\bar{Z}</math></li> </ul> | <ul style="list-style-type: none"> <li>O : Open Collector</li> <li>V : Voltage Output</li> <li>T : Totem Pole</li> <li>L : Line Driver</li> </ul> | <ul style="list-style-type: none"> <li>1 : 1[M]</li> <li>2 : 2[M]</li> <li>3 : 3[M]</li> <li>4 : 5[M]</li> <li>5 : 10[M]</li> </ul> |

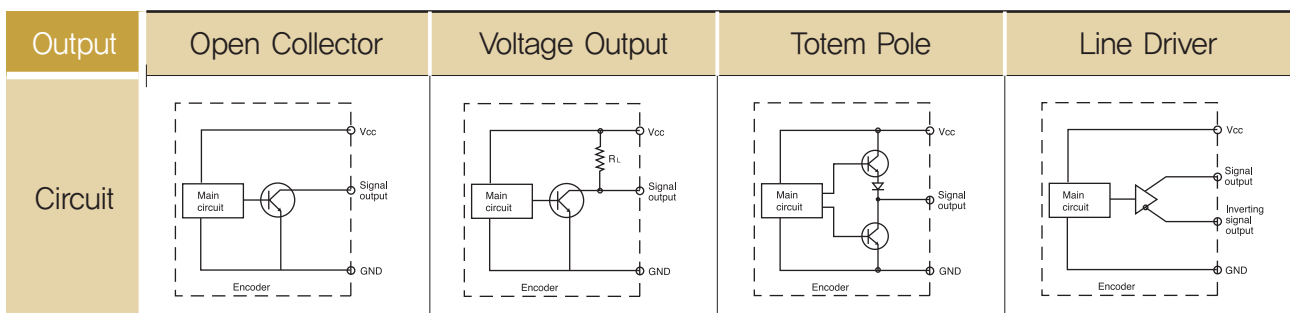


The sepc of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit





## Electrical Spec.

| Output type                              | Open Collector   | Voltage Output                         | Totem Pole                                    | Line Driver                           |
|--|--|--|---|---------------------------------------|
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%   | DC +15[V]<br>Ripple p-p : less than 5% | DC +5[V] ~ 24[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max   | 70mA Max                               | 150mA Max                                     | 150mA Max                             |
| Maximum Response Frequency               | 150 KHz (10 ~ 2048 P/R)  |  |   |                                       |
| Output voltage                           | Less than $V_i - 0.5[V]$ / More than $V_i - 2.5[V]$ (In case of inputting +5V) / More than $V_i - 10[V]$ (In case of inputting +15V) / More than $V_i - 18[V]$ (In case of inputting +24V) |  |   |                                       |
| Output current                           | Less than 20mA   | Less than 20mA                         | Less than 10mA                                | Less than 20mA                        |
| Rising, decline time                     | Less than 3 $\mu$ s  | Less than 3 $\mu$ s                    | Less than 1 $\mu$ s                           | Less than 0.1 $\mu$ s                 |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]   |  |   |                                       |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 800g – cm Max   |
| Maximum number of revolution           | 8000 rpm  |
| Bearing lifetime                       | 100,000[hr](In case of rotating by 6000rpm)           |
| Allowable Shaft Load                   | Radial : 5kg Max<br>Axial : 5kg Max                   |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 620g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ +85% RH                  |
| Preserving Humidity   | 30% ~ +90% RH                  |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

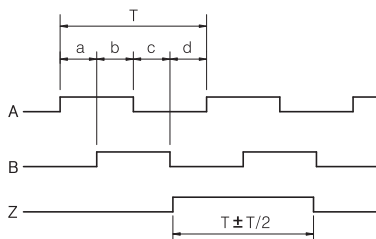
CW → Clockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

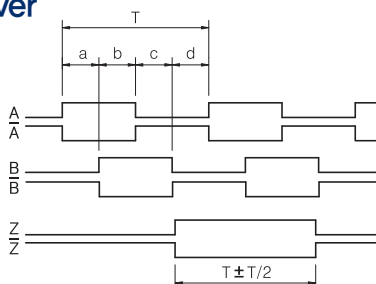
$$a, b, c, d = T/4 \pm T/10$$



## Open Collector, Voltage Output Totem Pole



## Line Driver



## Connection Table

| Cable's Color | Connection Table                               |               |
|---------------|--|---------------|
|               | Open Collector<br>Voltage Output<br>Totem Pole | Line Driver   |
| Red           | Vcc  | Vcc           |
| Black         | GND  | GND           |
| Green         | A Sig  | A Sig         |
| Blue          | -  | $\bar{A}$ Sig |
| White         | B Sig  | B Sig         |
| Pink          | -  | $\bar{B}$ Sig |
| Yellow        | Z Sig  | Z Sig         |
| Orange        | -  | $\bar{Z}$ Sig |
| Shield        | CASE Shield                                    | CASE Shield   |

# S78 Series

■ Features : Elevator, Industrial Machine



## Model

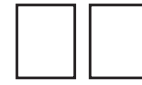
INCREMENTAL  
SHAFT TYPE  
Outer Diameter  $\varnothing 78$

Shaft Size

8 :  $\varnothing 8$

**S78**

**8**



Resolution(P/R)

0512

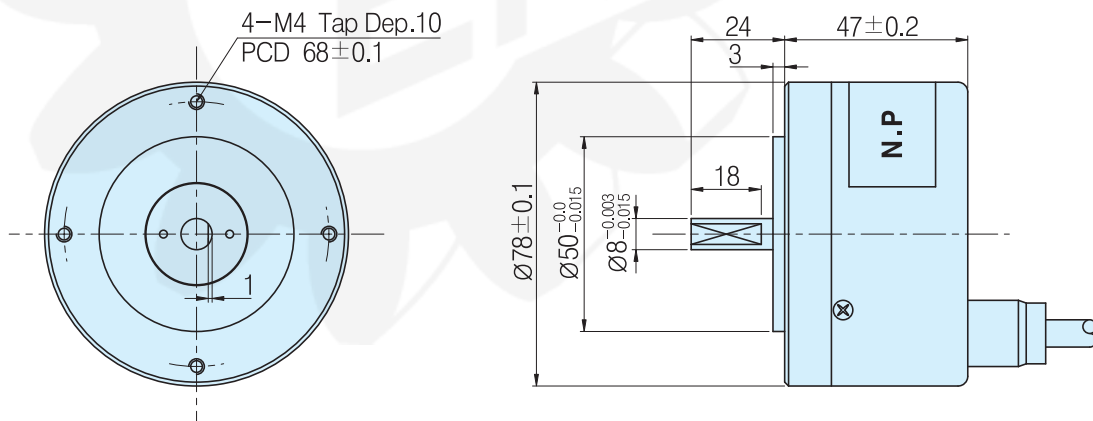
Output Signal

B : A, B

Output Form

C : Complemental

## External Dimension

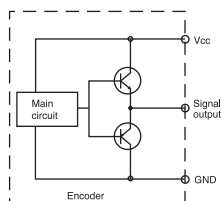


## Output Circuit

Output

Complemental

Circuit



## Electrical Spec.

|  |  |
|--|--|
| Output type                              | Complemental   |
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%   |
| Consuming Current ( In case of no load ) | 150mA Max  |
| Maximum Response Frequency               | 150 KHz  |
| Output voltage                           | Less than $V_L$ 0,5[V] / More than $V_H$ 10[V]   |
| Output current                           | Less than 10mA   |
| Rising, decline time                     | Less than 1 $\mu$ s  |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 100g – cm Max   |
| Maximum number of revolution           | 5000 rpm  |
| Bearing lifetime                       | 500,000[hr](In case of rotating by 5000rpm)           |
| Allowable Shaft Load                   | Radial : 3,0kg Max<br>Axial : 1,5kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,05 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 400g  |

## Rigid Spec.

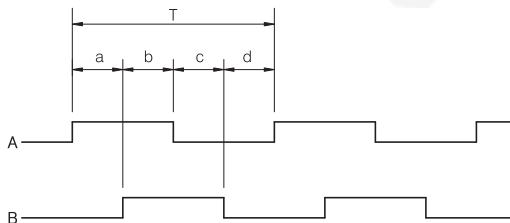
|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ +85% RH                  |
| Preserving Humidity   | 35% ~ +90% RH                  |
| Internal Vibration    | 5G                             |
| Internal Shock        | 100G                           |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

CW  $\Rightarrow$  Clockwise viewed from shaft end  
 $a + b, c + d = T/2 \pm T/10$   
 $a, b, c, d = T/4 \pm T/10$



## Complemental



## Connection Table

| Cable's Color | Connection Table |
|---------------|------------------|
| Output Form   | Complemental     |
| Red           | Vcc              |
| Black         | GND              |
| Green         | A Sig            |
| Yellow        | B Sig            |
| Shield        | CASE Shield      |

INCREMENTAL  
HOLLOW TYPE

# H35 Series

- Features : AC, DC SERVO MOTOR
- Small sized, High-response frequency
- Easy to be attached, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter  $\varnothing 35$

### Shaft Size

8 :  $\varnothing 8$  ※Option : 6 :  $\varnothing 6$

# H35 - 8 -



| Resolution(P/R) |      |      |
|-----------------|------|------|
| 0512            | 1000 | 1024 |
| 2000            | 2048 | 2500 |
| 3000            |      |      |

| Output Signal |  |
|---------------|--|
| Z             | : A, B, Z  |
| V             | : A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$   |
| W             | : A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$<br>U, $\bar{U}$ , V, $\bar{V}$ , W, $\bar{W}$ |

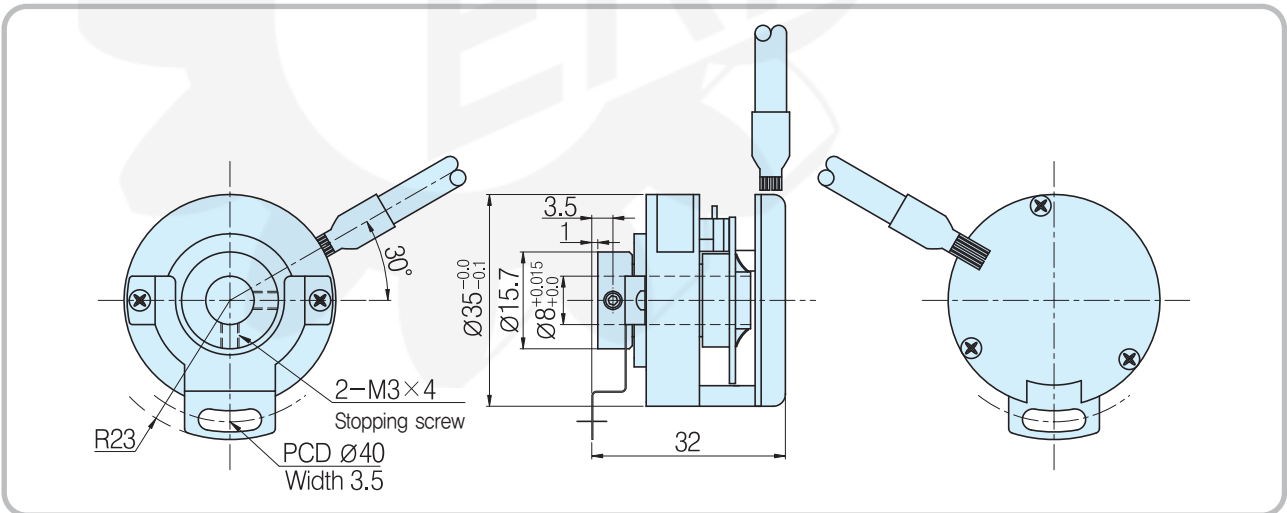
| Output Form |                  |
|-------------|------------------|
| O           | : Open Collector |
| V           | : Voltage Output |
| L           | : Line Driver    |

| Cable Length |         |
|--------------|---------|
| 1            | : 1[M]  |
| 2            | : 2[M]  |
| 3            | : 3[M]  |
| 4            | : 5[M]  |
| 5            | : 10[M] |

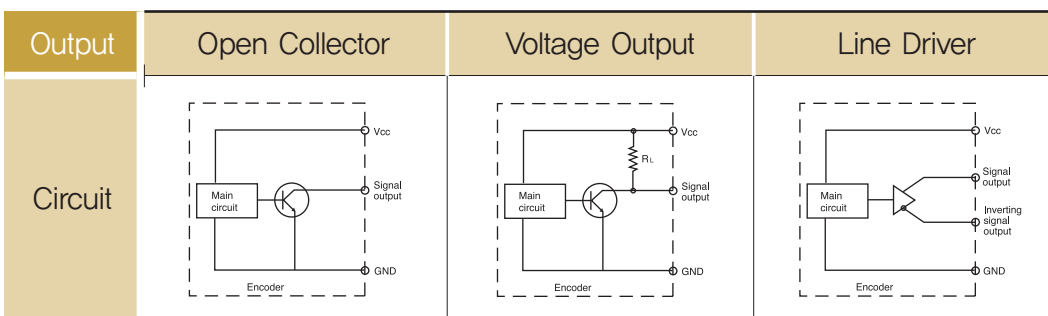


The sepl of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit



## Electrical Spec.

| Output type                              | Open Collector  | Voltage Output                         | Line Driver                           |
|--|---|--|---------------------------------------|
| Power Supply                             | DC +12[V]<br>Ripple p-p : less than 5%  | DC +12[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 200mA Max                              | 300mA Max                             |
| Maximum Response Frequency               | 300 KHz   |  |                                       |
| Output voltage                           | Less than $V_L$ 0.5[V] / More than $V_H$ 2.5[V](In case of inputting +5V) / More than $V_H$ 8[V](In case of inputting +12V) |  |                                       |
| Output current                           | Less than 20mA  | Less than 20mA                         | Less than 10mA                        |
| Rising, decline time                     | Less than 3 $\mu$ s   | Less than 3 $\mu$ s                    | Less than 1 $\mu$ s                   |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]                        |  |                                       |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 80g – cm Max  |
| Maximum number of revolution           | 5000 rpm  |
| Bearing lifetime                       | 27,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 2.2kg Max<br>Axial : 1.1kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.03 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 7P(AWG26) Shield CABLE                                |
| weight                                 | 100g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 70% RH                   |
| Preserving Humidity   | 30% ~ 80% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 00                          |

## Output Phase Shift

CCW → Counterclockwise viewed from shaft end

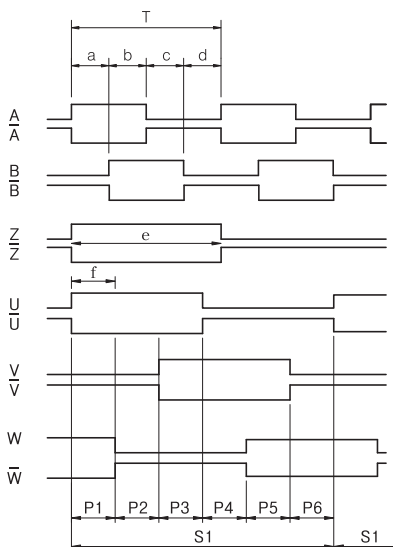
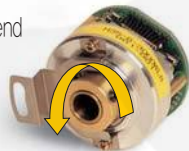
a + b, c + d = T/2 ± T/10

a, b, c, d = T/4 ± T/10

e = T ± T/2(±1°)

f = The center of Z phase and U phase (±1°)

From Uch (rise point) to Zch center



|      |      |
|------|------|
| Pole | 8    |
| P1   |      |
| P2   | 15°  |
| P3   | ±    |
| P4   | 0.9° |
| P5   |      |
| P6   |      |
| S1   |      |
| S2   | 90°  |
| --   |      |

## Connection Table

| Cable's Color | Connection Table |   |
|---------------|------------------|---|
|               | Servo Motor      | DC Motor  |
| Output Form   | Line Driver      | Open Collector<br>Voltage Output<br>Line Driver |
| Red           | Vcc              | A Sig   |
| Black         | GND              | GND   |
| Green         | A Sig            | B Sig   |
| White/Green   | $\bar{A}$ Sig    |   |
| Gray          | B Sig            |   |
| White/Gray    | $\bar{B}$ Sig    |   |
| Yellow        | Z Sig            | Z Sig   |
| White/Yellow  | $\bar{Z}$ Sig    |   |
| Brown         | U Sig            |   |
| White/Brown   | $\bar{U}$ Sig    |   |
| Blue          | V Sig            | $\bar{B}$ , Sig GND                             |
| White/Blue    | $\bar{V}$ Sig    |   |
| Orange        | W Sig            | $\bar{Z}$ , Sig GND                             |
| White/Orange  | $\bar{W}$ Sig    |   |
| White         |                  | Vcc   |
| Pink          |                  | $\bar{A}$ , Sig GND                             |
| Shield        | CASE Shield      | CASE Shield                                     |

INCREMENTAL  
HOLLOW TYPE

# H40 Series

- Features : Various resolution, 10~3600 P/R(29 class)
- Wide ranging power voltage, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter  $\varnothing 40$

### Shaft Size

■ 8 :  $\varnothing 8$  ※Option: 5 :  $\varnothing 5$  / 6 :  $\varnothing 6$

**H40 - 8 -**     **-**   **-**

| Resolution(P/R)          |
|--------------------------|
| 0010 0030 0048 0050 0060 |
| 0072 0075 0100 0120 0125 |
| 0192 0200 0250 0256 0300 |
| 0360 0400 0500 0512 0600 |
| 0720 1000 1024 1200 2000 |
| 2048 2500 3000 3600      |

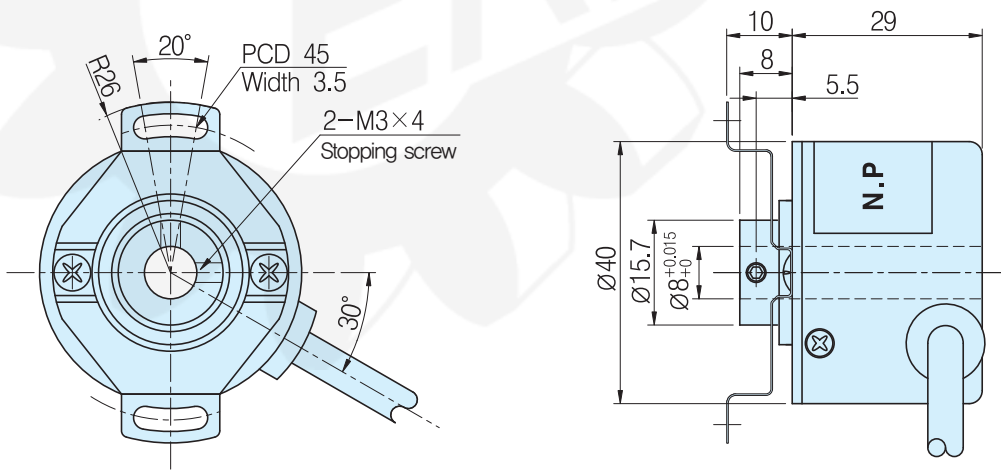
| Output Signal                                    |
|--|
| ■ B : A, B                                       |
| ■ Z : A, B, Z                                    |
| ■ U : A, $\bar{A}$ , B, $\bar{B}$                |
| ■ V : A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$ |

| Output Form          |
|----------------------|
| ■ O : Open Collector |
| ■ V : Voltage Output |
| ■ C : Complemental   |
| ■ T : Totem Pole     |
| ■ L : Line Driver    |

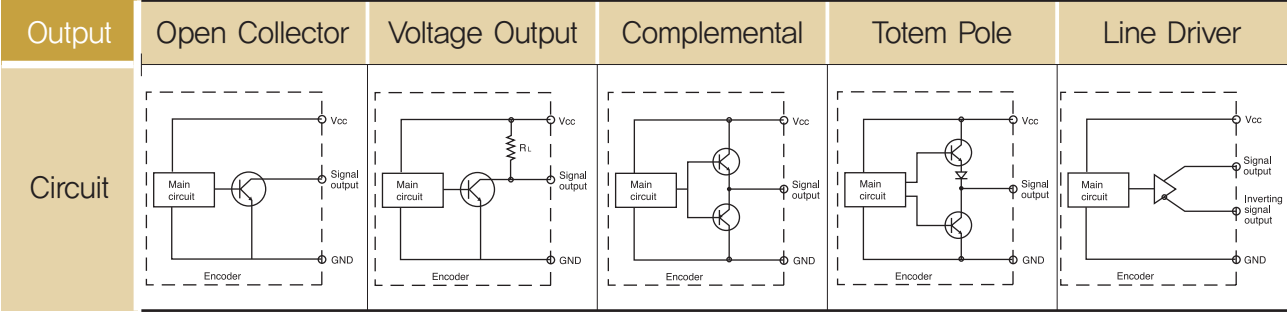
| Cable Length |
|--------------|
| ■ 1 : 1[M]   |
| ■ 2 : 2[M]   |
| ■ 3 : 3[M]   |
| ■ 4 : 5[M]   |
| ■ 5 : 10[M]  |

**!** The sepl of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit



## Electrical Spec.

| Output type                              | Open Collector  | Voltage Output                                 | Complemental                                   | Totem Pole  | Line Driver                                     |
|--|---|--|--|---|---|
| Power Supply                             | DC +5[V] ~ +24[V]<br>Ripple p-p : less than 5%  | DC +5[V] ~ +24[V]<br>Ripple p-p : less than 5% | DC +15[V], +24[V]<br>Ripple p-p : less than 5% | DC +5[V] ~ 15[V], +24[V]<br>Ripple p-p : less than 5% | DC +5[V], +5~24[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 70mA Max                                       | 150mA Max                                      | 150mA Max   | 150mA Max                                       |
| Maximum Response Frequency               | 150 KHz (10 ~ 2048 P/R) / 300 KHz (2500 ~ 3600 P/R)   |  |  |   |   |
| Output voltage                           | Less than $V_i \cdot 0.5[V]$ / More than $V_i \cdot 2.5[V]$ (In case of inputting +5V), / More than $V_i \cdot 10[V]$ (In case of inputting +15V) / More than $V_i \cdot 18[V]$ (In case of inputting +24V) |  |  |   |   |
| Output current                           | Less than 20mA  | Less than 20mA                                 | Less than 10mA                                 | Less than 10mA  | Less than 20mA                                  |
| Rising, decline time                     | Less than 3 $\mu$ s   | Less than 3 $\mu$ s                            | Less than 1 $\mu$ s                            | Less than 1 $\mu$ s                                   | Less than 0.1 $\mu$ s                           |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]  |  |  |   |   |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 80g – cm Max  |
| Maximum number of revolution           | 6000 rpm  |
| Bearing lifetime                       | 27,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 2.5kg Max<br>Axial : 1.3kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 150g  |

## Rigid Spec.

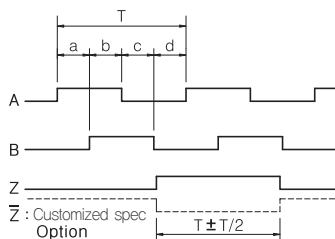
|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 30% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

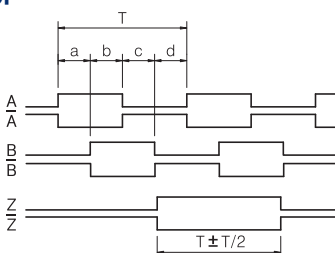
CW  $\Rightarrow$  Clockwise viewed from shaft end  
 $a + b, c + d = T/2 \pm T/10$   
 $a, b, c, d = T/4 \pm T/10$



## Open Collector, Voltage Output Complemental, Totem Pole



## Line Driver



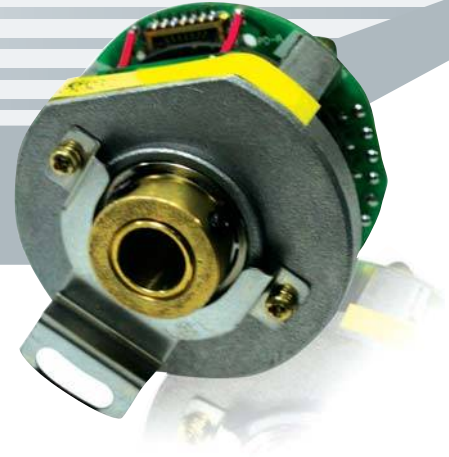
## Connection Table

| Cable's Color | Connection Table   |               |
|---------------|--|---------------|
|               | Open Collector<br>Voltage Output<br>Complemental<br>Totem Pole | Line Driver   |
| Red           | Vcc  | Vcc           |
| Black         | GND  | GND           |
| Green         | A Sig  | A Sig         |
| Blue          | -  | $\bar{A}$ Sig |
| White         | B Sig  | B Sig         |
| Pink          | -  | $\bar{B}$ Sig |
| Yellow        | Z Sig  | Z Sig         |
| Orange        | -  | $\bar{Z}$ Sig |
| Shield        | CASE Shield  | CASE Shield   |

INCREMENTAL  
HOLLOW TYPE

# H42 Series

- Features : AC, DC SERVO MOTOR
- Small sized , High-response frequency
- Easy to be attached, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter  $\varnothing 42$

Shaft Size

8 :  $\varnothing 8$

H42 - 8 -



Resolution(P/R)

2000 2048 2500  
3000

Output Signal

V : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$   
W : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$   
U,  $\bar{U}$ , V,  $\bar{V}$ , W,  $\bar{W}$

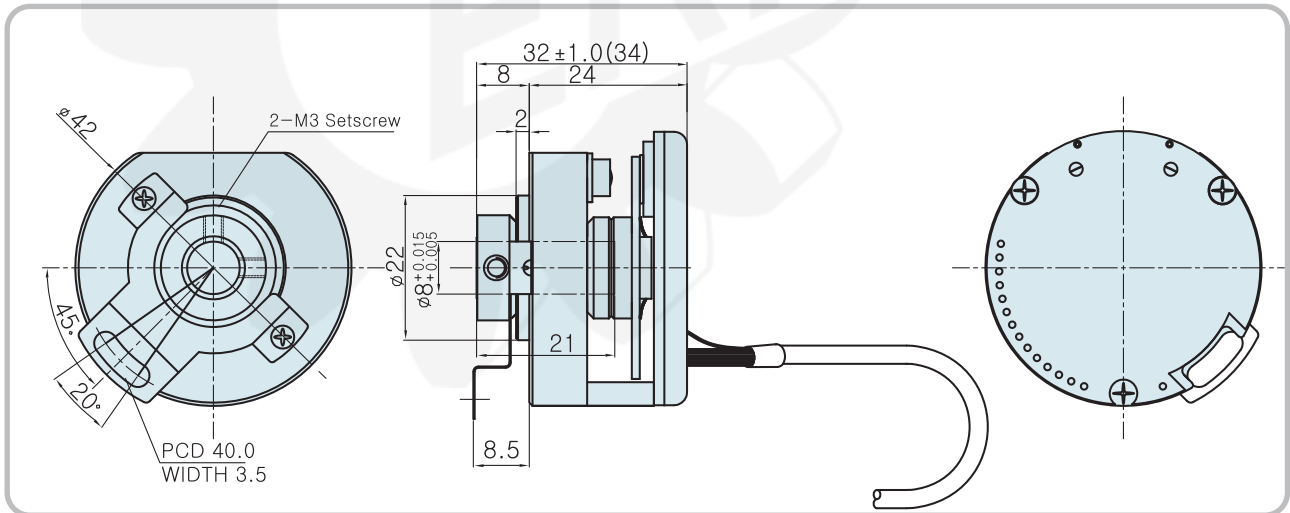
Output Form

L : Line Driver

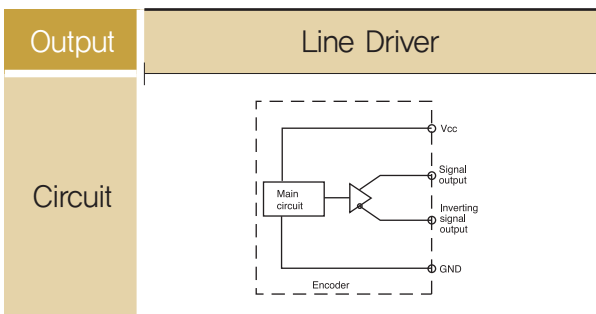
Cable Length

1 : 1[M]  
2 : 2[M]  
3 : 3[M]  
4 : 5[M]  
5 : 10[M]

## External Dimension



## Output Circuit





## Electrical Spec.

|  |  |
|--|--|
| Output type                              | Voltage Output   |
| Power Supply                             | DC +5[V]<br>Ripple p-p : less than 5%  |
| Consuming Current ( In case of no load ) | 300mA Max  |
| Maximum Response Frequency               | 300 KHz  |
| Output voltage                           | Less than $V_L$ 0,5[V] / More than $V_H$ 2,5[V]  |
| Output current                           | Less than 20mA   |
| Rising, decline time                     | Less than 1 $\mu$ s  |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 80g – cm Max  |
| Maximum number of revolution           | 6000 rpm  |
| Bearing lifetime                       | 30,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 2,2kg Max<br>Axial : 1,1kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,03 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 7P(AWG26) Shield CABLE                                |
| weight                                 | 200g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 70% RH                   |
| Preserving Humidity   | 30% ~ 80% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 00                          |

## Output Phase Shift

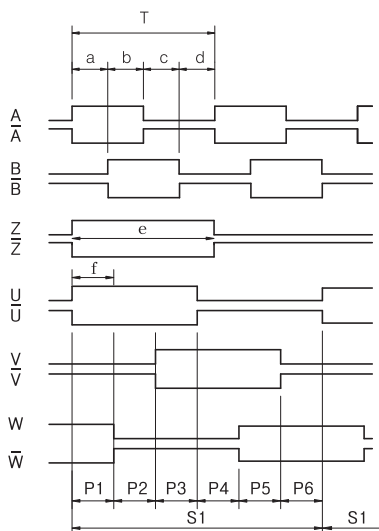
CCW → Counterclockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

$$a, b, c, d = T/4 \pm T/10$$

$$e = T \pm T/2$$

f = The center of Z phase and U phase ( $\pm 1^\circ$ )  
From Uch (rise point) to Zch center



| Pole | 6    | 8    |
|------|------|------|
| P1   |      |      |
| P2   | 20°  | 15°  |
| P3   | ±    | ±    |
| P4   | 0,9° | 0,9° |
| P5   |      |      |
| P6   |      |      |
| S1   |      |      |
| S2   | 120° | 90°  |
| --   |      |      |

## Connection Table

| Cable's Color | Connection Table |
|---------------|------------------|
| Output Form   | Line Driver      |
| Red           | Vcc              |
| Black         | GND              |
| Green         | A Sig            |
| White/Green   | $\bar{A}$ Sig    |
| Gray          | B Sig            |
| White/Gray    | $\bar{B}$ Sig    |
| Yellow        | Z Sig            |
| White/Yellow  | $\bar{Z}$ Sig    |
| Brown         | U Sig            |
| White/Brown   | $\bar{U}$ Sig    |
| Blue          | V Sig            |
| White/Blue    | $\bar{V}$ Sig    |
| Orange        | W Sig            |
| White/Orange  | $\bar{W}$ Sig    |
| Shield        | CASE Shield      |

INCREMENTAL  
HOLLOW TYPE

# H45A Series

- Features : AC, DC SERVO MOTOR
- Small sized , High-response frequency
- Easy to be attached, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter  $\varnothing 45$

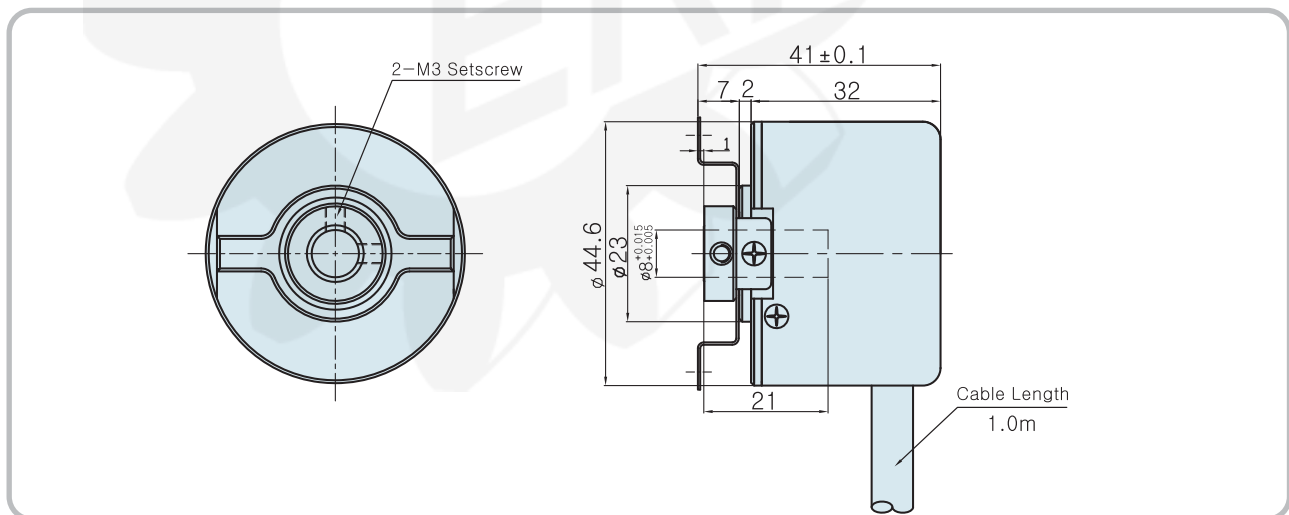
Shaft Size

8 :  $\varnothing 8$

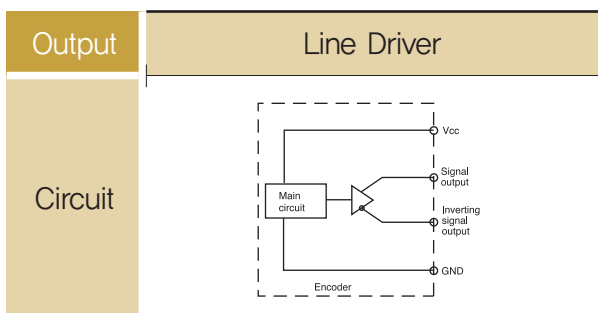
**H45A- 8 -**     -   -

| Resolution(P/R)        | Output Signal  | Output Form     | Cable Length  |
|------------------------|--|-----------------|---|
| 2000 2048 2500<br>3000 | V : A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$<br>W : A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$<br>U, $\bar{U}$ , V, $\bar{V}$ , W, $\bar{W}$ | L : Line Driver | 1 : 1[M]<br>2 : 2[M]<br>3 : 3[M]<br>4 : 5[M]<br>5 : 10[M] |

## External Dimension



## Output Circuit



## Electrical Spec.

|  |  |
|--|--|
| Output type                              | Voltage Output   |
| Power Supply                             | DC +5[V]<br>Ripple p-p : less than 5%  |
| Consuming Current ( In case of no load ) | 300mA Max  |
| Maximum Response Frequency               | 300 KHz  |
| Output voltage                           | Less than $V_L$ 0,5[V] / More than $V_H$ 2,5[V]  |
| Output current                           | Less than 20mA   |
| Rising, decline time                     | Less than 1 $\mu$ s  |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 80g – cm Max  |
| Maximum number of revolution           | 6000 rpm  |
| Bearing lifetime                       | 30,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 2,2kg Max<br>Axial : 1,1kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,03 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 7P(AWG26) Shield CABLE                                |
| weight                                 | 200g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 70% RH                   |
| Preserving Humidity   | 30% ~ 80% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 00                          |

## Output Phase Shift

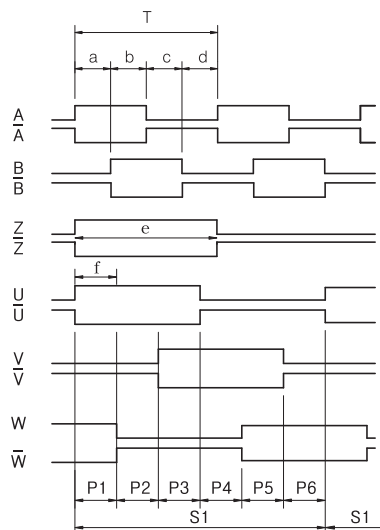
CCW → Counterclockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

$$a, b, c, d = T/4 \pm T/10$$

$$e = T \pm T/2$$

f = The center of Z phase and U phase ( $\pm 1^\circ$ )  
From Uch (rise point) to Zch center



| Pole | 6    | 8    |
|------|------|------|
| P1   |      |      |
| P2   | 20°  | 15°  |
| P3   | ±    | ±    |
| P4   | 0,9° | 0,9° |
| P5   |      |      |
| P6   |      |      |
| S1   |      |      |
| S2   | 120° | 90°  |
| --   |      |      |

## Connection Table

| Cable's Color | Connection Table |
|---------------|------------------|
| Output Form   | Line Driver      |
| Red           | Vcc              |
| Black         | GND              |
| Green         | A Sig            |
| White/Green   | $\bar{A}$ Sig    |
| Gray          | B Sig            |
| White/Gray    | $\bar{B}$ Sig    |
| Yellow        | Z Sig            |
| White/Yellow  | $\bar{Z}$ Sig    |
| Brown         | U Sig            |
| White/Brown   | $\bar{U}$ Sig    |
| Blue          | V Sig            |
| White/Blue    | $\bar{V}$ Sig    |
| Orange        | W Sig            |
| White/Orange  | $\bar{W}$ Sig    |
| Shield        | CASE Shield      |

INCREMENTAL  
HOLLOW TYPE

# H48 Series

- Features : AC, DC SERVO MOTOR
- Small sized , High-response frequency
- Easy to be attached, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter  $\varnothing 48$

Shaft Size

8 :  $\varnothing 8$

**H48 - 8 -**



Resolution(P/R)

5000 6000

Output Signal

V : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$   
W : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$   
U,  $\bar{U}$ , V,  $\bar{V}$ , W,  $\bar{W}$

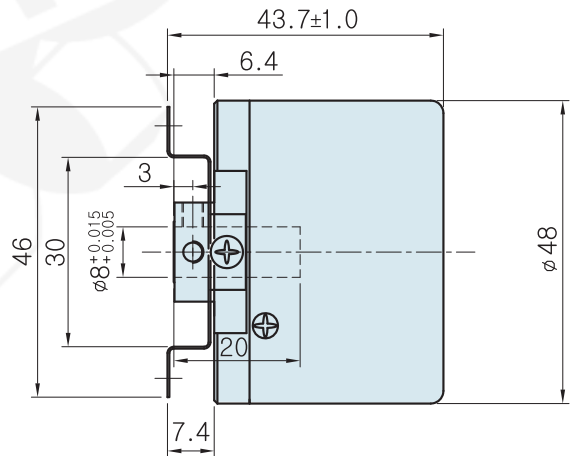
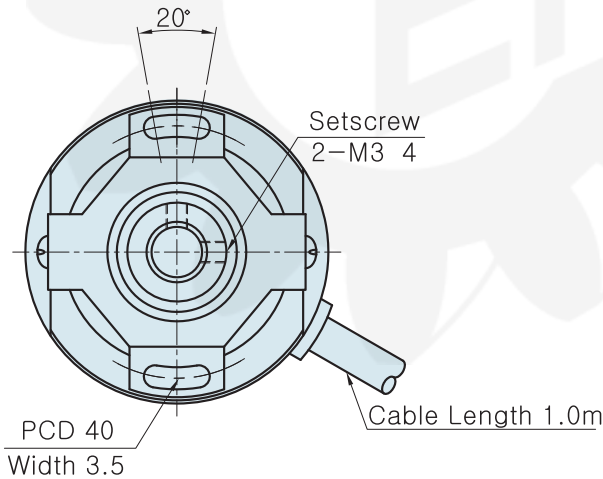
Output Form

L : Line Driver

Cable Length

1 : 1[M]  
2 : 2[M]  
3 : 3[M]  
4 : 5[M]  
5 : 10[M]

## External Dimension

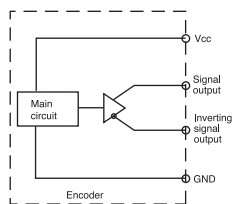


## Output Circuit

Output

Line Driver

Circuit



## Electrical Spec.

|  |  |
|--|--|
| Output type                              | Voltage Output   |
| Power Supply                             | DC +5[V]<br>Ripple p-p : less than 5%  |
| Consuming Current ( In case of no load ) | 300mA Max  |
| Maximum Response Frequency               | 300 KHz  |
| Output voltage                           | Less than $V_L$ 0,5[V] / More than $V_H$ 2,5[V]  |
| Output current                           | Less than 20mA   |
| Rising, decline time                     | Less than 1 $\mu$ s  |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 80g – cm Max  |
| Maximum number of revolution           | 6000 rpm  |
| Bearing lifetime                       | 30,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 2,2kg Max<br>Axial : 1,1kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,03 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 7P(AWG26) Shield CABLE                                |
| weight                                 | 200g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 70% RH                   |
| Preserving Humidity   | 30% ~ 80% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 00                          |

## Output Phase Shift

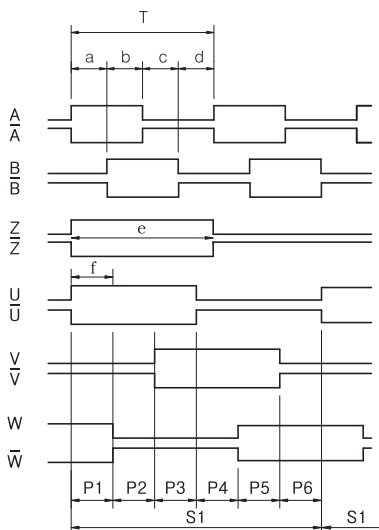
CCW → Counterclockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

$$a, b, c, d = T/4 \pm T/10$$

$$e = T \pm T/2$$

f = The center of Z phase and U phase ( $\pm 1^\circ$ )  
From Uch (rise point) to Zch center



|         |      |
|---------|------|
| 극수 Pole | 8    |
| P1      | 15°  |
| P2      | ±    |
| P3      | 0.9° |
| P4      |      |
| P5      |      |
| P6      |      |
| S1      |      |
| S2      | 90°  |
| --      |      |

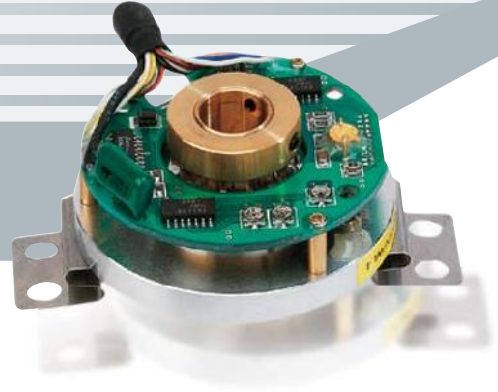
## Connection Table

| Cable's Color | Connection Table |
|---------------|------------------|
| Output Form   | Line Driver      |
| Red           | Vcc              |
| Black         | GND              |
| Green         | A Sig            |
| White/Green   | $\bar{A}$ Sig    |
| Gray          | B Sig            |
| White/Gray    | $\bar{B}$ Sig    |
| Yellow        | Z Sig            |
| White/Yellow  | $\bar{Z}$ Sig    |
| Brown         | U Sig            |
| White/Brown   | $\bar{U}$ Sig    |
| Blue          | V Sig            |
| White/Blue    | $\bar{V}$ Sig    |
| Orange        | W Sig            |
| White/Orange  | $\bar{W}$ Sig    |
| Shield        | CASE Shield      |

INCREMENTAL  
HOLLOW TYPE

# H60 Series

- Features : AC, DC SERVO MOTOR
- Small sized, High-response frequency
- Easy to be attached, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter Ø60

Shaft Size

12.7: Ø12.7

H60 -12.7-



Resolution(P/R)

2000 2048 3000  
6000

Output Signal

W : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$   
U,  $\bar{U}$ , V,  $\bar{V}$ , W,  $\bar{W}$

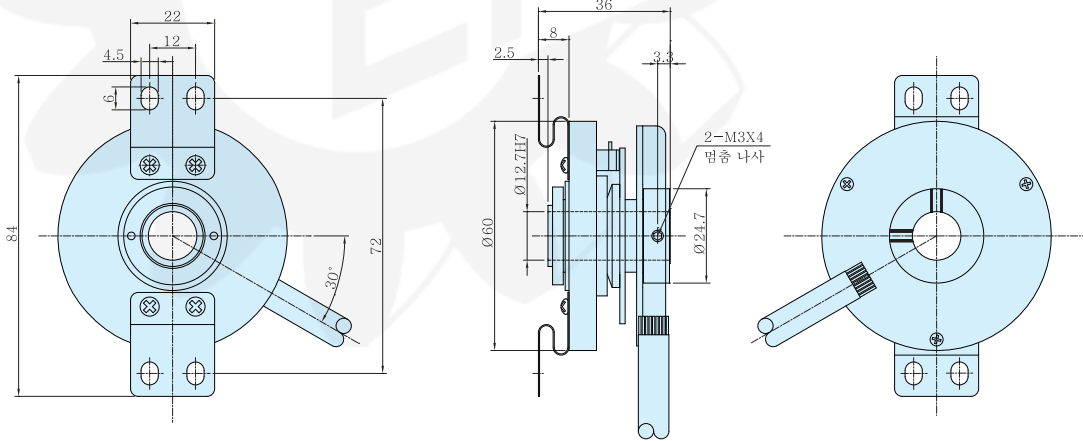
Output Form

L : Line Driver

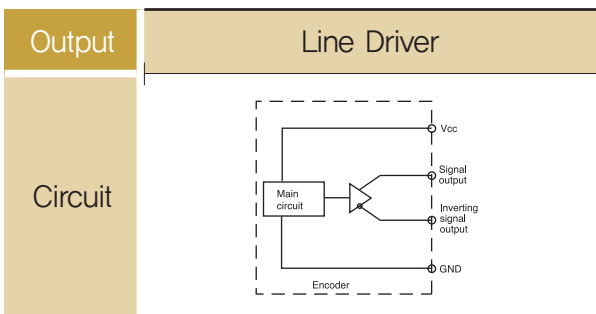
Cable Length

1 : 1[M]  
2 : 2[M]  
3 : 3[M]  
4 : 5[M]  
5 : 10[M]

## External Dimension



## Output Circuit



## Electrical Spec.

|  |  |
|--|--|
| Output type                              | Line Driver  |
| Power Supply                             | DC +5[V]<br>Ripple p-p : less than 5%  |
| Consuming Current ( In case of no load ) | 300mA Max  |
| Maximum Response Frequency               | 300 KHz  |
| Output voltage                           | Less than $V_L$ 0,5[V] / More than $V_H$ 2,5[V]  |
| Output current                           | Less than 20mA   |
| Rising, decline time                     | Less than 1 $\mu$ s  |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 150g – cm Max   |
| Maximum number of revolution           | 6000 rpm  |
| Bearing lifetime                       | 40,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 2,0kg Max<br>Axial : 1,0kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,03 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 7P(AWG26) Shield CABLE                                |
| weight                                 | 200g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 70% RH                   |
| Preserving Humidity   | 35% ~ 80% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 00                          |

## Output Phase Shift

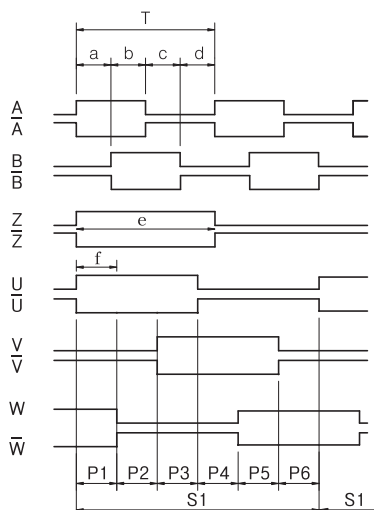
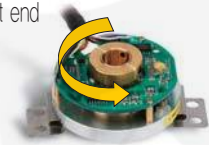
CCW → Counterclockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

$$a, b, c, d = T/4 \pm T/10$$

$$e = T \pm T/2$$

f = The center of Z phase and U phase ( $\pm 1^\circ$ )  
From Uch (rise point) to Zch center



|      |      |
|------|------|
| Pole | 8    |
| P1   |      |
| P2   | 15°  |
| P3   | ±    |
| P4   | 0.9° |
| P5   |      |
| P6   |      |
| S1   |      |
| S2   | 90°  |
| --   |      |

## Connection Table

| Cable's Color | Connection Table |
|---------------|------------------|
| Output Form   | Line Driver      |
| Red           | Vcc              |
| Black         | GND              |
| Green         | A Sig            |
| White/Green   | $\bar{A}$ Sig    |
| Gray          | B Sig            |
| White/Gray    | $\bar{B}$ Sig    |
| Yellow        | Z Sig            |
| White/Yellow  | $\bar{Z}$ Sig    |
| Brown         | U Sig            |
| White/Brown   | $\bar{U}$ Sig    |
| Blue          | V Sig            |
| White/Blue    | $\bar{V}$ Sig    |
| Orange        | W Sig            |
| White/Orange  | $\bar{W}$ Sig    |
| Shield        | CASE Shield      |

INCREMENTAL  
HOLLOW TYPE

# H62 Series

■ Features : Elevator, A, G, V

Rigid type, Strengthened anti-Noise characteristic

Customized design, Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE

Shaft Size

Outer Diameter  $\varnothing 62$

10 :  $\varnothing 10$  ※Option : 8 :  $\varnothing 8$  / 95 :  $\varnothing 9.525$

# H62 - 10 -

Resolution(P/R)

1000 1024 2048

Output Signal

B : A, B  
Z : A, B, Z  
U : A,  $\bar{A}$ , B,  $\bar{B}$   
V : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$

Output Form

O : Open Collector  
V : Voltage Output  
C : Complemental  
L : Line Driver

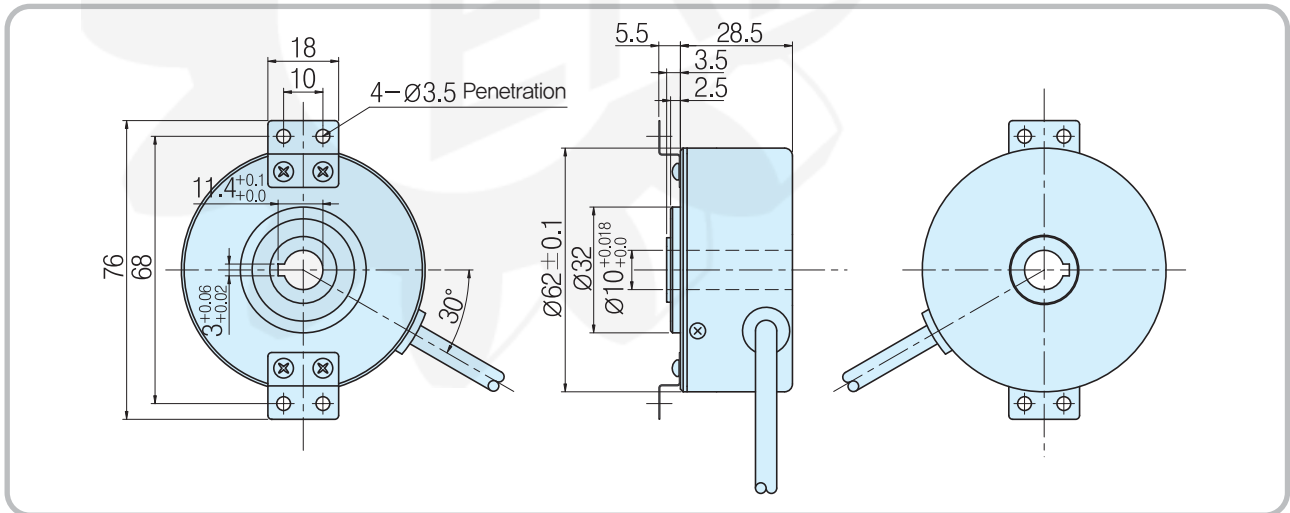
Cable Length

1 : 1[M]  
2 : 2[M]  
3 : 3[M]  
4 : 5[M]  
5 : 10[M]

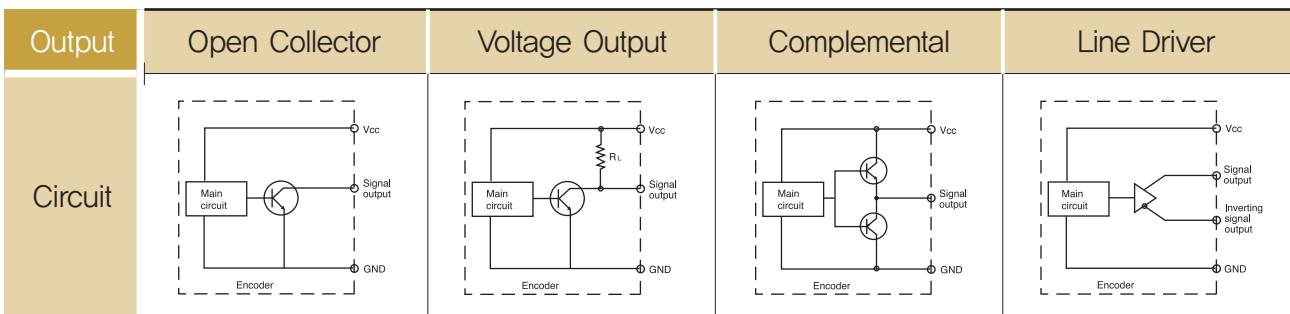


The sepc of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit





## Electrical Spec.

| Output type                              | Open Collector   | Voltage Output                         | Complemental                           | Line Driver                           |
|--|--|--|--|---------------------------------------|
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%   | DC +15[V]<br>Ripple p-p : less than 5% | DC +12[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max   | 70mA Max                               | 150mA Max                              | 200mA Max                             |
| Maximum Response Frequency               | 300 KHz  |  |  |                                       |
| Output voltage                           | Less than $V_L$ 0.5[V] / More than $V_H$ 2.5[V] (In case of inputting +5V), /More than $V_H$ 10[V](In case of inputting +5V) |  |  |                                       |
| Output current                           | Less than 20mA   | Less than 20mA                         | Less than 10mA                         | Less than 20mA                        |
| Rising, decline time                     | Less than 3 $\mu$ s  | Less than 3 $\mu$ s                    | Less than 1 $\mu$ s                    | Less than 1 $\mu$ s                   |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]                         |  |  |                                       |

## Mechanical Spec.

| Starting Torque                        | 120g – cm Max   |
|--|---|
| Maximum number of revolution           | 5000 rpm  |
| Bearing lifetime                       | 40,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 3.0kg Max<br>Axial : 1.5kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 400g  |

## Rigid Spec.

| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
|-----------------------|--------------------------------|
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 30% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

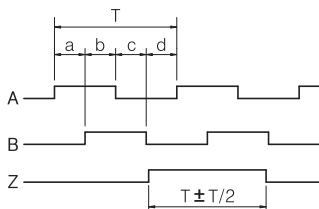
CW  $\Rightarrow$  Clockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

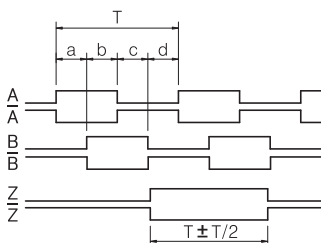
$$a, b, c, d = T/4 \pm T/10$$



## Open Collector, Voltage Output Complemental



## Line Driver



## Connection Table

| Cable's Color | Connection Table                                 |               |
|---------------|--|---------------|
|               | Open Collector<br>Voltage Output<br>Complemental | Line Driver   |
| Red           | Vcc  | A Sig         |
| Black         | GND  | GND           |
| Green         | A Sig  | A Sig         |
| Blue          | -  | $\bar{A}$ Sig |
| White         | B Sig  | B Sig         |
| Pink          | -  | $\bar{B}$ Sig |
| Yellow        | Z Sig  | Z Sig         |
| Orange        | -  | $\bar{Z}$ Sig |
| Shield        | CASE Shield                                      | CASE Shield   |

INCREMENTAL  
HOLLOW TYPE

# H70 Series

- Features : Textile machine, Industrial application
- Rigid type, High reliability
- Customized design, Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter  $\varnothing 70$

Shaft Size

6 :  $\varnothing 6$

**H70 - 6 -**

Resolution(P/R)

0045

Output Signal

B : A, B

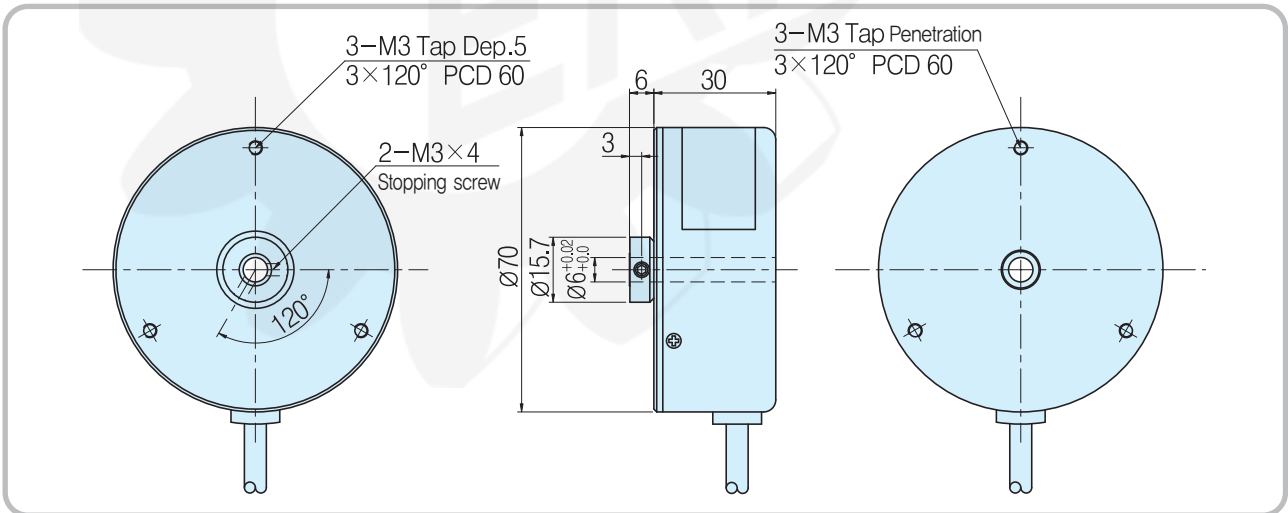
Output Form

C : Complementary

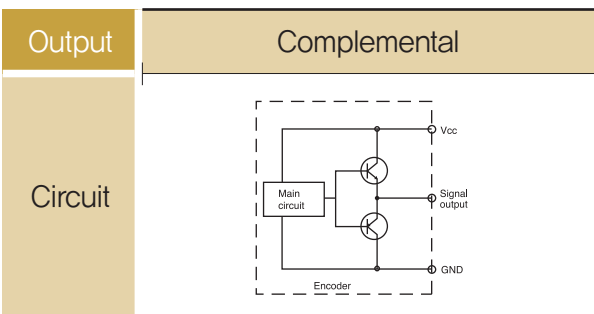
Cable Length

- 1 : 1[M]
- 2 : 2[M]
- 3 : 3[M]
- 4 : 5[M]
- 5 : 10[M]

## External Dimension



## Output Circuit



## Electrical Spec.

|  |  |
|--|--|
| Output type                              | Complemental   |
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%   |
| Consuming Current ( In case of no load ) | 150mA Max  |
| Maximum Response Frequency               | 5 KHz  |
| Output voltage                           | Less than $V_L$ 0,5[V] / More than $V_H$ 10[V]   |
| Output current                           | Less than 10mA   |
| Rising, decline time                     | Less than 1 $\mu$ s  |
| $T_R / T_F$                              | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 80g – cm Max  |
| Maximum number of revolution           | 6000 rpm  |
| Bearing lifetime                       | 27,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 2,2kg Max<br>Axial : 1,1kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,05 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 400g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 35% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

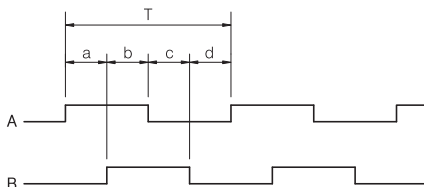
CCW → Counterclockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

$$a, b, c, d = T/4 \pm T/10$$



## Complemental



## Connection Table

| Cable's Color | Connection Table |
|---------------|------------------|
| Output Form   | Complemental     |
| Red           | Vcc              |
| Black         | GND              |
| Green         | A Sig            |
| Blue          | -                |
| White         | B Sig            |
| Pink          | -                |
| Yellow        | -                |
| Orange        | -                |
| Shield        | CASE Shield      |

INCREMENTAL  
HOLLOW TYPE

# H88-18 Series

- Features : Elevator, Parking system, Industrial motor
- Easy to be attached, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter Ø88

Shaft Size

18 : Ø18

H88 - 18 - [ ] [ ] [ ] [ ] - [ ] [ ] - [ ]

Resolution(P/R)

0512 1024

Output Signal

- B : A, B
- Z : A, B, Z
- U : A,  $\bar{A}$ , B,  $\bar{B}$
- V : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$

Output Form

- O : Open Collector
- V : Voltage Output
- C : Complemental
- L : Line Driver

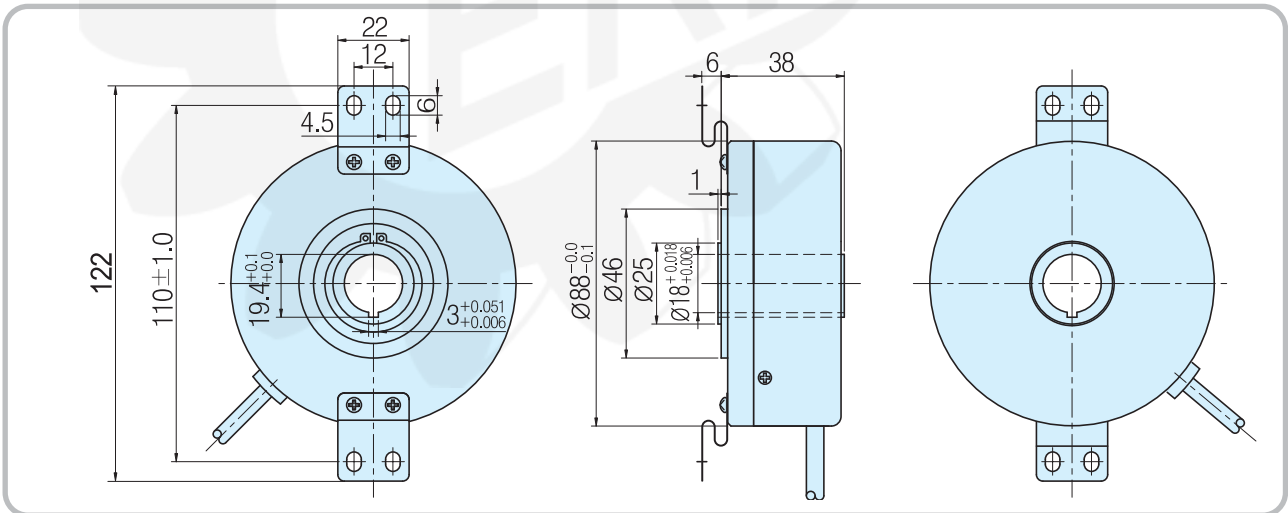
Cable Length

- 1 : 1[M]
- 2 : 2[M]
- 3 : 3[M]
- 4 : 5[M]
- 5 : 10[M]



The sepc of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit

| Output  | Open Collector | Voltage Output | Complemental | Line Driver |
|---------|----------------|----------------|--------------|-------------|
| Circuit |                |                |              |             |

## Electrical Spec.

| Output type                              | Open Collector  | Voltage Output                         | Complemental                           | Line Driver                           |
|--|---|--|--|---------------------------------------|
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%  | DC +15[V]<br>Ripple p-p : less than 5% | DC +15[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 70mA Max                               | 150mA Max                              | 150mA Max                             |
| Maximum Response Frequency               | 150 KHz   |  |  |                                       |
| Output voltage                           | Less than $V_L$ 0.5[V] / More than $V_H$ 2.5[V] (In case of inputting +5V), /More than $V_H$ 10[V](In case of inputting +15V) |  |  |                                       |
| Output current                           | Less than 20mA  | Less than 20mA                         | Less than 10mA                         | Less than 20mA                        |
| Rising, decline time                     | Less than 3 $\mu$ s   | Less than 3 $\mu$ s                    | Less than 1 $\mu$ s                    | Less than 0.1 $\mu$ s                 |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]                          |  |  |                                       |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 200g – cm Max   |
| Maximum number of revolution           | 3000 rpm  |
| Bearing lifetime                       | 40,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 3.8kg Max<br>Axial : 1.9kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 550g  |

## Rigid Spec.

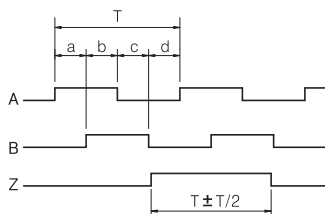
|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 30% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 100G                           |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

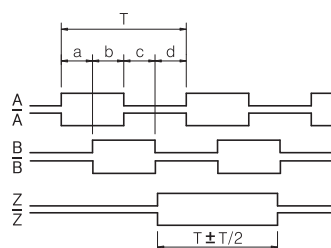
CCW  $\Rightarrow$  Counterclockwise viewed from shaft end  
 $a + b, c + d = T/2 \pm T/10$   
 $a, b, c, d = T/4 \pm T/10$



## Open Collector, Voltage Output Complemental, Totem Pole



## Line Driver



## Connection Table

| Cable's Color | Connection Table   |               |
|---------------|--|---------------|
| Output Form   | Open Collector<br>Voltage Output<br>Complemental<br>Totem Pole | Line Driver   |
| Red           | Vcc  | Vcc           |
| Black         | GND  | GND           |
| Green         | A Sig  | A Sig         |
| Blue          | -  | $\bar{A}$ Sig |
| White         | B Sig  | B Sig         |
| Pink          | -  | $\bar{B}$ Sig |
| Yellow        | Z Sig  | Z Sig         |
| Orange        | -  | $\bar{Z}$ Sig |
| Shield        | CASE Shield  | CASE Shield   |

INCREMENTAL  
HOLLOW TYPE

# H88A-18 Series

- Features : Elevator, Parking system, Industrial motor
- Easy to be attached, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter Ø88

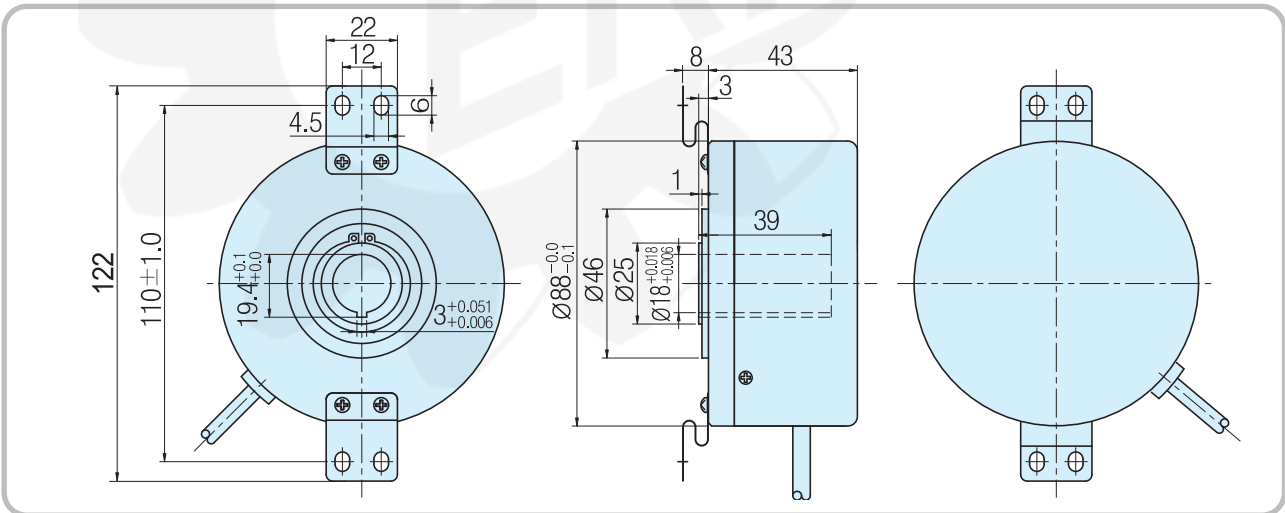
Shaft Size  
18 : Ø18

H88A - 18 - [ ] [ ] [ ] [ ] - [ ] [ ] - [ ]

| Resolution(P/R) | Output Signal  | Output Form   | Cable Length  |
|-----------------|--|---|---|
| 0512 1024       | <ul style="list-style-type: none"> <li>B : A, B</li> <li>Z : A, B, Z</li> <li>U : A, <math>\bar{A}</math>, B, <math>\bar{B}</math></li> <li>V : A, <math>\bar{A}</math>, B, <math>\bar{B}</math>, Z, <math>\bar{Z}</math></li> </ul> | <ul style="list-style-type: none"> <li>O : Open Collector</li> <li>V : Voltage Output</li> <li>C : Complemental</li> <li>L : Line Driver</li> </ul> | <ul style="list-style-type: none"> <li>1 : 1[M]</li> <li>2 : 2[M]</li> <li>3 : 3[M]</li> <li>4 : 5[M]</li> <li>5 : 10[M]</li> </ul> |

The sepc of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit

| Output  | Open Collector | Voltage Output | Complemental | Line Driver |
|---------|----------------|----------------|--------------|-------------|
| Circuit |                |                |              |             |

## Electrical Spec.

| Output type                              | Open Collector  | Voltage Output                         | Complemental                           | Line Driver                           |
|--|---|--|--|---------------------------------------|
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%  | DC +15[V]<br>Ripple p-p : less than 5% | DC +15[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 70mA Max                               | 150mA Max                              | 150mA Max                             |
| Maximum Response Frequency               | 150 KHz   |  |  |                                       |
| Output voltage                           | Less than $V_L$ 0.5[V] / More than $V_H$ 2.5[V] (In case of inputting +5V), /More than $V_H$ 10[V](In case of inputting +15V) |  |  |                                       |
| Output current                           | Less than 20mA  | Less than 20mA                         | Less than 10mA                         | Less than 20mA                        |
| Rising, decline time                     | Less than 3 $\mu$ s   | Less than 3 $\mu$ s                    | Less than 1 $\mu$ s                    | Less than 0.1 $\mu$ s                 |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]                          |  |  |                                       |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 200g – cm Max   |
| Maximum number of revolution           | 3000 rpm  |
| Bearing lifetime                       | 40,000[hr](In case of rotating by 5000rpm)            |
| Allowable Shaft Load                   | Radial : 3.8kg Max<br>Axial : 1.9kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 550g  |

## Rigid Spec.

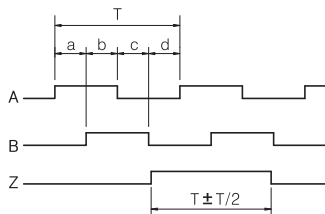
|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 30% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 100G                           |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

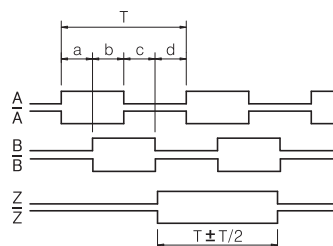
CCW  $\rightarrow$  Counterclockwise viewed from shaft end  
 $a + b, c + d = T/2 \pm T/10$   
 $a, b, c, d = T/4 \pm T/10$



## Open Collector, Voltage Output Complemental, Totem Pole



## Line Driver



## Connection Table

| Cable's Color | Connection Table   |               |
|---------------|--|---------------|
|               | Open Collector<br>Voltage Output<br>Complemental<br>Totem Pole | Line Driver   |
| Red           | Vcc  | Vcc           |
| Black         | GND  | GND           |
| Green         | A Sig  | A Sig         |
| Blue          | -  | $\bar{A}$ Sig |
| White         | -  | B Sig         |
| Pink          | -  | $\bar{B}$ Sig |
| Yellow        | B Sig  | Z Sig         |
| Orange        | -  | $\bar{Z}$ Sig |
| Shield        | CASE Shield  | CASE Shield   |

INCREMENTAL  
HOLLOW TYPE

# H88-30B Series

- Features : Elevator, Parking system, Industrial motor  
Easy to be attached, Customized design,  
Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter  $\varnothing 88$

Shaft Size

30 :  $\varnothing 30$

**H88 - 30B -**

Resolution(P/R)

0512 1024

Output Signal

B : A, B

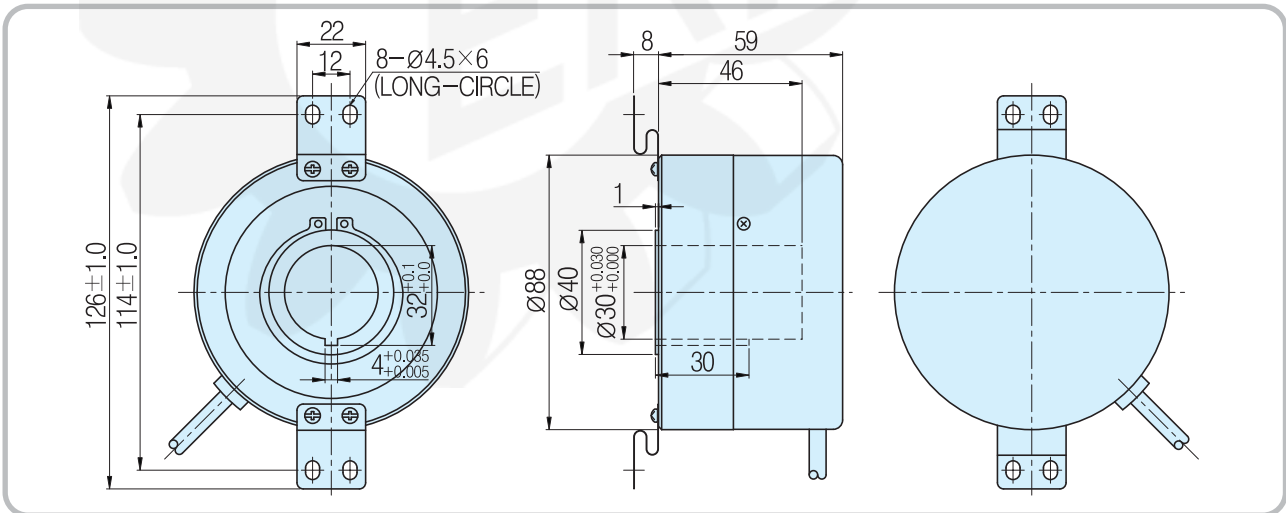
Output Form

O : Open Collector

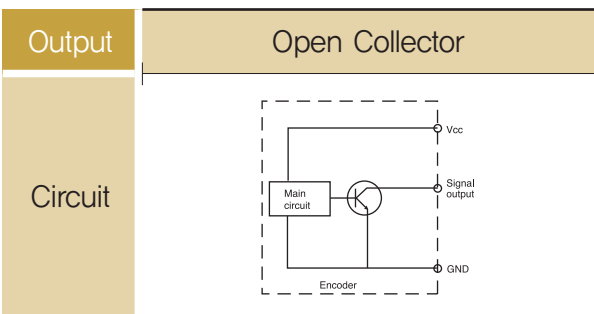
Cable Length

- 1 : 1[M]
- 2 : 2[M]
- 3 : 3[M]
- 4 : 5[M]
- 5 : 10[M]

## External Dimension



## Output Circuit





## Electrical Spec.

|  |  |
|--|--|
| Output type                              | Open Collector   |
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%   |
| Consuming Current ( In case of no load ) | 70mA Max   |
| Maximum Response Frequency               | 100 KHz  |
| Output voltage                           | Less than $V_L$ 0,5[V] / More than $V_H$ 10[V]   |
| Output current                           | Less than 20mA   |
| Rising, decline time                     | Less than 3 $\mu$ s  |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 800g – cm Max   |
| Maximum number of revolution           | 3000 rpm  |
| Bearing lifetime                       | 50,000[hr](In case of rotating by 3000rpm)            |
| Allowable Shaft Load                   | Radial : 5,0kg Max<br>Axial : 2,5kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,05 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 3P(AWG26) Shield CABLE                                |
| weight                                 | 900g  |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 35% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 100G                           |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

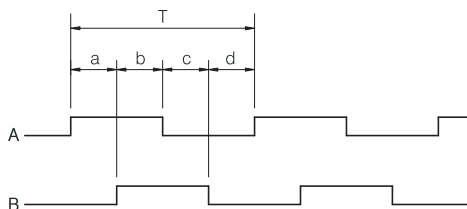
CCW → Counterclockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

$$a, b, c, d = T/4 \pm T/10$$



## Open Collector



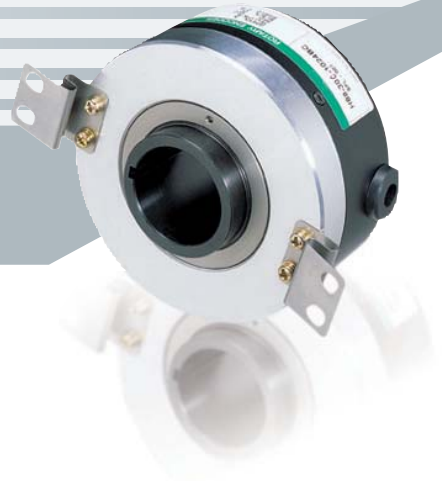
## Connection Table

| Cable's Color | Connection Table |
|---------------|------------------|
| Output Form   | Open Collector   |
| Red           | Vcc              |
| Black         | GND              |
| Green         | A Sig            |
| Orange        | A Sig GND        |
| Brown         | B Sig            |
| White         | B Sig GND        |
| Shield        | CASE Shield      |

INCREMENTAL  
HOLLOW TYPE

# H88-30C Series

- Features : Elevator, Parking system, Industrial motor
- Easy to be attached, Customized design,
- Prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter Ø88

Shaft Size

30 : Ø30

H88 - 30C -



Resolution(P/R)

0512 1024

Output Signal

- B : A, B
- Z : A, B, Z
- V : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$

Output Form

- O : Open Collector
- C : Complemental
- L : Line Driver

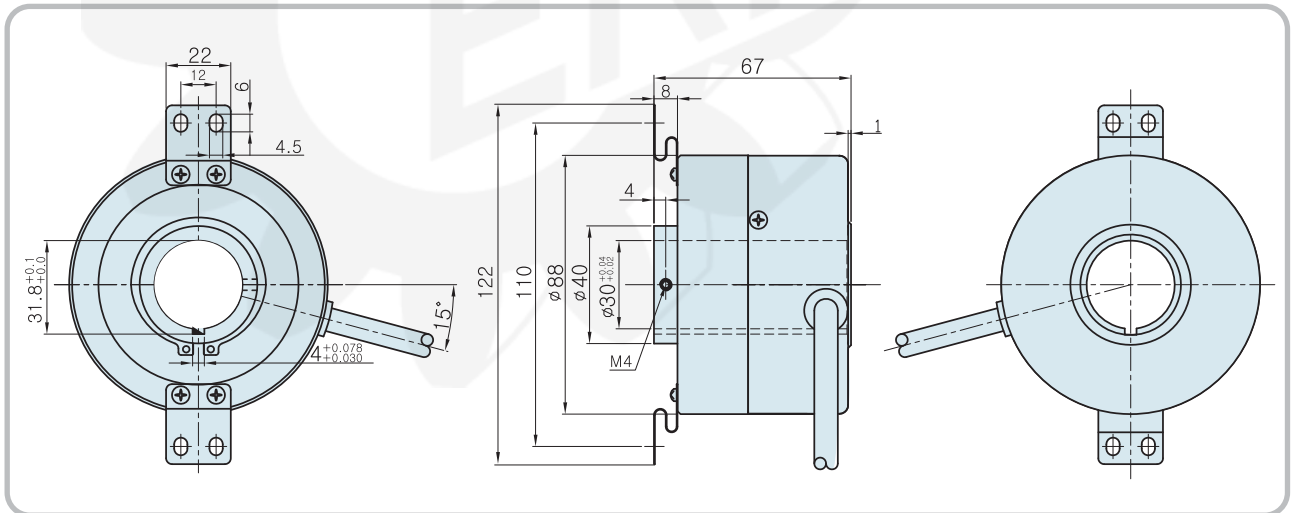
Cable Length

- 1 : 1[M]
- 2 : 2[M]
- 3 : 3[M]
- 4 : 5[M]
- 5 : 10[M]



The sepc of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit

| Output  | Open Collector | Complemental | Line Driver |
|---------|----------------|--------------|-------------|
| Circuit |                |              |             |

## Electrical Spec.

| Output type                              | Open Collector  | Complemental                           | Line Driver                                     |
|--|---|--|---|
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%  | DC +15[V]<br>Ripple p-p : less than 5% | DC +5[V], +5~24[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 150mA Max                              | 150mA Max                                       |
| Maximum Response Frequency               | 150 KHz   |  |   |
| Output voltage                           | Less than $V_L$ 0.5[V] / More than $V_H$ 2.5[V] (In case of inputting +5V), /More than $V_H$ 10[V](In case of inputting +15V) |  |   |
| Output current                           | Less than 20mA  | Less than 10mA                         | Less than 20mA                                  |
| Rising, decline time<br>$T_R / T_F$      | Less than 3 $\mu$ s   | Less than 1 $\mu$ s                    | Less than 0.1 $\mu$ s                           |
|  | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]                          |  |   |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 800g – cm Max   |
| Maximum number of revolution           | 3000 rpm  |
| Bearing lifetime                       | 50,000[hr](In case of rotating by 3000rpm)            |
| Allowable Shaft Load                   | Radial : 5.0kg Max<br>Axial : 2.5kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 4P(AWG26) Shield CABLE                                |
| weight                                 | 600g  |

## Rigid Spec.

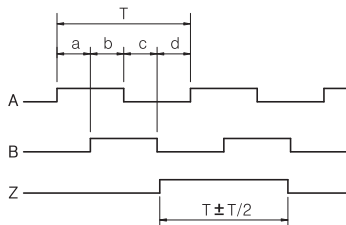
|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 30% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 100G                           |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

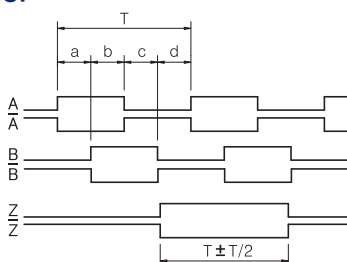
CW → Clockwise viewed from shaft end  
 $a + b, c + d = T/2 \pm T/10$   
 $a, b, c, d = T/4 \pm T/10$



## Open Collector, Voltage Output Complemental, Totem Pole



## Line Driver



## Connection Table

| Cable's Color | Connection Table                                 |               |
|---------------|--|---------------|
|               | Open Collector<br>Voltage Output<br>Complemental | Line Driver   |
| Red           | Vcc  | Vcc           |
| Black         | GND  | GND           |
| Green         | A Sig  | A Sig         |
| Orange        | A Sig GND  | $\bar{Z}$ Sig |
| Yellow        | B Sig  | Z Sig         |
| White         | B Sig GND  | B Sig         |
| Blue          | -  | $\bar{A}$ Sig |
| Pink          | -  | $\bar{B}$ Sig |
| Shield        | CASE Shield                                      | CASE Shield   |

INCREMENTAL  
HOLLOW TYPE

# H88-38 Series

- Features : Elevator, Parking system, Industrial motor
- Easy to be attached, Customized design,
- Prompt delivery



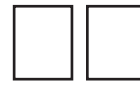
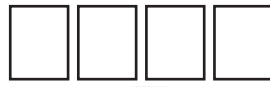
## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter Ø88

Shaft Size

38 : Ø38

# H88 - 38 -



Resolution(P/R)

0512 1024

Output Signal

- B : A, B
- Z : A, B, Z
- V : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$

Output Form

- O : Open Collector
- C : Complemental
- L : Line Driver

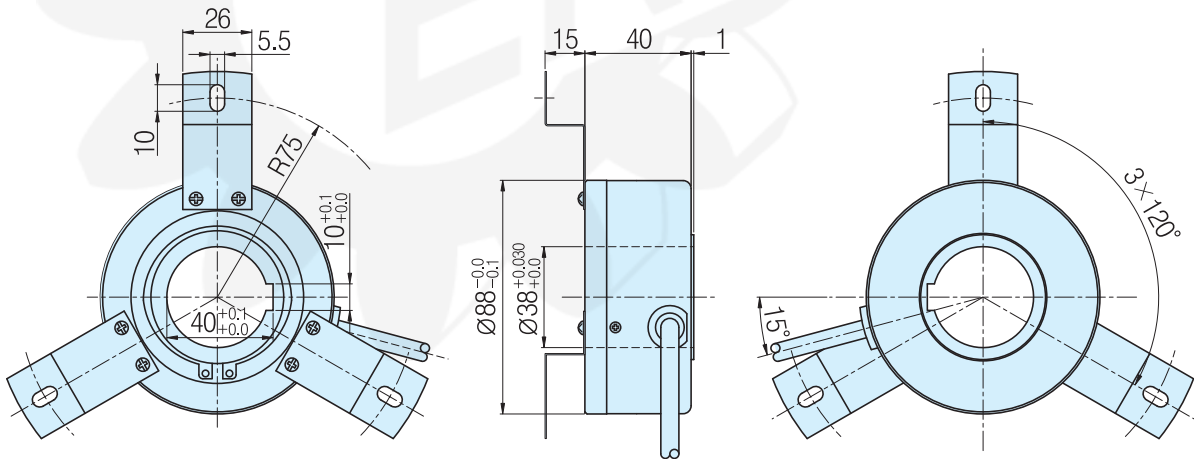
Cable Length

- 1 : 1[M]
- 2 : 2[M]
- 3 : 3[M]
- 4 : 5[M]
- 5 : 10[M]



The sepc of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit

| Output  | Open Collector | Complemental | Line Driver |
|---------|----------------|--------------|-------------|
| Circuit |                |              |             |

## Electrical Spec.

| Output type                              | Open Collector  | Complemental                           | Line Driver                                     |
|--|---|--|---|
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%  | DC +15[V]<br>Ripple p-p : less than 5% | DC +5[V], +5~24[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 150mA Max                              | 150mA Max                                       |
| Maximum Response Frequency               | 100 KHz MAX   |  |   |
| Output voltage                           | Less than $V_L$ 0.5[V] / More than $V_H$ 2.5[V] (In case of inputting +5V), /More than $V_H$ 10[V](In case of inputting +15V) |  |   |
| Output current                           | Less than 20mA  | Less than 10mA                         | Less than 20mA                                  |
| Rising, decline time<br>$T_R / T_F$      | Less than 3 $\mu$ s   | Less than 1 $\mu$ s                    | Less than 0.1 $\mu$ s                           |
|  | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]                          |  |   |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 800g - cm Max   |
| Maximum number of revolution           | 3000 rpm  |
| Bearing lifetime                       | 50,000[hr](In case of rotating by 3000rpm)            |
| Allowable Shaft Load                   | Radial : 5.8kg Max<br>Axial : 1.9kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 3P(AWG26) Shield CABLE                                |
| weight                                 | 930g  |

## Rigid Spec.

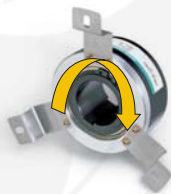
|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 30% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 100G                           |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

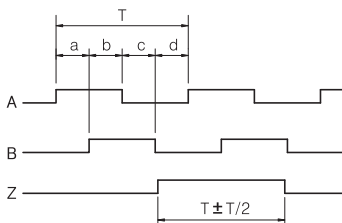
CW → Clockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

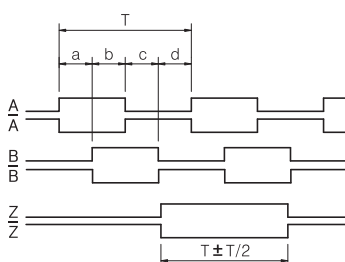
$$a, b, c, d = T/4 \pm T/10$$



## Open Collector



## Line Driver



## Connection Table

| Cable's Color | Connection Table |               |
|---------------|------------------|---------------|
|               | Open Collector   | Line Driver   |
| Output Form   | Open Collector   | Line Driver   |
| Red           | Vcc              | Vcc           |
| Black         | GND              | GND           |
| Green         | A Sig            | A Sig         |
| Orange        | A Sig GND        | $\bar{Z}$ Sig |
| Yellow        | B Sig            | Z Sig         |
| White         | B Sig GND        | B Sig         |
| Blue          | -                | $\bar{A}$ Sig |
| Pink          | -                | $\bar{B}$ Sig |
| Shield        | CASE Shield      | CASE Shield   |

INCREMENTAL  
HOLLOW TYPE

# H100 Series

- Features : Elevator, Parking system, Industrial motor
- Easy to be attached, Customized design, a prompt delivery



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter Ø100

Shaft Size

40 : Ø40

# H100-40-



Resolution(P/R)

0512 1024

Output Signal

B : A, B  
U : A,  $\bar{A}$ , B,  $\bar{B}$

Output Form

O : Open Collector  
T : Totem Pole  
L : Line Driver

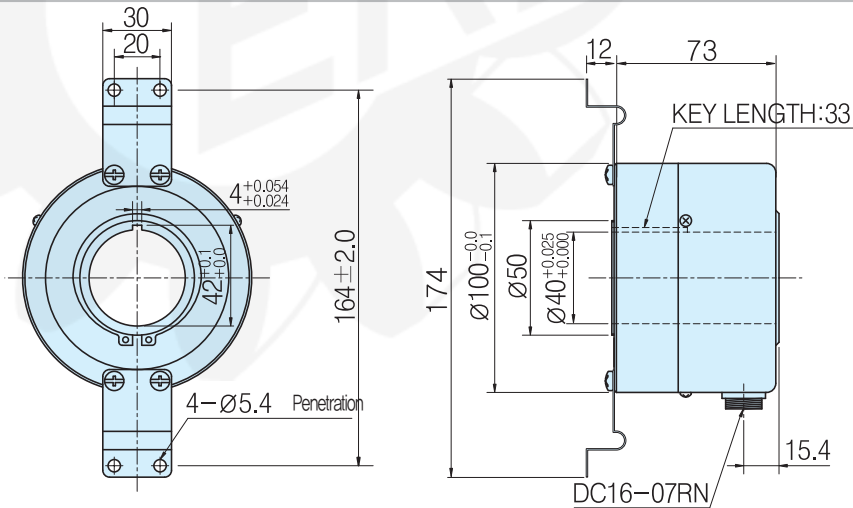
Cable Length

1 : 1[M]  
2 : 2[M]  
3 : 3[M]  
4 : 5[M]  
5 : 10[M]



The sepl of power may be different depending on the type of output and be sure to check the electric spec.

## External Dimension



## Output Circuit

| Output  | Open Collector | Totem Pole | Line Driver |
|---------|----------------|------------|-------------|
| Circuit |                |            |             |

## Electrical Spec.

| Output type                              | Open Collector  | Totem Pole                            | Line Driver                           |
|--|---|---------------------------------------|---------------------------------------|
| Power Supply                             | DC +5[V]<br>Ripple p-p : less than 5%   | DC +5[V]<br>Ripple p-p : less than 5% | DC +5[V]<br>Ripple p-p : less than 5% |
| Consuming Current ( In case of no load ) | 70mA Max  | 150mA Max                             | 150mA Max                             |
| Maximum Response Frequency               | 150 KHz   |                                       |                                       |
| Output voltage                           | Less than $V_L$ 0.5[V] / More than $V_H$ 2.5[V] (In case of inputting +5V), /More than $V_H$ 10[V](In case of inputting +15V) |                                       |                                       |
| Output current                           | Less than 20mA  | Less than 10mA                        | Less than 20mA                        |
| Rising, decline time                     | Less than 3 $\mu$ s   | Less than 1 $\mu$ s                   | Less than 0.1 $\mu$ s                 |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ]                          |                                       |                                       |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 800g – cm Max   |
| Maximum number of revolution           | 3000 rpm  |
| Bearing lifetime                       | 50,000[hr](In case of rotating by 3000rpm)            |
| Allowable Shaft Load                   | Radial : 5.0kg Max<br>Axial : 2.5kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 3P(AWG26) Shield CABLE                                |
| weight                                 | 1.2kg   |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 30% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 100G                           |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

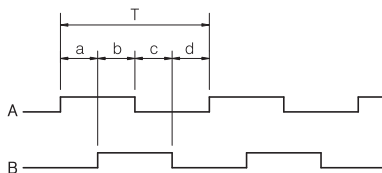
CCW → Counterclockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

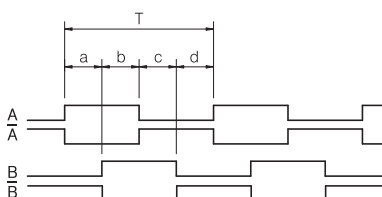
$$a, b, c, d = T/4 \pm T/10$$



## Open Collector, Totem Pole



## Line Driver



## Connection Table

| PIN NO | Cable's Color | Connection Table          |               |
|--------|---------------|---------------------------|---------------|
|        |               | Open Collector Totem Pole | Line Driver   |
| 1      | Red           | Vcc                       | Vcc           |
| 2      | Black         | GND                       | GND           |
| 3      | Green         | A Sig                     | A Sig         |
| 4      | Orange        | A Sig GND                 | $\bar{A}$ Sig |
| 5      | Brown         | B Sig                     | B Sig         |
| 6      | White         | B Sig GND                 | $\bar{B}$ Sig |
| 7      | Shield        | CASE Shield               | CASE Shield   |

# INCREMENTAL HOLLOW TYPE H108 Series

- Features : Elevator
  - High resolution, High response
  - Customized design, Easy to be attached



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter Ø108

Shaft Size

50 : Ø50

H108 - 50 -

Resolution(P/R)

4096

Output Signal

V : A,  $\bar{A}$ , B,  $\bar{B}$ , Z, Z $\bar{Z}$   
 W : A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$   
 U,  $\bar{U}$ , V,  $\bar{V}$ , W,  $\bar{W}$

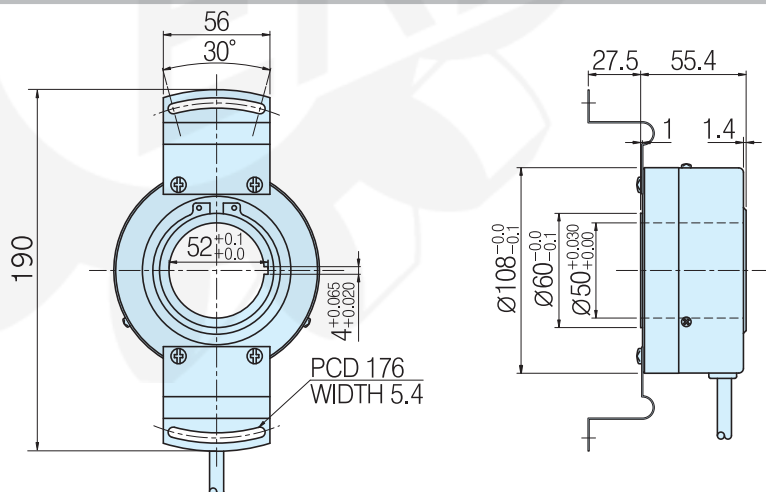
Output Form

L : Line Driver

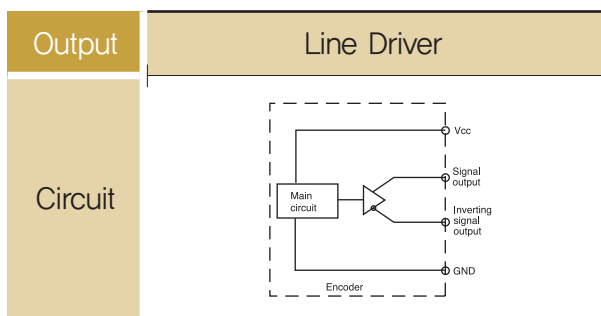
Cable Length

1 : 1[M]  
 2 : 2[M]  
 3 : 3[M]  
 4 : 5[M]  
 5 : 10[M]

## External Dimension



## Output Circuit





## Electrical Spec.

|  |  |
|--|--|
| Output type                              | Line Driver  |
| Power Supply                             | DC +5[V]<br>Ripple p-p : less than 5%  |
| Consuming Current ( In case of no load ) | 200mA Max  |
| Maximum Response Frequency               | 300 KHz MAX  |
| Output voltage                           | Less than $V_L$ 0,5[V] / More than $V_H$ 2,5[V]  |
| Output current                           | Less than 20mA   |
| Rising, decline time                     | Less than 0,1 $\mu$ s  |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 800g – cm Max   |
| Maximum number of revolution           | 1200 rpm  |
| Bearing lifetime                       | 50,000[hr](In case of rotating by 3000rpm)            |
| Allowable Shaft Load                   | Radial : 5,0kg Max<br>Axial : 2,5kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,05 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 7P(AWG26) Shield CABLE                                |
| weight                                 | 1,0kg   |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 30% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

CCW → Counterclockwise viewed from shaft end

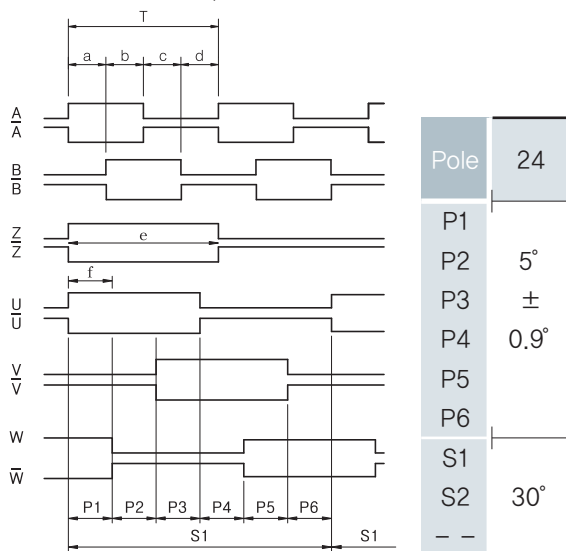
$$a + b, c + d = T/2 \pm T/10$$

$$a, b, c, d = T/4 \pm T/10$$

$$e = T \pm T/2$$

f = The center of Z phase and U phase ( $\pm 1^\circ$ )

From Uch (rise point) to Zch center



## Connection Table

| Cable's Color | Connection Table |
|---------------|------------------|
| Output Form   | Line Driver      |
| Red           | Vcc              |
| Black         | GND              |
| Green         | A Sig            |
| White/Green   | $\bar{A}$ Sig    |
| Gray          | B Sig            |
| White/Gray    | $\bar{B}$ Sig    |
| Yellow        | Z Sig            |
| White/Yellow  | $\bar{Z}$ Sig    |
| Brown         | U Sig            |
| White/Brown   | $\bar{U}$ Sig    |
| Blue          | V Sig            |
| White/Blue    | $\bar{V}$ Sig    |
| Orange        | W Sig            |
| White/Orange  | $\bar{W}$ Sig    |
| Shield        | CASE Shield      |

# INCREMENTAL HOLLOW TYPE H128 Series

- Features : Elevator, Parking system  
High resolution, Customized design,  
Easy to be attached



## Model

INCREMENTAL  
HOLLOW TYPE  
Outer Diameter  $\varnothing 128$

Shaft Size

52 :  $\varnothing 52$

H128 - 52 -



Resolution(P/R)

1024 8192

Output Signal

B : A, B

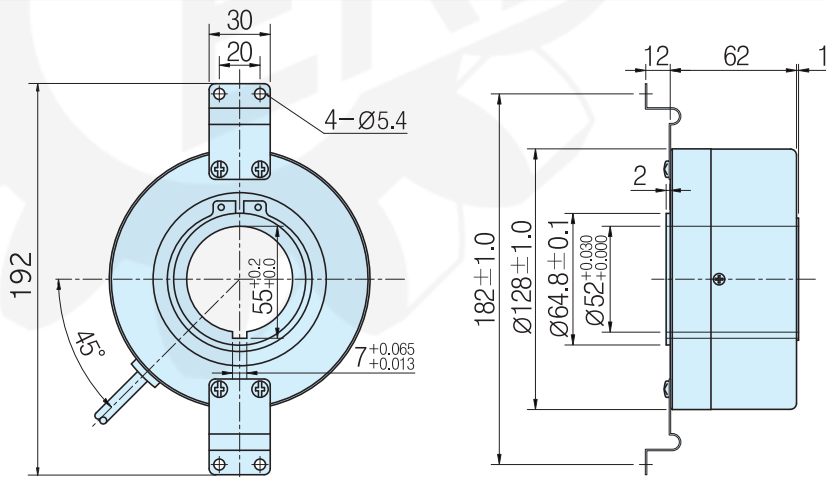
Output Form

O : Open Collector

Cable Length

- 1 : 1[M]
- 2 : 2[M]
- 3 : 3[M]
- 4 : 5[M]
- 5 : 10[M]

## External Dimension

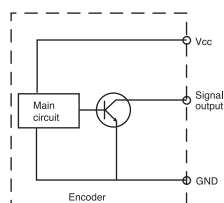


## Output Circuit

Output

Open Collector

Circuit



## Electrical Spec.

|  |  |
|--|--|
| Output type                              | Open Collector   |
| Power Supply                             | DC +15[V]<br>Ripple p-p : less than 5%   |
| Consuming Current ( In case of no load ) | 70mA Max   |
| Maximum Response Frequency               | 100 KHz  |
| Output voltage                           | Less than $V_L$ 0,5[V] / More than $V_H$ 10[V]   |
| Output current                           | Less than 20mA   |
| Rising, decline time                     | Less than 0,1 $\mu$ s  |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 800g – cm Max   |
| Maximum number of revolution           | 800 rpm   |
| Bearing lifetime                       | 50,000[hr](In case of rotating by 3000rpm)            |
| Allowable Shaft Load                   | Radial : 5,0kg Max<br>Axial : 2,5kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0,05 mm<br>Axial : Less than 0,2mm |
| Connection Table                       | 3P(AWG26) Shield CABLE                                |
| weight                                 | 1,5kg   |

## Rigid Spec.

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 35% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

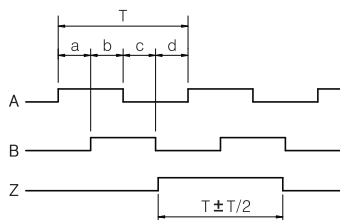
CCW → Counterclockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/10$$

$$a, b, c, d = T/4 \pm T/10$$



## Open Collector



## Connection Table

| Cable's Color | Connection Table |
|---------------|------------------|
| Output Form   | Open Collector   |
| Red           | Vcc              |
| Black         | GND              |
| Green         | A Sig            |
| Orange        | A Sig GND        |
| Brown         | B Sig            |
| White         | B Sig GND        |
| Shield        | CASE Shield      |

# ABSOLUTE SHAFT TYPE SA58 Series

- Features : Index table, Textile machine
- Gray code output(10 Bit)
- Easy to be attached



## Model

ABSOLUTE  
SHAFT TYPE  
Outer Diameter Ø58

Shaft Size

10 : Ø10

**SA58 - 10 -**     **-**   **-**

Resolution(P/R)

1024(10Bit)

Output Signal

G : Gray Code

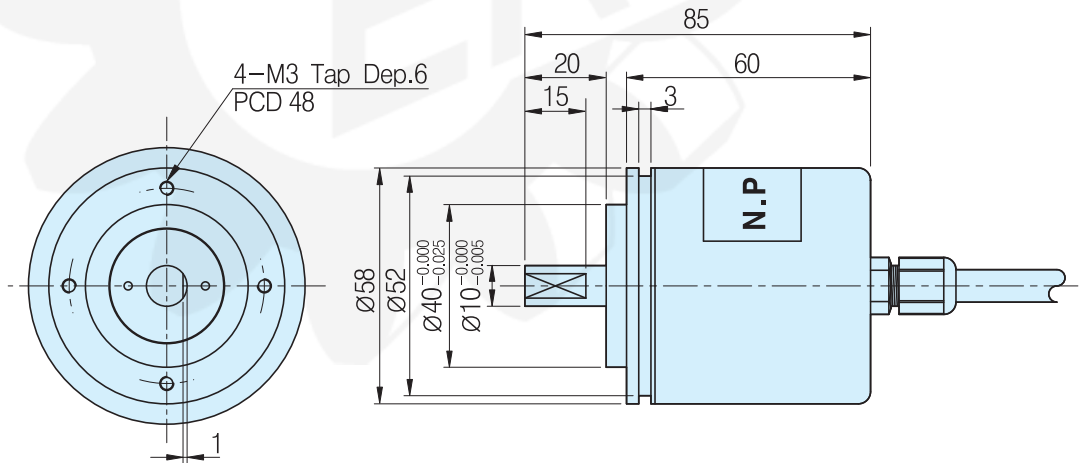
Output Form

O : Open Collector

Cable Length

- 1 : 1[M]
- 2 : 2[M]
- 3 : 3[M]
- 4 : 5[M]
- 5 : 10[M]

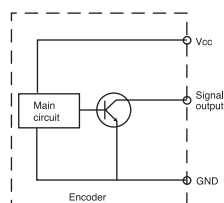
## External Dimension



## Output Circuit

Output : Open Collector

Circuit



## Electrical Spec.

|  |  |
|--|--|
| Output type                              | Open Collector   |
| Power Supply                             | DC +5[V] ~ 24[V]<br>Ripple p-p : less than 5%  |
| Consuming Current ( In case of no load ) | 150mA Max  |
| Maximum Response Frequency               | 10 KHz MAX   |
| Output voltage                           | Less than $V_L$ 0.5[V] / More than $V_H$ 2.5[V]( Based on inputting 5[V] )                           |
| Output current                           | Less than 20mA   |
| Rising, decline time                     | Less than 0.1 $\mu$ s  |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |

## Mechanical Spec.

|  |   |
|--|---|
| Starting Torque                        | 800g - cm Max   |
| Maximum number of revolution           | 3000 rpm  |
| Bearing lifetime                       | 30,000[hr](In case of rotating by 3000rpm)            |
| Allowable Shaft Load                   | Radial : 5.0kg Max<br>Axial : 2.5kg Max               |
| Position deflection of allowable shaft | Radial : Less than 0.05 mm<br>Axial : Less than 0.2mm |
| Connection Table                       | 7P(AWG26) Shield CABLE                                |
| weight                                 | 500g  |

## Rigid Spec.

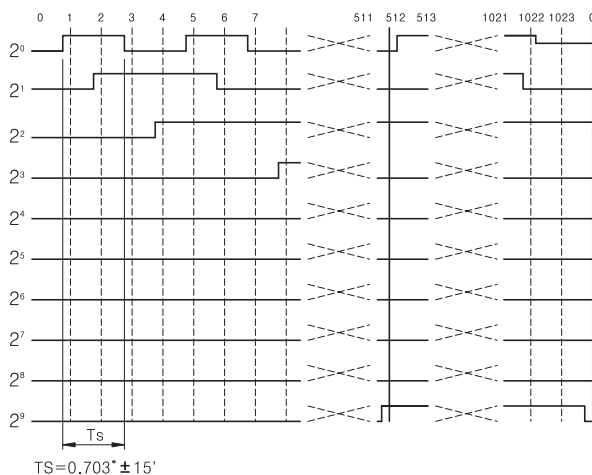
|                       |                                |
|-----------------------|--------------------------------|
| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 35% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 100G                           |
| Degree of Protection  | IP 54                          |

## Output Phase Shift

CW → Clockwise viewed from shaft end



## Open Collector



## Connection Table

| Cable's Color | Connection Table |
|---------------|------------------|
| Output Form   | Open Collector   |
| Red           | Vcc              |
| Black         | GND              |
| Green         | 2 <sup>0</sup>   |
| White/Green   | 2 <sup>1</sup>   |
| Gray          | 2 <sup>2</sup>   |
| White/Gray    | 2 <sup>3</sup>   |
| Yellow        | 2 <sup>4</sup>   |
| White/Yellow  | 2 <sup>5</sup>   |
| Brown         | 2 <sup>6</sup>   |
| White/Brown   | 2 <sup>7</sup>   |
| Blue          | 2 <sup>8</sup>   |
| White/Blue    | 2 <sup>9</sup>   |
| Shield        | CASE Shield      |

MANUAL  
PULSE GENERATOR  
**SM80 Series**

- Features : NC tooling machine, Industrial application
- High reliability, Customized logo can be available
- Half permanent durability



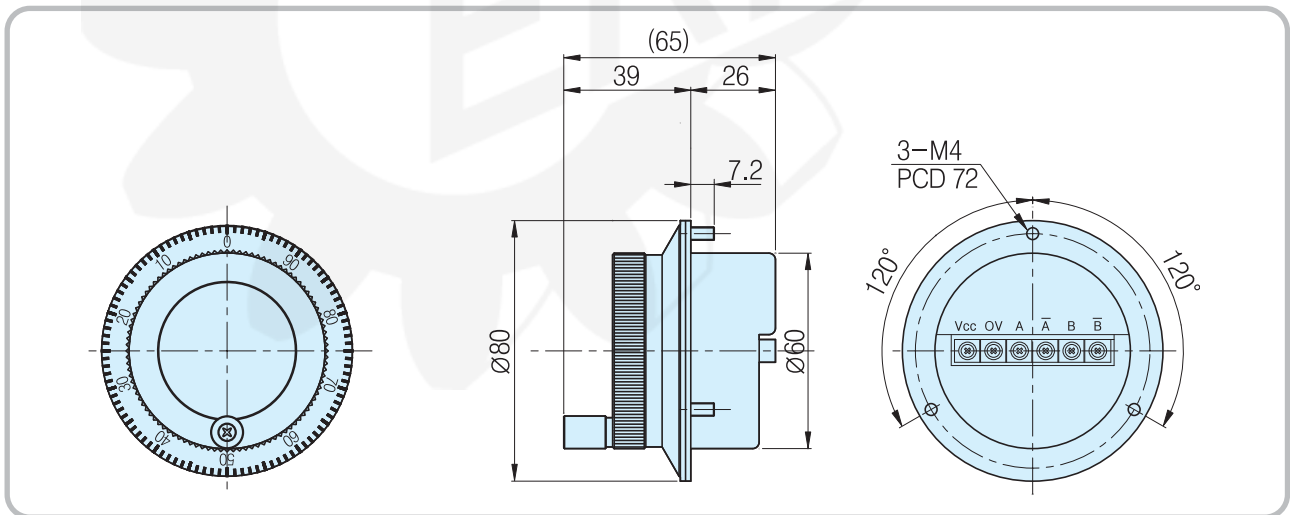
**Model**

MANUAL  
PULSE GENERATOR  
Outer Diameter Ø80

**SM80 - N -**     **-**   **-**

|                        |  |   |  |
|------------------------|--|---|--|
| <b>Resolution(P/R)</b> | <b>Output Signal</b>   | <b>Output Form</b>  | <b>MPG Color</b>   |
| 0100                   | <ul style="list-style-type: none"> <li>B : A, B</li> <li>U : A, <math>\bar{A}</math>, B, <math>\bar{B}</math></li> </ul> | <ul style="list-style-type: none"> <li>O : Open Collector</li> <li>V : Voltage Output</li> <li>L : Line Driver</li> </ul> | <ul style="list-style-type: none"> <li>1 : Silver(Attaching logo)</li> <li>2 : Silver(Without logo)</li> <li>3 : Black(Attaching logo)</li> <li>4 : Black(Without logo)</li> </ul> |

**External Dimension**



**Output Circuit**

| Output  | Open Collector | Voltage Output | Line Driver |
|---------|----------------|----------------|-------------|
| Circuit |                |                |             |

## Electrical Spec.

| Output type                              | Open Collector   | Voltage Output        | Line Driver           |
|--|--|-----------------------|-----------------------|
| Power Supply                             | DC +5[V]<br>Ripple p-p : less than 5%  |                       |                       |
| Consuming Current ( In case of no load ) | 70mA Max   | 70mA Max              | 150mA Max             |
| Maximum Response Frequency               | 5 KHz MAX  | 5 KHz MAX             | 5 KHz MAX             |
| Output voltage                           | Less than $V_L$ 0,5[V] / More than $V_H$ 2,5[V]  |                       |                       |
| Output current                           | Less than 20mA   | Less than 20mA        | Less than 20mA        |
| Rising, decline time                     | Less than 0,1 $\mu$ s  | Less than 0,1 $\mu$ s | Less than 0,1 $\mu$ s |
| Common conditions                        | In case that the cable length of output side is 1[M] and load resistance is less than 1[k $\Omega$ ] |                       |                       |

## Mechanical Spec.

| Starting Torque              | 50g – cm Max                              |
|------------------------------|---|
| Maximum number of revolution | 600 rpm                                   |
| Bearing lifetime             | 50,000[hr](In case of rotating by 600rpm) |
| Connection Table             | 6P board                                  |
| weight                       | 600g                                      |

## Rigid Spec.

| Operating Temp. Range | -10°C ~ +70°C<br>(No freezing) |
|-----------------------|--------------------------------|
| Preserving temp       | -20°C ~ +85°C                  |
| Using humidity        | 35% ~ 80% RH                   |
| Preserving Humidity   | 30% ~ 85% RH                   |
| Internal Vibration    | 5G                             |
| Internal Shock        | 50G                            |
| Degree of Protection  | IP 50                          |

## Output Phase Shift

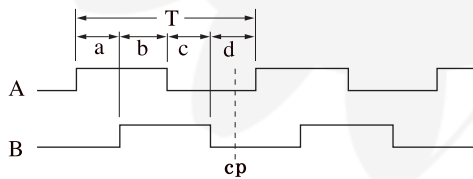
CW ➡ Clockwise viewed from shaft end

$$a + b, c + d = T/2 \pm T/8$$

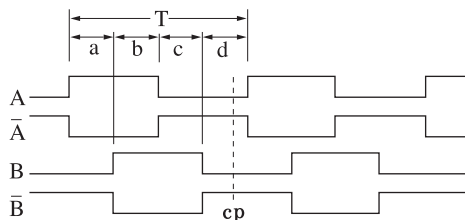
$$a, b, c, d = T/4 \pm T/8$$



## Open Collector, Voltage Output



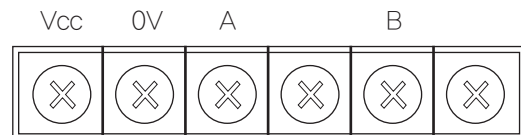
## Line Driver



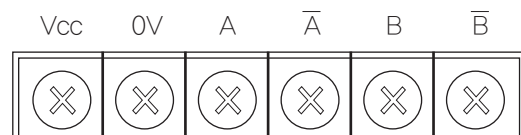
## Connection Table

### Cable Configuration

Open Collector, Voltage Output



### Line Driver



| Color  | Silver | Black |
|--|--------|-------|
| The logo by color can be attached and detached |        |       |

# SPM Series

- Features : NC tooling machine, Industrial application
- High reliability, Customized logo can be available
- Half permanent durability



## Model

**SPM** — **S01** — **A** — **L** — **M** — **1**

Spec      IP Grade      Output Form      Magnet      Cable Length

S01 : Standard  
S02 : Standard + EMG + Enable  
S03 : Standard + EMG  
S04 : Standard + Enable  
M01 : Standard + JOG

A : IP 50  
B : IP 65

L : Line Driver

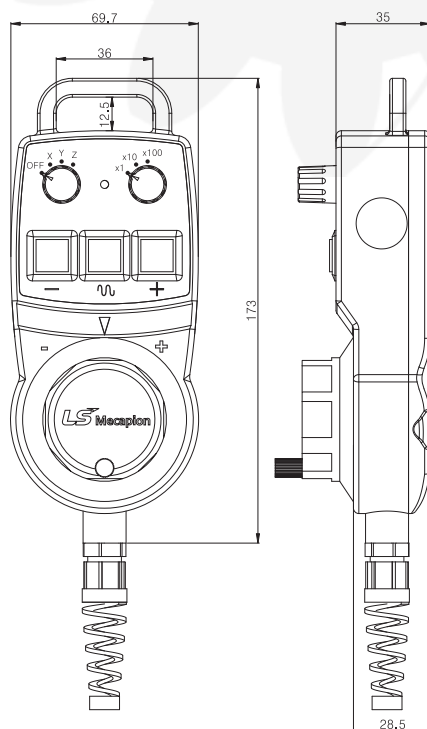
M : With Magnet  
O : Without Magnet

1 : 0.7m  
2 : 1.0m

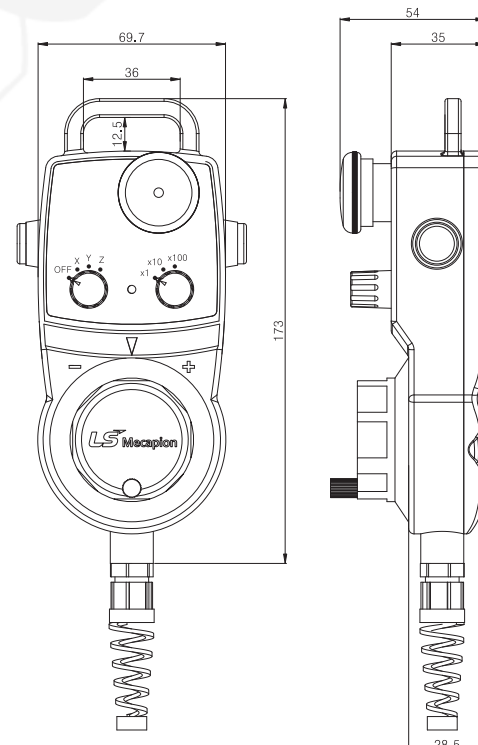
⚠ \*Note) S/W Spec  
Axes : 3axes(OFF,X,Y,Z)  
Multipulation : X1, X10, X100  
Enable S/W : OR type

## External Dimension

<JOG Type>



<Standard+EMG+ENA Type>





## Electrical Spec.

|  |  |               |                               |
|--|--|---------------|-------------------------------|
| Output type                            | Line Driver                                    |               |                               |
| Power Supply                           | DC +5[V]                                       |               |                               |
| Consuming Current (In case of no load) | 50mA Max                                       |               |                               |
| Maximum Response Frequency             | 5 KHz MAX                                      |               |                               |
| Output voltage                         | Less than $V_L$ 0.5[V]/ Over than $V_H$ 2.5[V] | Multipulation | X1, X10, X100 (Rotary Switch) |
| Output current                         | Less than 20mA                                 |               | Emergency S/W                 |
| Rising, decline time                   | Less than 0.1 $\mu$ s                          | S/W           | Enable S/W                    |
| Axis                                   | X, Y, Z  |               | JOG S/W                       |

## Mechanical Spec.

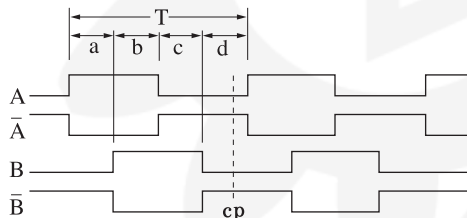
|                              |                |
|------------------------------|----------------|
| Starting Torque              | 50g - cm Max   |
| Maximum number of revolution | 600 rpm        |
| Bearing lifetime             | 50,000[hr]     |
| Terminal Block               | 5268-6(Molex)  |
| Magnet                       | With / Without |

## Rigid Spec.

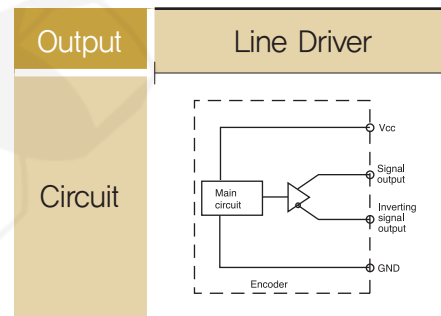
|                       |               |
|-----------------------|---------------|
| Operating Temp. Range | -10°C ~ +70°C |
| Preserving temp       | -20°C ~ +85°C |
| Using humidity        | 35% ~ 80% RH  |
| Preserving Humidity   | 30% ~ 85% RH  |
| Internal Vibration    | 5G            |
| Internal Shock        | 10G           |
| Degree of Protection  | IP 50         |

## Output Phase Shift

### Line Driver



## Output Circuit



## Connection Table

### Wiring Diagram

| NO. | Signal | Color        |
|-----|--------|--------------|
| 1   | H+5V   | Red          |
| 2   | HOV    | Black        |
| 3   | HA     | White        |
| 4   | HB     | Brown        |
| 5   | /HA    | Yellow       |
| 6   | /HB    | Gray         |
| 7   | COM    | Pink         |
| 8   | AX1    | Blue         |
| 9   | AX2    | Violet       |
| 10  | AX4    | Green        |
| 11  | MP1    | Red/Blue     |
| 12  | MP2    | White/Green  |
| 13  | L+     | Gray/Pink    |
| 14  | L-     | White/Gray   |
| 15  | F1     | White/Yellow |
| 16  | F2     | Yellow/Brown |
| 17  | F3     | Gray/Brown   |
| 18  | Shield | Case Shield  |

<JOG Type>

### Wiring Diagram

| NO. | Signal | Color        |
|-----|--------|--------------|
| 1   | H+5V   | Red          |
| 2   | HOV    | Black        |
| 3   | HA     | White        |
| 4   | HB     | Brown        |
| 5   | /HA    | Yellow       |
| 6   | /HB    | Gray         |
| 7   | COM    | Pink         |
| 8   | AX1    | Blue         |
| 9   | AX2    | Violet       |
| 10  | AX4    | Green        |
| 11  | MP1    | Red/Blue     |
| 12  | MP2    | White/Green  |
| 13  | L+     | Gray/Pink    |
| 14  | L-     | White/Gray   |
| 15  | RES1   | White/Yellow |
| 16  | RES2   | Yellow/Brown |
| 17  | EN1    | Gray/Brown   |
| 18  | EN2    | Brown/Green  |
|     | Shield | Case Shield  |

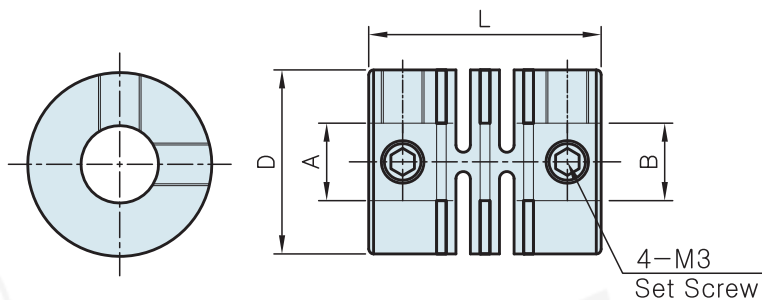
<Standard+EMG+ENA Type>

# Coupling

## ■ Option

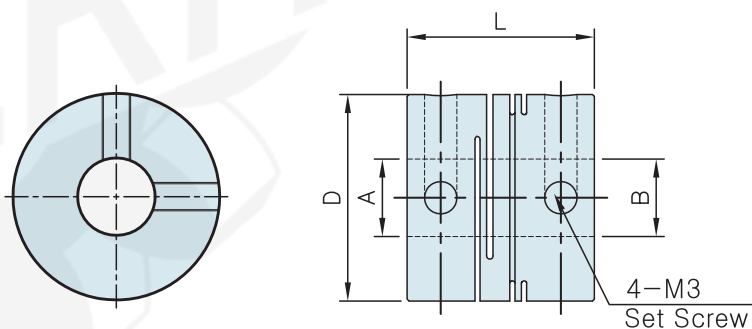
### Plastic coupling

| Model | A  | B  | D   | L    |
|-------|----|----|-----|------|
| P6-6  | ø6 | ø6 | ø15 | 21.6 |
| P8-8  | ø8 | ø8 | ø19 | 24   |



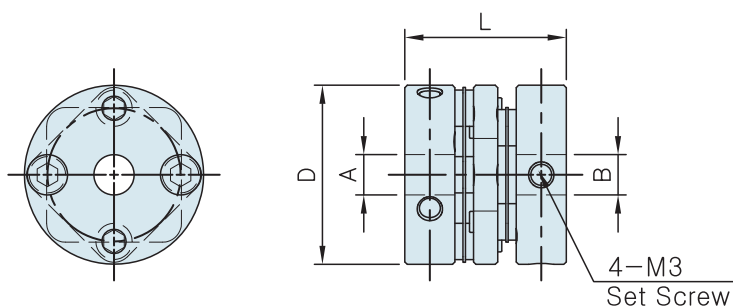
### Helical coupling

| Model | A  | B   | D     | L    |
|-------|----|-----|-------|------|
| H6-6  | ø6 | ø6  | ø19   | 22.2 |
| H8-8  | ø8 | ø8  | ø22.2 | 22.2 |
| H6-10 | ø6 | ø10 | ø22.2 | 22.2 |
| H6-10 | ø8 | ø10 | ø22.2 | 22.2 |



### Disk coupling

| Model | A  | B   | D   | L    |
|-------|----|-----|-----|------|
| D6-6  | ø6 | ø6  | ø26 | 22.5 |
| D8-8  | ø8 | ø8  | ø26 | 22.5 |
| D6-10 | ø6 | ø10 | ø26 | 22.5 |
| D8-10 | ø8 | ø10 | ø26 | 22.5 |



**LS**  Mecapion

# LS Mecapion

www.lsmecapion.com



Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance. Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.



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Girardot 1368 - C1427AKD  
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Tel. (011) 4554-3232 [www.erhsa.com](http://www.erhsa.com)

#### Head Office & Plant

(Hightech Industrial Park) 8-4, Hosandong-ro 12-9,  
Dalseo-Gu, Daegu, Korea 704-240  
T 82-53-593-0066 F 82-53-591-8614

#### Kyungin Center

104-605, SK-Ventium, Gosan-ro 166,  
Gunpo, Gyeonggi-Do, Korea 435-776  
T 82-31-436-0600 F 82-31-436-0604

#### China Factory

204-1, Xida Road, Meicun Industrial Center,  
Xinqu, Wuxi, Jiangsu, China  
T 86-510-8295-3000 F 86-510-8295-3019

#### Guangzhou Agency

RM.1403 Fl.14 New Baoli Mansion N0.2 The Sixth Zhongshan  
Road, Guangzhou, China  
T 86-20-8326-6415 F 86-20-8326-6875