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 perfomed by the personnel having expertise concerned.

Head Office & Plant
(Hightech Industrial Park) 8-4, Holim-Dong, Dalseo-Gu, Daegu, Korea 704-240
T 82-53-593-0066 F 82-53-591-8614

Kyungin Center
104-808, SK-Ventium, 522, Dangjeong-Dong, Gunpo, Gyeonggi-Do, Korea 435-776
T 82-31-436-0600 F 82-31-436-0604

China Factory
204-1, Xidalu, Meichunzhen Wuxi National Hi-Tech Industrial Development Zone Jiangsu, China
T 86-510-8295-3000 F 86-510-8295-3019

Guangdong Center
RM.1403 Fl.14 New Baoli Mansion N0.2 The Sixth Zhongshan Road,Guangzhou,510180, China
T 86-20-8326-6415 F 86-20-8326-6287

04. 2010 ※The content and specifications may be changed without prior notice for the improvment of the products Industrial Robot System 04. 2010. ajin

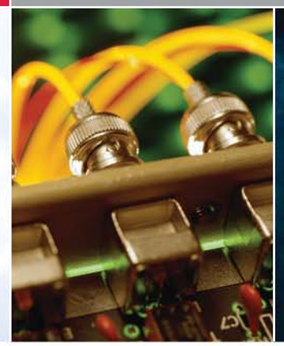
Rotary Encoder Vol. 1.1

LS Mecapion

Moving towards tomorrow

Rotary Encoder

High performance and precise control



LS Mecapion

Products Collection **Vol. 1.1**

Global FA Leading Company LS MECAPION

Various type With high resolution

- → Shaft type : Φ30 ~ Φ78
- → Hollow shaft type : Φ30 ~ Φ128
- → MPG : Panel attach type, Portable type
- → Incremental type, Absolute type, Magnet type
- → Customized models
- → Various output types
- → Resolution : 10P/R ~ 6,000P/R

High stability

- → Strong against noise with digital output
- → Various power input
- → High compatibility with various machine
- → Easy to apply

Application

- → Elevator
- → Lubrication
- → FA Machine
- → Industrial Motor

Contents

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.

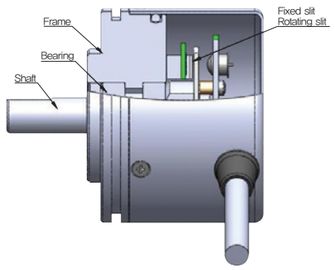
■ High Stability
- Since it can make a digital servo, it is not to be influenced by noise even if there is some time-delay.

■ 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.

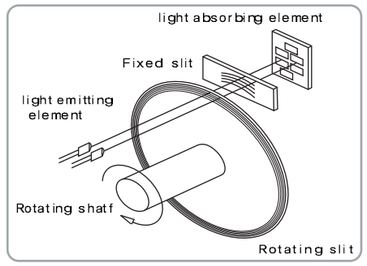
■ The equipment part is composed by shaft, frame, bearing. The light-absorbing / light emitting part are composed by light-absorbing element,light emitting element, disk/mask. The circuit part is composed by the circuit which formalizes the signal generated from light-absorbing element.

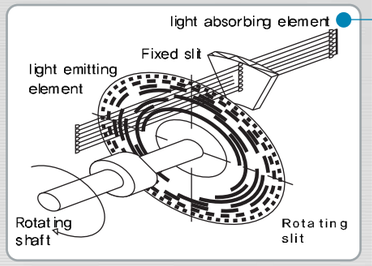


The principle of Rotary Encoder

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.

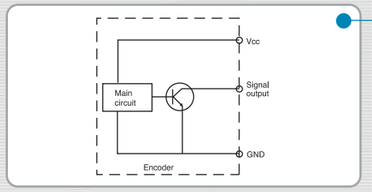




Absolute Encoder

- 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.

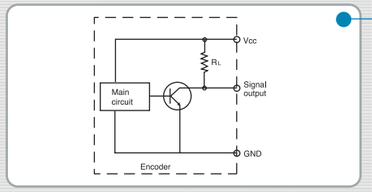
The output circuit type of Rotary Encoder



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.

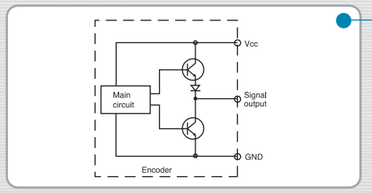
〈Application〉 FA for general use, Textile machine, Lubricator, Automation Machine, Injection machine, Cutting machine, Printing machine, Packaging machine



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.

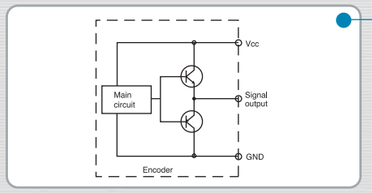
〈Application〉 FA for general use, Textile machine, Lubricator, Automation Machine Injection machine, Cutting machine, Printing machine, Packaging machine



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.

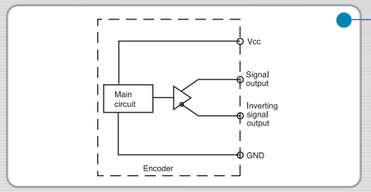
〈Application〉 FA for general use, Textile machine, Lubricator, Automation Machine Injection machine, Cutting machine, Printing machine, Packaging machine



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)

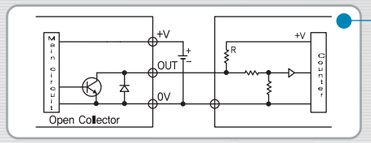


Line Driver

- 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.

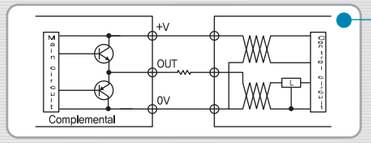
〈Application〉 AC Servo system, DC Servo System, Robot, A.G.V., NC Construction machine

The example of output connection for Rotary Encoder



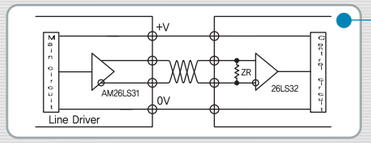
The output connection with counter

- 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.



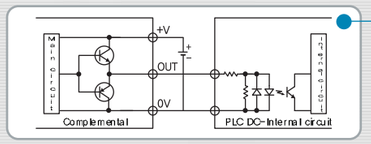
The output connection of Complemental type

- In case of complemental 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.



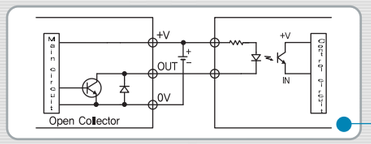
The output connection of Line Driver type

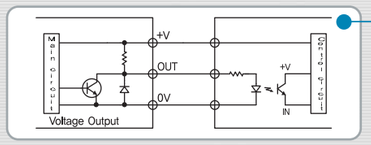
- In case of Line driver output type, For the receiving circuit which receives the output of encoder, you have to use IC(26LS32) which is corresponding to RS422A.
  You have to also apply use Twist pair cable .

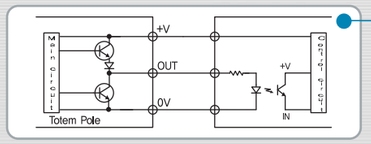


The output connection of Encoder and PLC

- 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.



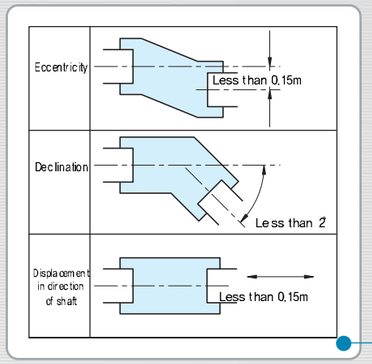


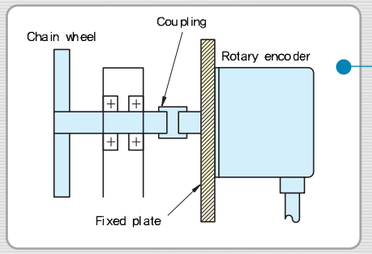


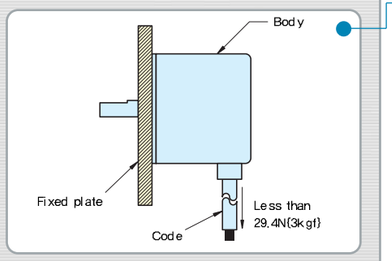
The output connection with Photo coupler

- 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 serge occurs at the used power, please suck serge by connecting serge 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, Complemental
    ➔ 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 μF 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 rotary encoder

Acquirement of the related information such as the applicable machine, equipment	Check Point Purpose
Type, installation method, appearance, output type	The shape of shaft, Appearance spec., Output type
Resolution, precision of wave	Resolution
Input voltage, using temperature, frequency features, output signal, the load allowed at shaft	Select the special items depending on the purpose
Special Spec., Special condition	Depending options
Selecting encoder	Delivery

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])

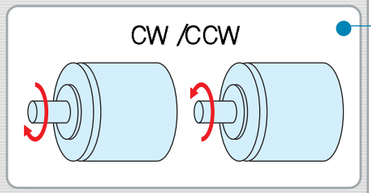
- It indicates the allowed radial and axial load when the shaft is rotated.

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

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

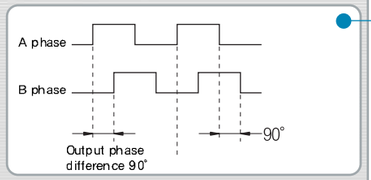
■Bearing lifespan (Symbol : [hs], Unit : [hrs])

- 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

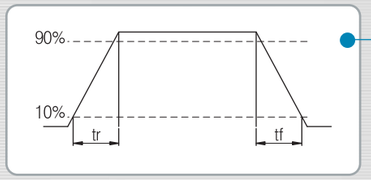
- The output signal of A, B phase are output with 90° of phase difference.
  It is the signal to discriminate the rotation direction.

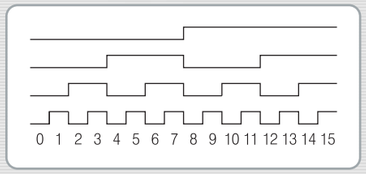
■Z phase

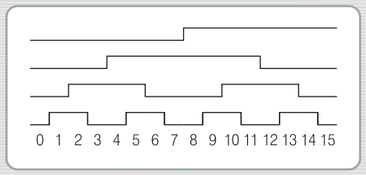
- One Z phase is output per one rotation, which is called origin signal.

■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
2^3	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
2^2	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
2^1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
2^0	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
2^3	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
2^2	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0
2^1	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0
2^0	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
$2^3\times10^0$	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
$2^2\times10^0$	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1
$2^1\times10^0$	0	0	1	1	0	0	1	1	0	0	0	0	1	1	0	0
$2^0\times10^0$	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

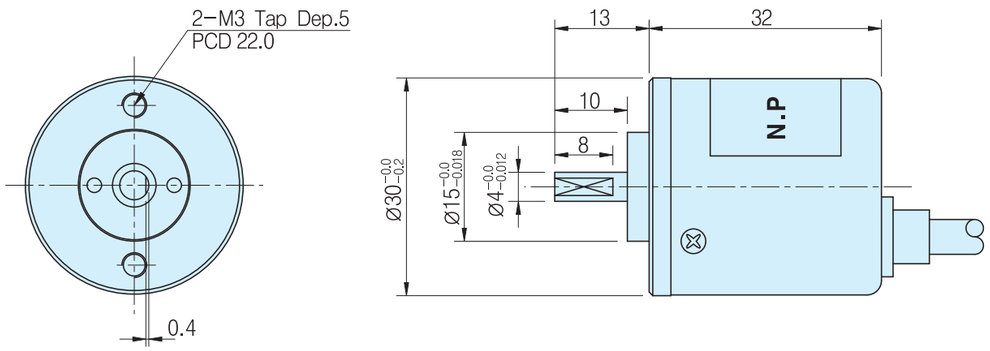
Output Signal
B : A, B
Z : A, B, Z
U : A, $\bar{A}$, B, $\bar{B}$
V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

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

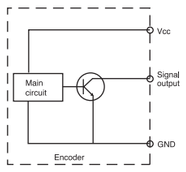
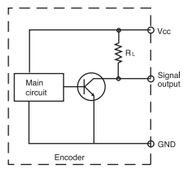
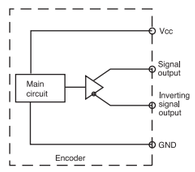
Cable Length
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

⚠ The 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	Line Driver
Circuit			

ROTARY ENCODER

Electrical Spec.

Output type	Open Collector	Voltage Output	Line Driver
Power Supply	DC +12[V] ~ +15[V] Ripple p-p : less than 5%	DC +12[V] ~ +15[V] Ripple p-p : less than 5%	DC +5[V] Ripple p-p: less than 5%
Consuming Current (In case of no load)	70㎃ Max	70㎃ Max	150㎃ 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㎲	Less than 3㎲	Less than 1㎲
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]		

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 Axial : 0.9kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	120g

Rigid Spec.

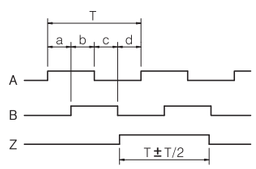
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ +85% RH
Preserving Humidity	30% ~ +90% RH
Internal Vibration	5G
Internal Shock	50G
Degree of Protection	IP 50

Output Phase Shift

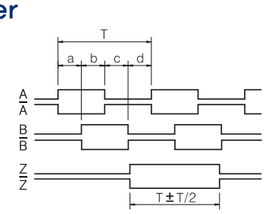
CW ➡ Clockwise viewed from shaft end

a + b, c + d = T/2 ± T/8
a, b, c, d = T/4 ± T/8

Open Collector, Voltage Output



Line Driver



Connection Table

Cable's Color	Connection Table	
Output Form	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 Ø40

Shaft Size
6 : Ø6 ※Option: 5 : Ø5

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

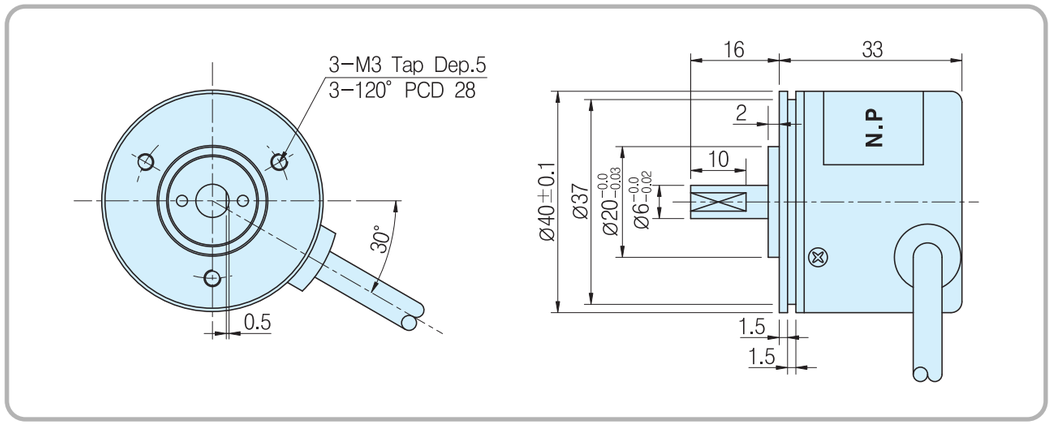
Output Signal
B : A, B
Z : A, B, Z
U : A, $\bar{A}$, B, $\bar{B}$
V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

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

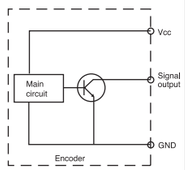
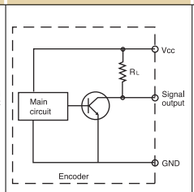
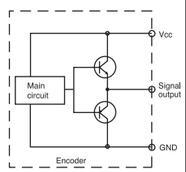
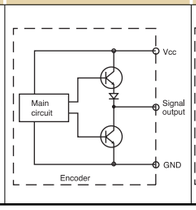
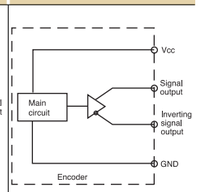
Cable Length
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

⚠ The 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	Totem Pole	Line Driver
Circuit					

ROTARY ENCODER

Electrical Spec.

Output type	Open Collector	Voltage Output	Complemental	Totem Pole	Line Driver
Power Supply	DC +5[V] ~ +24[V] Ripple p-p : less than 5%	DC +5[V] ~ +24[V] Ripple p-p : less than 5%	DC +15[V], +24[V] Ripple p-p : less than 5%	DC +5[V] ~ 24[V] Ripple p-p : less than 5%	DC +5[V] Ripple p-p : less than 5%
Consuming Curent (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 Vl. 0.5[V] / More than Vh 2.5[V] (In case of inputting +5V), / More than Vh 10[V](In case of inputting +15V) / More than Vh 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 3μs	Less than 3μs	Less than 1μs	Less than 1μs	Less than 0.1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]				

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 Axial : 1.1kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	150g

Rigid Spec.

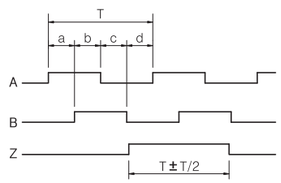
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 85% RH
Preserving Humidity	30% ~ 90% RH
Internal Vibration	5G
Internal Shock	50G
Degree of Protection	IP 50

Output Phase Shift

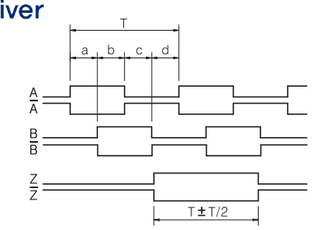
CW ➡ Clockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector, Voltage Output Complemental, Totem Pole



Line Driver



Connection Table

Cable's Color	Connection Table	
Output Form	Open Collector Voltage Output Complemental 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 Ø48

Shaft Size
8 : Ø8 ※Option: 6: Ø6

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

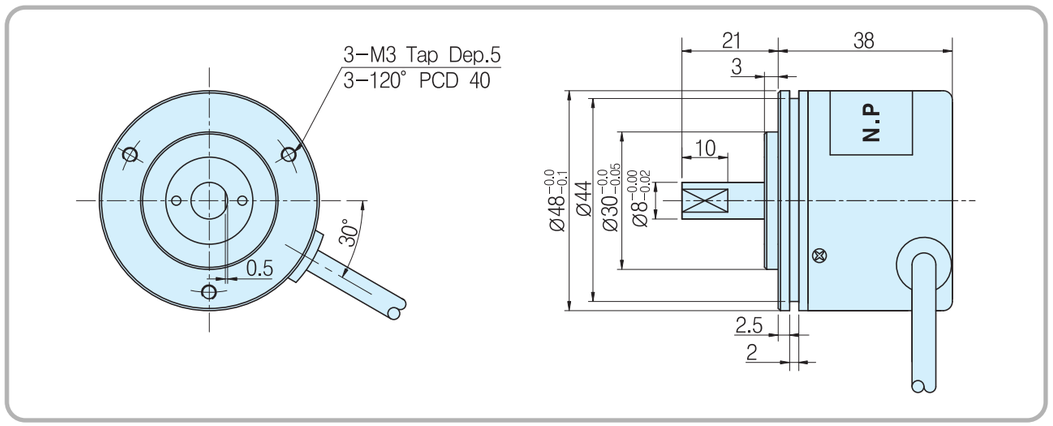
Output Signal
B : A, B
Z : A, B, Z
U : A, $\bar{A}$, B, $\bar{B}$
V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

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

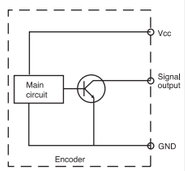
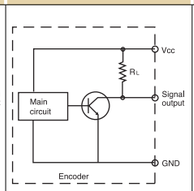
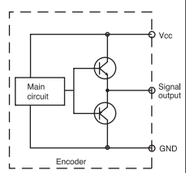
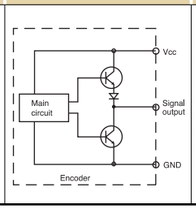
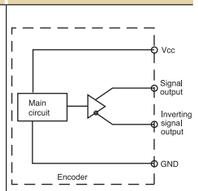
Cable Length
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

⚠ hesepc) of powerm ay 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	Totem Pole	Line Driver
Circuit					

ROTARY ENCODER

Electrical Spec.

Output type	Open Collector	Voltage Output	Complemental	Totem Pole	Line Driver
Power Supply	DC +5[V] ~ +24[V] Ripple p-p : less than 5%	DC +5[V] ~ +24[V] Ripple p-p : less than 5%	DC +15[V], +24[V] Ripple p-p : less than 5%	DC +5[V] ~ 24[V] Ripple p-p : less than 5%	DC +5[V] Ripple p-p : less than 5%
Consuming Curent (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_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) / More than V_H 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 3μs	Less than 3μs	Less than 1μs	Less than 1μs	Less than 0.1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]				

※ 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 Axial : 1.3kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	206g

Rigid Spec.

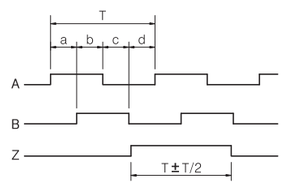
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 85% RH
Preserving Humidity	30% ~ 90% RH
Internal Vibration	5G
Internal Shock	100G
Degree of Protection	IP 50

Output Phase Shift

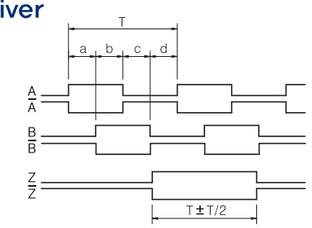
CW ➡ Clockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector, Voltage Output Complemental, Totem Pole



Line Driver



Connection Table

Cable's Color	Connection Table	
Output Form	Open Collector Voltage Output Complemental 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

ROTARY ENCODER

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

Model

INCREMENTAL SHAFT TYPE | Shaft Size | Resolution

S58 - 10 - □□□□ - □ - □ - □ - □ - □ - □ - □[3]

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

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

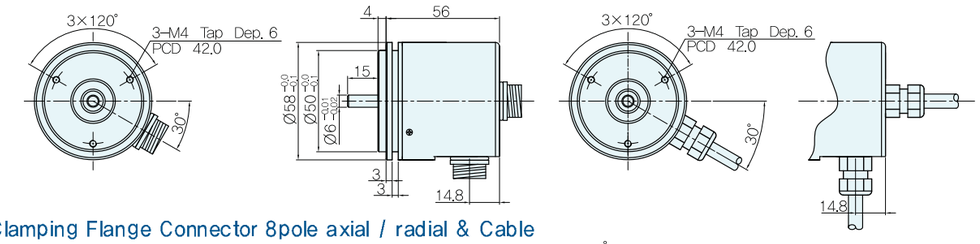
Cable Connecting Type
A : Circular Connector, radial[1]
B : Circular Connector, axial[1]
C : Cable, radial[2]
D : Cable, axial[2]

Power supply
1 : 5~24V
2 : 15V
3 : 24V
4 : 5V

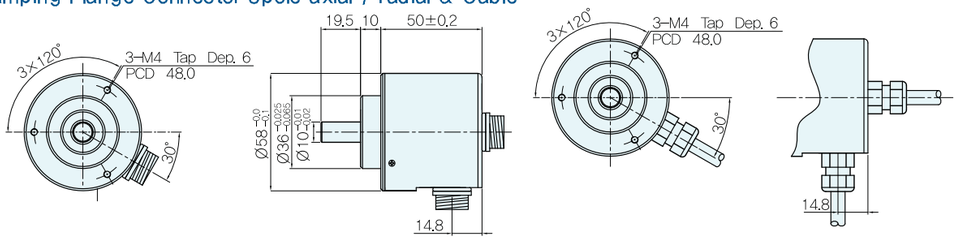
Cable Length
1 : 1.0m
|
A : 10.0m

External Dimension

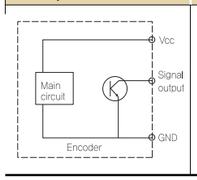
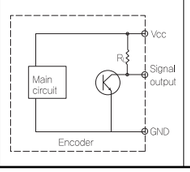
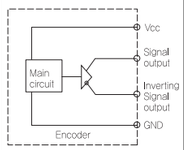
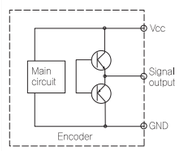
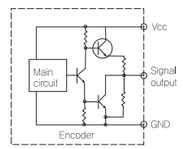
Synchro Flange Connector 8pole axial / radial & Cable



Clamping Flange Connector 8pole axial / radial & Cable



Output Circuit

Output	Open Collector	Voltage Output	Line Driver	Complemental	Totem Pole
Circuit					

Electrical Spec.

• Electrical Spec.

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

※ 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.

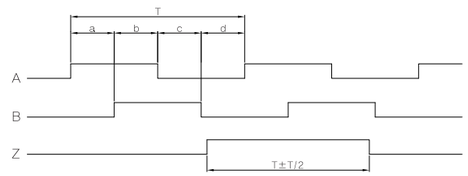
Operating Temp. Range	-10℃ ~+70℃ (No Freezing)
Preserving Temp	-20℃ ~+85℃
Using Temp	35%~85%RH
Preserving Humidity	35%~90%RH
Internal Vibration	5G
Internal Shock	100G
Degree of Protection	IP 65

• Mechanical Spec.

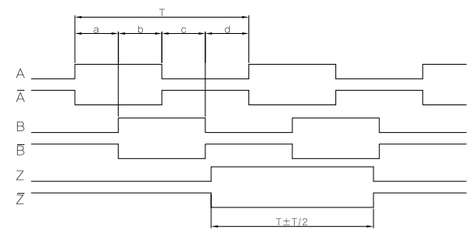
Starting Torque	100 gf-㎝
Max. No. of Rotation	6000rpm
Bearing Lifetime	30,000Hr(W/5000rpm)
Allowable Shaft Load	Radial : 2.2kg Max.
	Axial : 1.1kg Max.
Cable Type	4P(AWG26) Shield Cable

Signal Spec.

Voltage output, Open collector, Complemental, Totem pole



Line Driver



• T=360° /N (N : Resolution)
• a+b, c+d = T/2±T/10
• A, B Phase has 90° of Difference
• Z Phase is Origin signal

→ CW from shaft end

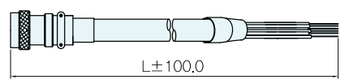
Cable Spec.

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	OS05BAK01×A	OS05BAK02×A	OS05BAK04×A
3.0m	OS05BAK01×B	OS05BAK02×B	OS05BAK04×B
5.0m	OS05BAK01×C	OS05BAK02×C	OS05BAK04×C
7.0m	OS05BAK01×D	OS05BAK02×D	OS05BAK04×D
10.0m	OS05BAK01×E	OS05BAK02×E	OS05BAK04×E

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

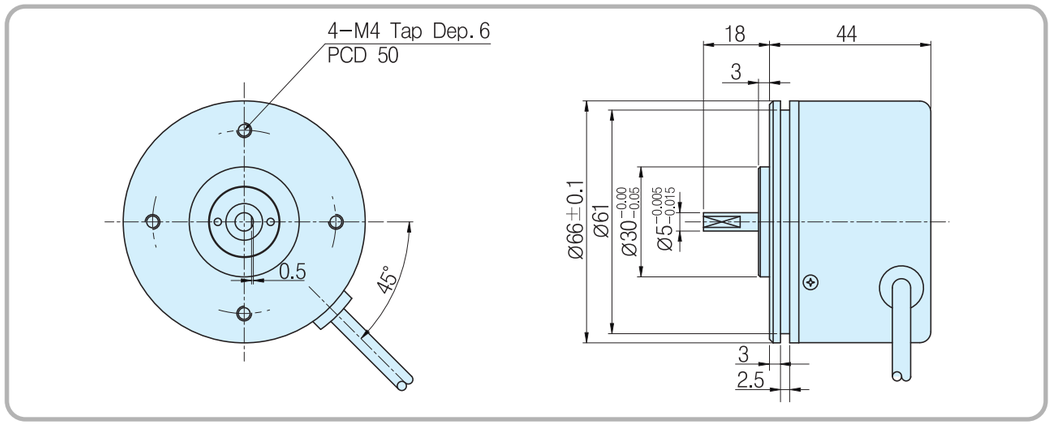
Output Signal
B : A, B
Z : A, B, Z
U : A, $\bar{A}$, B, $\bar{B}$
V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

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

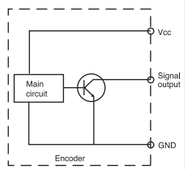
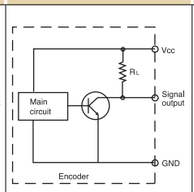
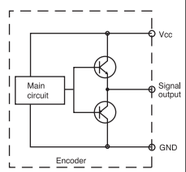
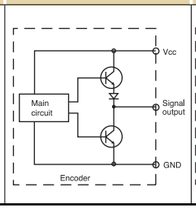
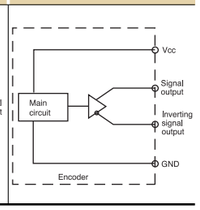
Cable Length
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

⚠ hesepc) of powerm ay 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	Totem Pole	Line Driver
Circuit					

ROTARY ENCODER

Electrical Spec.

Output type	Open Collector	Voltage Output	Complemental	Totem Pole	Line Driver
Power Supply	DC +5[V] ~ +24[V] Ripple p-p : less than 5%	DC +5[V] ~ +24[V] Ripple p-p : less than 5%	DC +15[V], +24[V] Ripple p-p : less than 5%	DC +5[V] ~ 24[V] Ripple p-p : less than 5%	DC +5[V] Ripple p-p : less than 5%
Consuming Curent (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_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) / More than V_H 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 3μs	Less than 3μs	Less than 1μs	Less than 1μs	Less than 0.1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]				

※ 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 Axial : 1.3kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	250g

Rigid Spec.

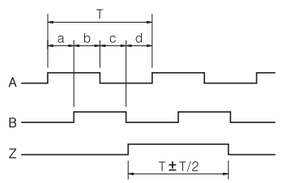
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 85% RH
Preserving Humidity	30% ~ 90% RH
Internal Vibration	5G
Internal Shock	50G
Degree of Protection	IP 50

Output Phase Shift

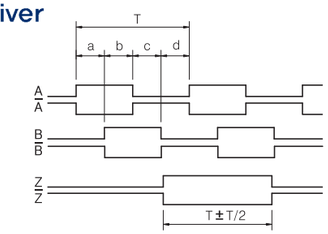
CW ➡ Clockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector, Voltage Output Complemental, Totem Pole



Line Driver



Connection Table

Cable's Color	Connection Table	
Output Form	Open Collector Voltage Output Complemental 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

ROTARY ENCODER

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

Model

INCREMENTAL
SHAFT TYPE
Outer Diameter Ø68

Shaft Size
15 : Ø 15 ※Option: 10: Ø 10

S68A - 15 - □□□□ - □□

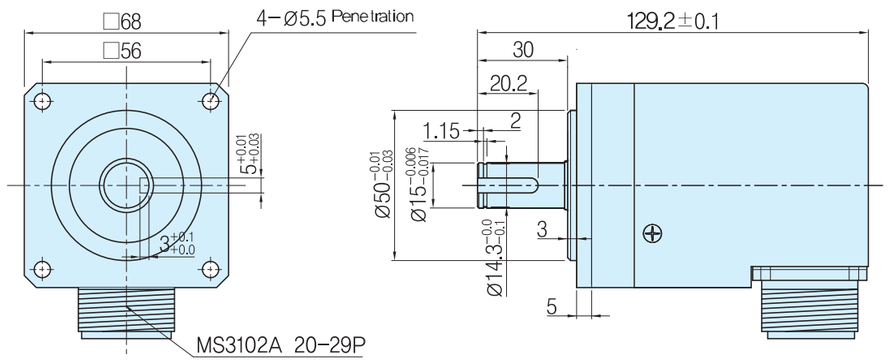
Resolution(P/R)
0100 0500 1000
1024 2000 2048

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

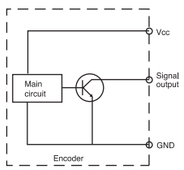
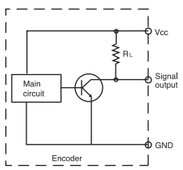
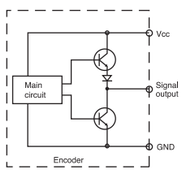
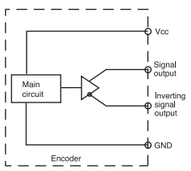
Output Form
O : Open Collector
V : Voltage Output
T : Totem Pole
L : Line Driver

⚠ hesepc) of powerm ay 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	Totem Pole	Line Driver
Circuit				

Electrical Spec.

Output type	Open Collector	Voltage Output	Totem Pole	Line Driver
Power Supply	DC +15[V] Ripple p-p : less than 5%	DC +15[V] Ripple p-p : less than 5%	DC +5[V] ~ 24[V] Ripple p-p : less than 5%	DC +5[V] Ripple p-p : less than 5%
Consuming Current (In case of no load)	70㎃ Max	70㎃ Max	150㎃ Max	150㎃ Max
Maximum Response Frequency	150 KHz (100 ~ 2048 P/R)			
Output voltage	Less than Vₒ 0.5[V] / More than Vₒ 2.5[V] (In case of inputting +5V), / More than Vₒ 10[V](In case of inputting +15V) / More than Vₒ 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㎲	Less than 3㎲	Less than 1㎲	Less than 0.1㎲
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]			

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 Axial : 5kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	MS3102A 20-29P
weight	720g

Rigid Spec.

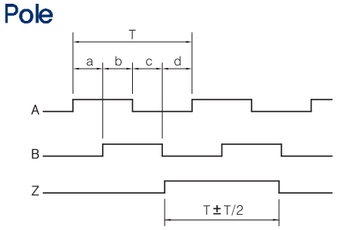
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ +85% RH
Preserving Humidity	35% ~ +95% RH
Internal Vibration	5G
Internal Shock	50G
Degree of Protection	IP 54

Output Phase Shift

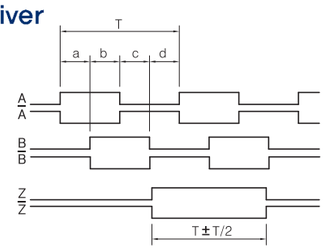
CW ➡ Clockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector, Voltage Output Totem Pole



Line Driver



Connection Table

Cable's Color	Connection Table	
Pin code	Open Collector Voltage Output 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

ROTARY ENCODER

■Features : Various resolution, 100~2048 P/R(6 class)
Wide ranging power voltage, Customized design,
Prompt delivery

Model

INCREMENTAL
SHAFT TYPE
Outer Diameter Ø68

Shaft Size
10 : Ø10 ※Option : 15: Ø15

S68B- 10 - □□□□ - □□ - □

Resolution(P/R)
0100 0500 1000
1024 2000 2048

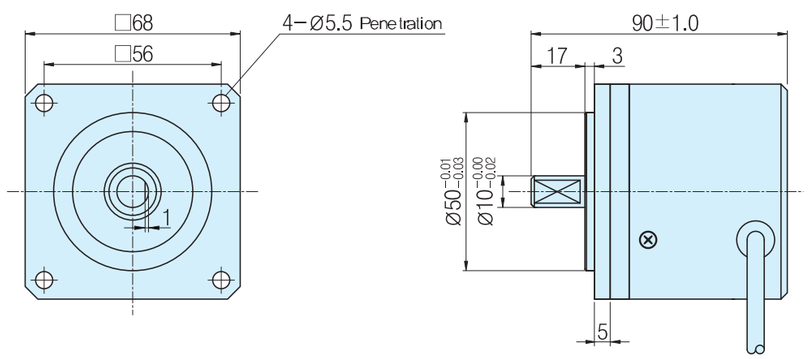
Output Signal
Z : A, B, Z
U : A, $\bar{A}$, B, $\bar{B}$
V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

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

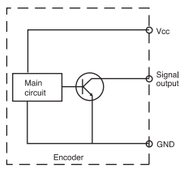
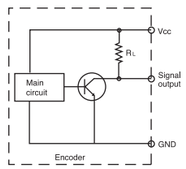
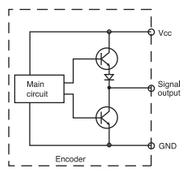
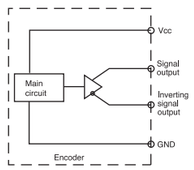
Cable Length
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

⚠ hesepc) of powerm ay 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	Totem Pole	Line Driver
Circuit				

Electrical Spec.

Output type	Open Collector	Voltage Output	Totem Pole	Line Driver
Power Supply	DC +15[V] Ripple p-p : less than 5%	DC +15[V] Ripple p-p : less than 5%	DC +5[V] ~ 24[V] Ripple p-p : less than 5%	DC +5[V] Ripple p-p : less than 5%
Consuming Current (In case of no load)	70㎃ Max	70㎃ Max	150㎃ Max	150㎃ Max
Maximum Response Frequency	150 KHz (10 ~ 2048 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) / More than V_H 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㎲	Less than 3㎲	Less than 1㎲	Less than 0.1㎲
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]			

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 Axial : 5kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	620g

Rigid Spec.

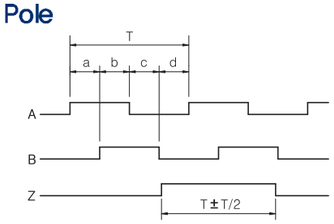
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ +85% RH
Preserving Humidity	30% ~ +90% RH
Internal Vibration	5G
Internal Shock	50G
Degree of Protection	IP 50

Output Phase Shift

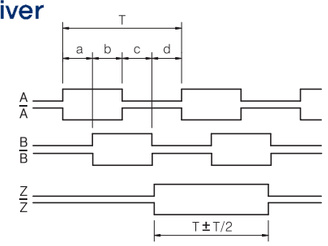
CW ➡ Clockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector, Voltage Output Totem Pole



Line Driver



Connection Table

Cable's Color	Connection Table	
Output Form	Open Collector Voltage Output 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

S78 Series

■Features : Elevator, Industrial Machine

ROTARY ENCODER

Model

INCREMENTAL
SHAFT TYPE
Outer Diameter Ø78

Shaft Size
8 : Ø8

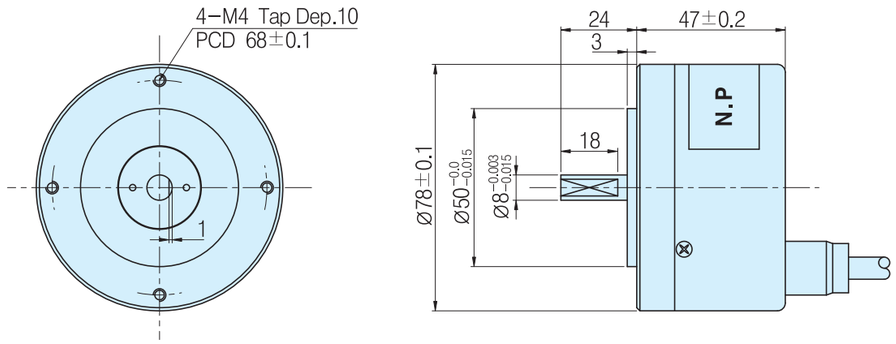
S78 - 8 - □□□□ - □□

Resolution(P/R)
0512

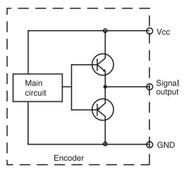
Output Signal
B : A, B

Output Form
C : Complemental

External Dimension



Output Circuit

Output	Complemental
Circuit	

Electrical Spec.

Output type	Complemental
Power Supply	DC +15[V] Ripple p-p : less than 5%
Consuming Curent (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 1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

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 Axial : 1.5kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	400g

Rigid Spec.

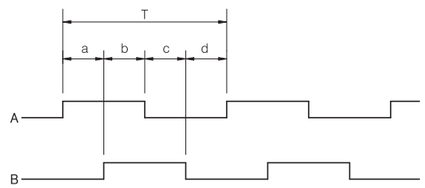
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ +85% RH
Preserving Humidity	35% ~ +90% RH
Internal Vibration	5G
Internal Shock	100G
Degree of Protection	IP 50

Output Phase Shift

CW ➡ Clockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Complemental



Connection Table

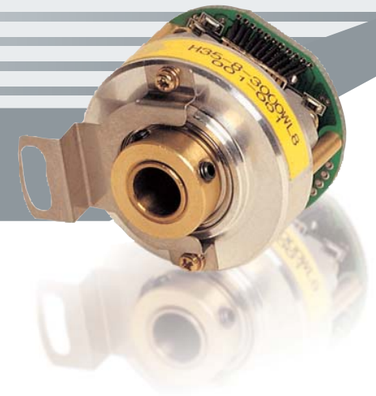
Cable's Color	Connection Table
Output Form	Complemental
Red	Vcc
Black	GND
Green	A Sig
Yellow	B Sig
Shield	CASE Shield

INCREMENTAL
HOLLOW TYPE

H35 Series

ROTARY ENCODER

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



Model

INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø35

Shaft Size
8 : Ø8 ※Option : 6 : Ø6

H35 - 8 - □□□□ - □□ - □

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

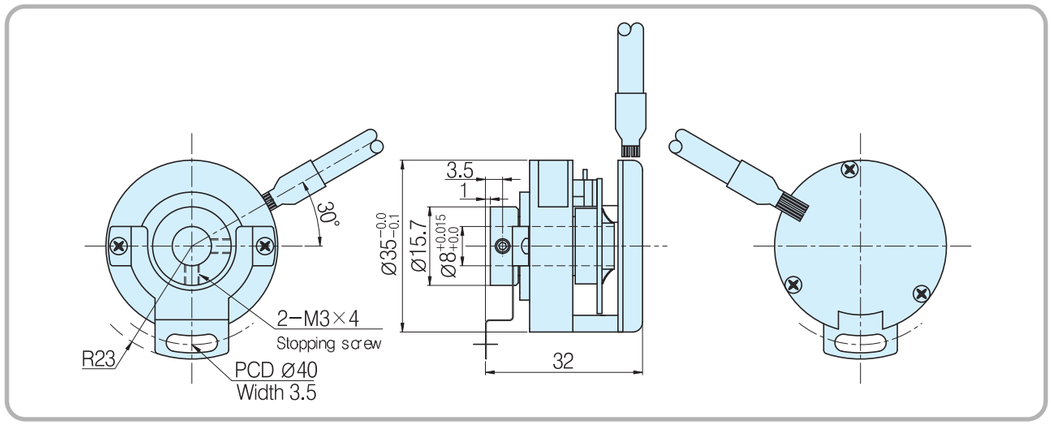
Output Signal
Z : A, B, Z
V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$
W : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$ U, $\bar{U}$, V, $\bar{V}$, W, $\bar{W}$

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

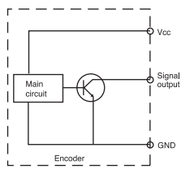
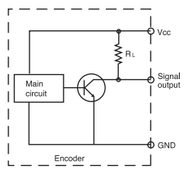
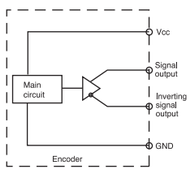
Cable Length
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

⚠ hesepc) of powerm ay 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	Line Driver
Circuit			

Electrical Spec.

Output type	Open Collector	Voltage Output	Line Driver
Power Supply	DC +12[V] Ripple p-p : less than 5%	DC +12[V] Ripple p-p : less than 5%	DC +5[V] Ripple p-p : less than 5%
Consuming Current (In case of no load)	70㎃ Max	200㎃ Max	300㎃ 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㎲	Less than 3㎲	Less than 1㎲
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]		

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 Axial : 1.1kg Max
Position deflection of allowable shaft	Radial : Less than 0.03 mm Axial : Less than 0.2mm
Connection Table	7P(AWG26) Shield CABLE
weight	100g

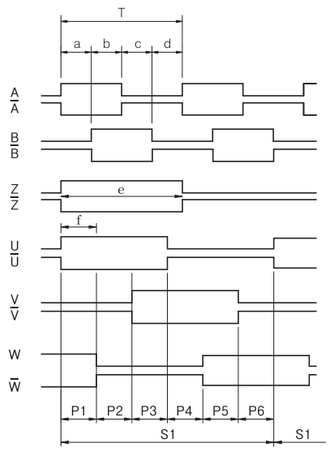
Rigid Spec.

Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
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 Voltage Output 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 Ø40

Shaft Size
8 : Ø8 ※Option 5 : Ø5 / 6 : Ø6

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

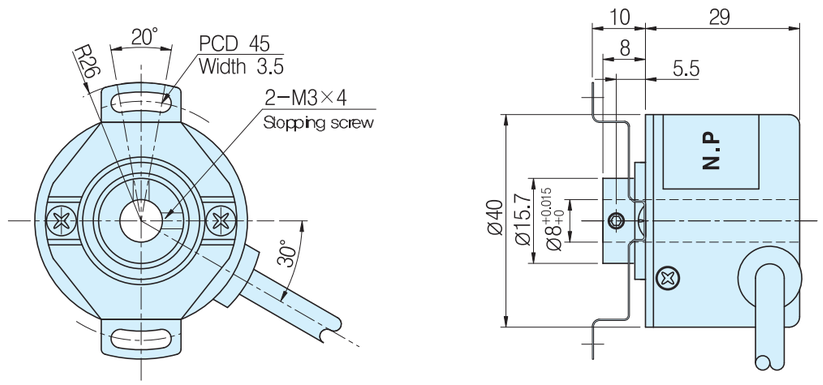
Output Signal
B : A, B
Z : A, B, Z
U : A, $\bar{A}$, B, $\bar{B}$
V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

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

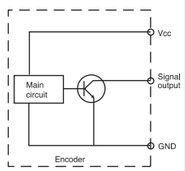
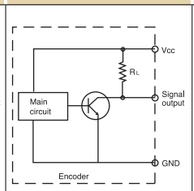
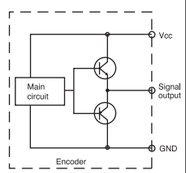
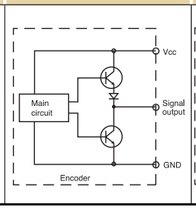
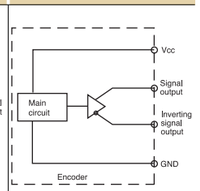
Cable Length
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

⚠ hesepc) of powerm ay 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	Totem Pole	Line Driver
Circuit					

ROTARY ENCODER

Electrical Spec.

Output type	Open Collector	Voltage Output	Complemental	Totem Pole	Line Drivet
Power Supply	DC +5[V] ~ +24[V] Ripple p-p : less than 5%	DC +5[V] ~ +24[V] Ripple p-p : less than 5%	DC +15[V], +24[V] Ripple p-p : less than 5%	DC +5[V] ~ 15[V], +24[V] Ripple p-p : less than 5%	DC +5[V],+5~24[V] Ripple p-p : less than 5%
Consuming Curent (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_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) / More than V_H 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 3μs	Less than 3μs	Less than 1μs	Less than 1μs	Less than 0.1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]				

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 Axial : 1.3kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	150g

Rigid Spec.

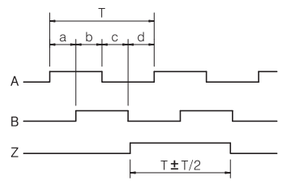
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 80% RH
Preserving Humidity	30% ~ 85% RH
Internal Vibration	5G
Internal Shock	50G
Degree of Protection	IP 50

Output Phase Shift

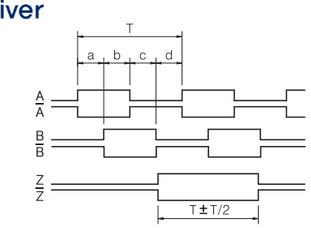
CW ➡ Clockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector, Voltage Output Complemental, Totem Pole



Line Driver



Connection Table

Cable's Color	Connection Table	
Output Form	Open Collector Voltage Output Complemental 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

ROTARY ENCODER

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

Model

INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø42

Shaft Size
8 : Ø8

H42 - 8 - □□□□ - □□ - □

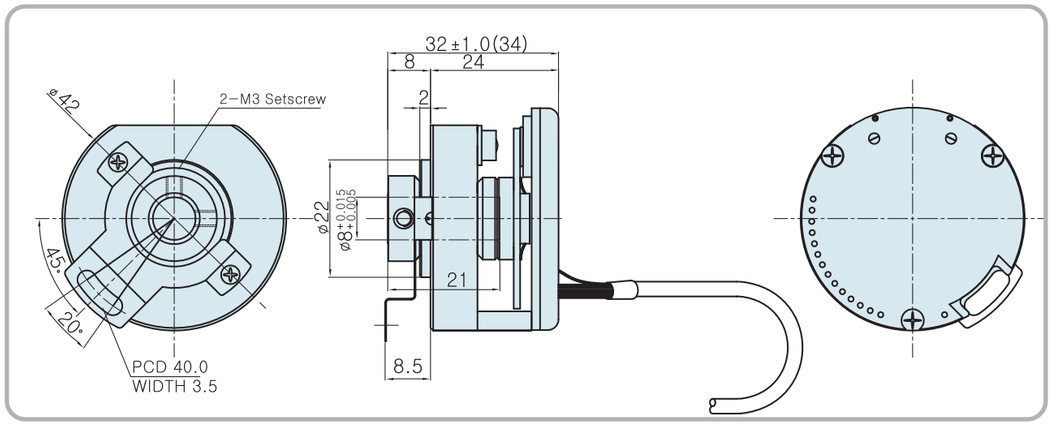
Resolution(P/R)		
2000	2048	2500
3000	5000	6000

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, $\bar{W}$

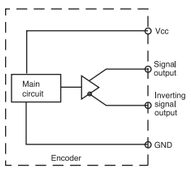
Output Form
L : Line Driver

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] Ripple p-p : less than 5%
Consuming Curent (In case of no load)	300㎃ 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㎲
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

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 Axial : 1.1kg Max
Position deflection of allowable shaft	Radial : Less than 0.03 mm Axial : Less than 0.2mm
Connection Table	7P(AWG26) Shield CABLE
weight	200g

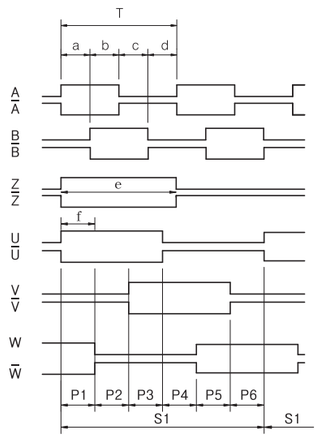
Rigid Spec.

Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
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 ➡ Courterclockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10
e = T ± T/2
f = The center of Z phase and U phase (±1°)
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

ROTARY ENCODER

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

Model

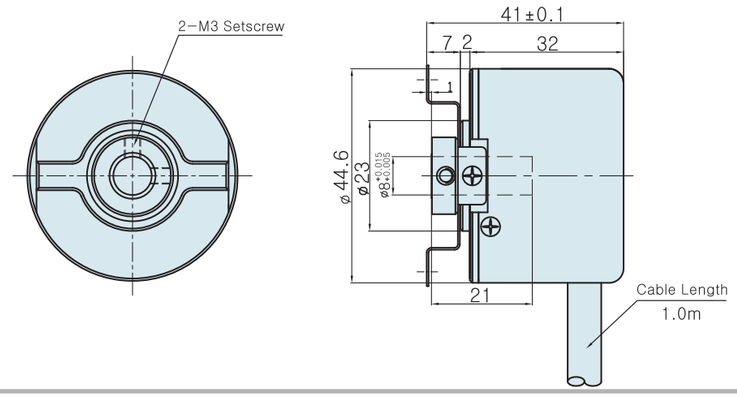
INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø45

Shaft Size
8 : Ø8

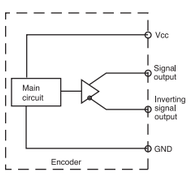
H45A- 8 - □□□□ - □□ - □

Resolution(P/R)	Output Signal	Output Form	Cable Length
2000 2048 2500 3000 5000 6000	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, $\bar{W}$	L : Line Driver	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] Ripple p-p : less than 5%
Consuming Current (In case of no load)	300㎃ 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㎲
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

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 Axial : 1.1kg Max
Position deflection of allowable shaft	Radial : Less than 0.03 mm Axial : Less than 0.2mm
Connection Table	7P(AWG26) Shield CABLE
weight	200g

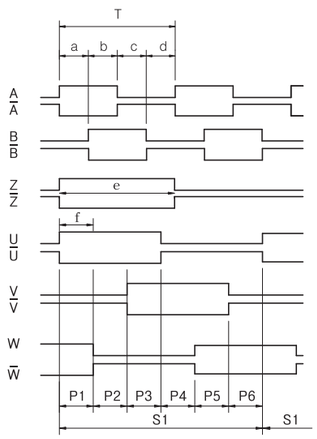
Rigid Spec.

Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
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 ➡ Courterclockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10
e = T ± T/2
f = The center of Z phase and U phase (±1°)
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

ROTARY ENCODER

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

Model

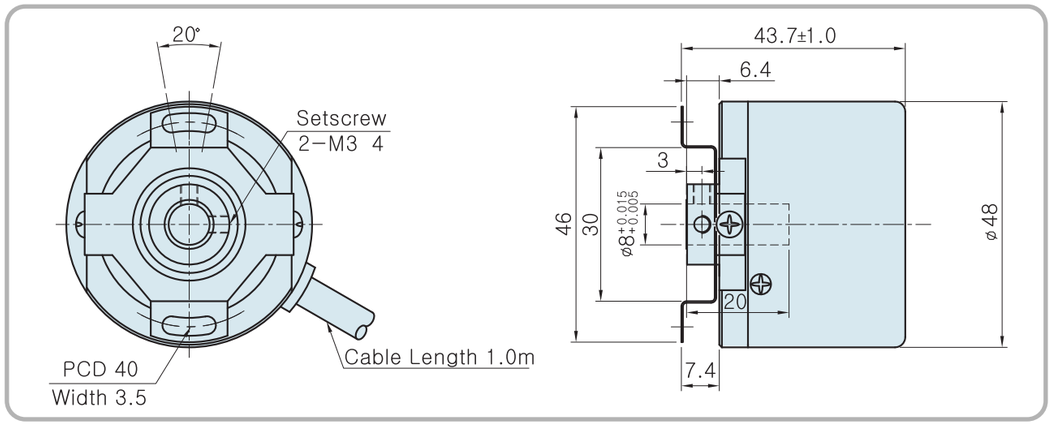
INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø48

Shaft Size
8 : Ø8

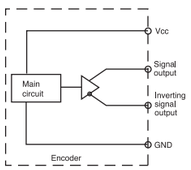
H48 - 8 - □□□□ - □□ - □

Resolution(P/R)	Output Signal	Output Form	Cable Length
5000 6000	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, $\bar{W}$	L : Line Driver	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] 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 1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

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 Axial : 1.1kg Max
Position deflection of allowable shaft	Radial : Less than 0.03 mm Axial : Less than 0.2mm
Connection Table	7P(AWG26) Shield CABLE
weight	200g

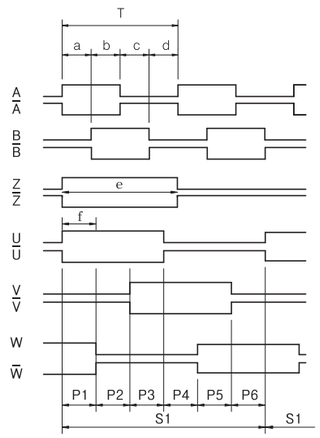
Rigid Spec.

Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
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
f = The center of Z phase and U phase (±1°)
From Uch (rise point) to Zch center



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

Connection Table

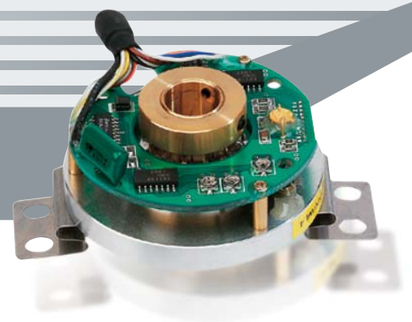
Cable's Color	Connection Table
Output Form	Line Driver
Red	Vcc
Black	GND
Green	A Sig
White/Green	$\bar{A}$ Sig
Gray	B Sig
White/Gray	$\bar{B}$ Sig
Yellow	Z Sig
White/Yellow	$\bar{Z}$ Sig
Brown	U Sig
White/Brown	$\bar{U}$ Sig
Blue	V Sig
White/Blue	$\bar{V}$ Sig
Orange	W Sig
White/Orange	$\bar{W}$ Sig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

INCREMENTAL
HOLLOW TYPE

H60 Series

ROTARY ENCODER

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



Model

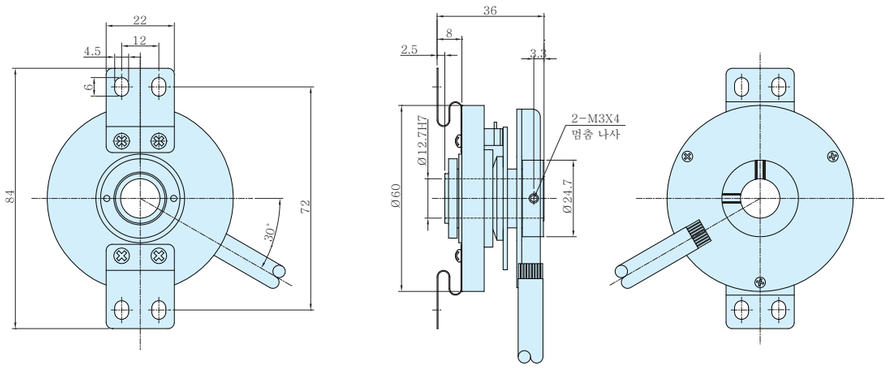
INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø60

Shaft Size
12.7 : Ø12.7

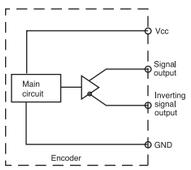
H60 -12.7- □□□□ - □□ - □

Resolution(P/R)	Output Signal	Output Form	Cable Length
2000 2048 3000 6000	W : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$ U, $\bar{U}$, V, $\bar{V}$, W, $\bar{W}$	L : Line Driver	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	Line Driver
Power Supply	DC +5[V] Ripple p-p : less than 5%
Consuming Curent (In case of no load)	300㎃ 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㎲
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

Mechanical Spec.

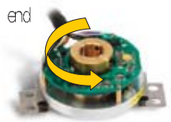
Starting Torque	150g - cm Max
Maximum number of revolution	6000 rpm
Bearing lifetime	40,000[hr](In case of rotating by 5000rpm)
Allowable Shaft Load	Radial : 2.0kg Max Axial : 1.0kg Max
Position deflection of allowable shaft	Radial : Less than 0.03 mm Axial : Less than 0.2mm
Connection Table	7P(AWG26) Shield CABLE
weight	200g

Rigid Spec.

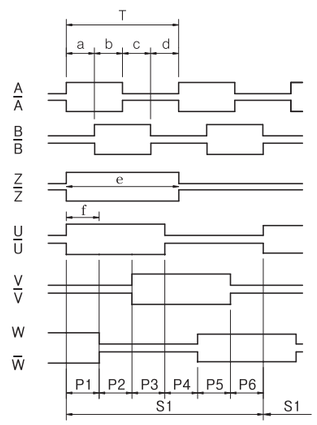
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 70% RH
Preserving Humidity	35% ~ 80% RH
Internal Vibration	5G
Internal Shock	50G
Degree of Protection	IP 00

Output Phase Shift

CCW ➡ Courterclockwise viewed from shaft end



a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10
e = T ± T/2
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
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

ROTARY ENCODER

■Features : Elevator, A. G. V
Rigid type, Strengthened anti-Noise characteristic
Customized design, Prompt delivery

Model

INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø62

Shaft Size
10 : Ø10 ※Option : 8 : Ø8 / 9.5 : Ø9.525

H62 - 10 - □□□□ - □□ - □

Resolution(P/R)
1000 1024 2048

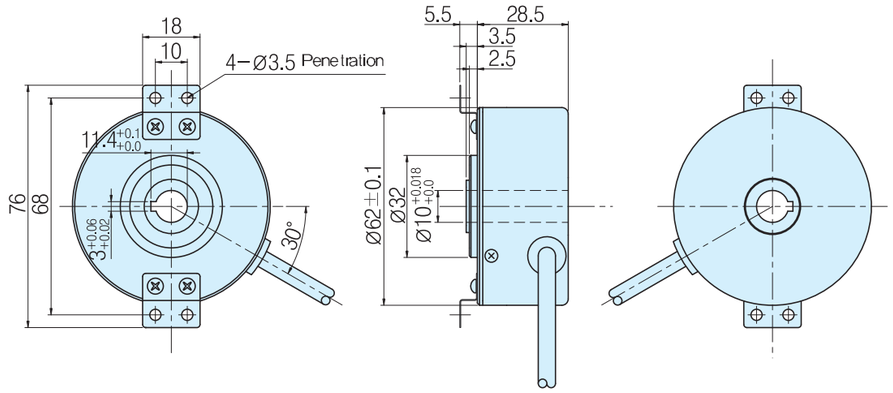
Output Signal
- B : A, B
- Z : A, B, Z
- U : A, $\bar{A}$, B, $\bar{B}$
- V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

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

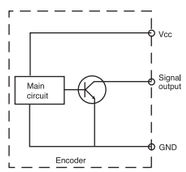
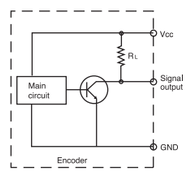
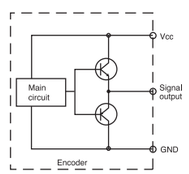
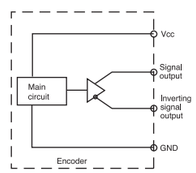
Cable Length
- 1 : 1[M]
- 2 : 2[M]
- 3 : 3[M]
- 4 : 5[M]
- 5 : 10[M]

⚠ hesepc) of powerm ay 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] Ripple p-p : less than 5%	DC +15[V] Ripple p-p : less than 5%	DC +12[V] Ripple p-p : less than 5%	DC +5[V] Ripple p-p : less than 5%
Consuming Current (In case of no load)	70㎃ Max	70㎃ Max	150㎃ Max	200㎃ 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㎲	Less than 3㎲	Less than 1㎲	Less than 1㎲
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]			

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 : 3.0㎏ Max Axial : 1.5㎏ Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	400g

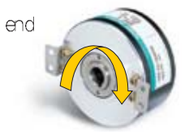
Rigid Spec.

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

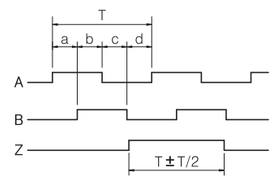
Output Phase Shift

CW ➡ Clockwise viewed from shaft end

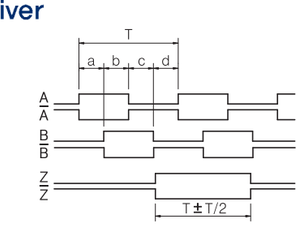
a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10



Open Collector, Voltage Output Complemental



Line Driver



Connection Table

Cable's Color	Connection Table	
Output Form	Open Collector Voltage Output 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

ROTARY ENCODER

■Features : Textile machine, Industrial application
Rigid type, High reliability
Customized design, Prompt delvery

Model

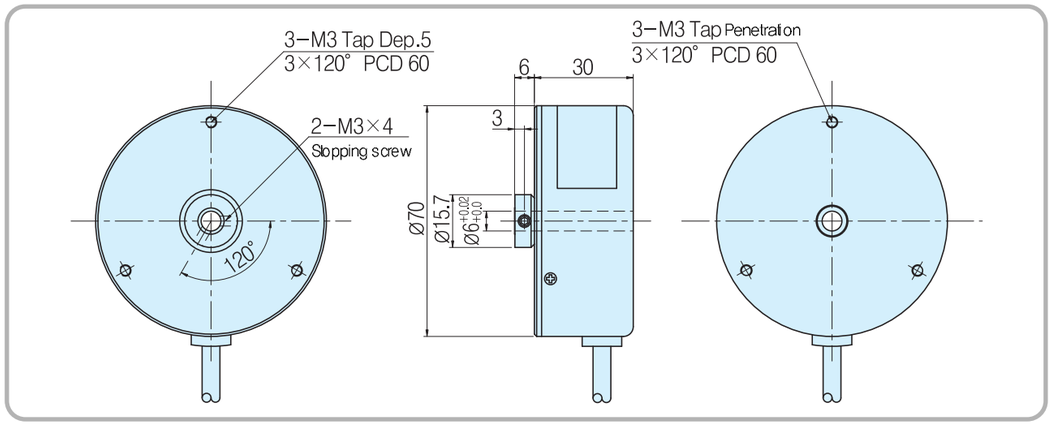
INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø70

Shaft Size
6 : Ø6

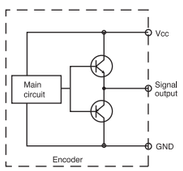
H70 - 6 - □□□□ - □□ - □

Resolution(P/R)	Output Signal	Output Form	Cable Length
0045	B : A, B	C : Complemental	1 : 1[M] 2 : 2[M] 3 : 3[M] 4 : 5[M] 5 : 10[M]

External Dimension



Output Circuit

Output	Complemental
Circuit	

Electrical Spec.

Output type	Complemental
Power Supply	DC +15[V] Ripple p-p : less than 5%
Consuming Curent (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 T_R / T_F	Less than 1μs In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

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 Axial : 1.1kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	400g

Rigid Spec.

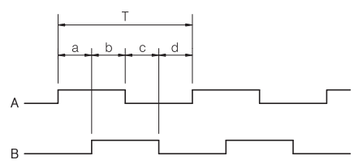
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 80% RH
Preserving Humidity	35% ~ 85% RH
Internal Vibration	5G
Internal Shock	50G
Degree of Protection	IP 50

Output Phase Shift

CCW ➡ Counterclockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± 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

ROTARY ENCODER

Model

INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø88

Shaft Size
18 : Ø18

H88 - 18 - □□□□ - □□ - □

Resolution(P/R)
0512 1024

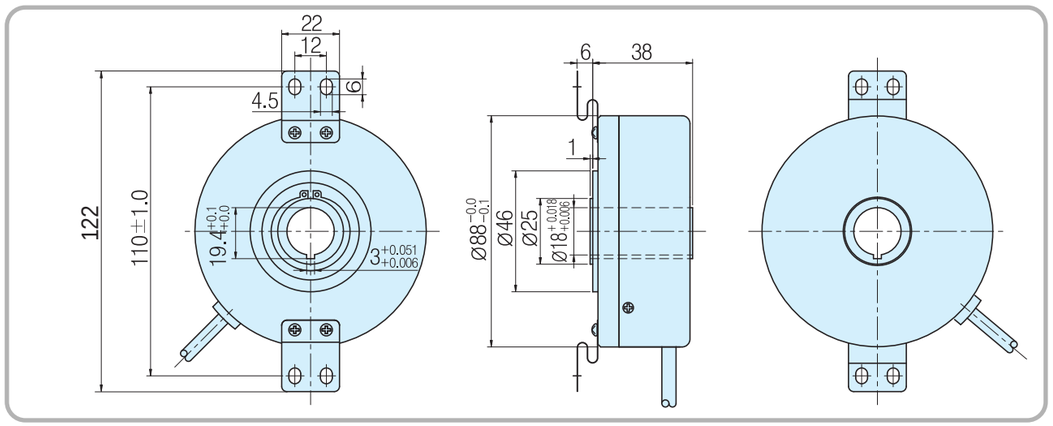
Output Signal
- B : A, B
- Z : A, B, Z
- U : A, $\bar{A}$, B, $\bar{B}$
- V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

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

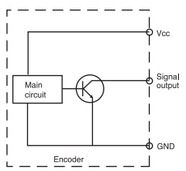
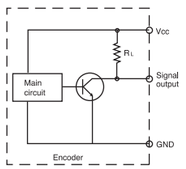
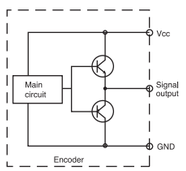
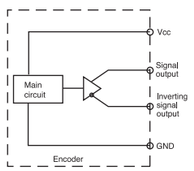
Cable Length
- 1 : 1[M]
- 2 : 2[M]
- 3 : 3[M]
- 4 : 5[M]
- 5 : 10[M]

⚠ hesepc) of powerm ay 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] Ripple p-p : less than 5%	DC +15[V] Ripple p-p : less than 5%	DC +15[V] Ripple p-p : less than 5%	DC +5[V] Ripple p-p : less than 5%
Consuming Curent (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 3μs	Less than 3μs	Less than 1μs	Less than 0.1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]			

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 Axial : 1.9kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	550g

Rigid Spec.

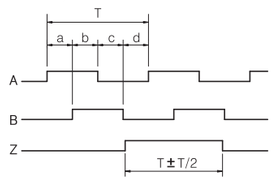
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 80% RH
Preserving Humidity	30% ~ 85% RH
Internal Vibration	5G
Internal Shock	100G
Degree of Protection	IP 50

Output Phase Shift

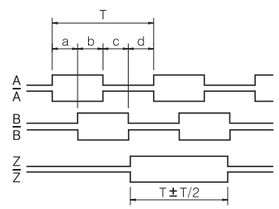
CCW ➡ Counterclockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector, Voltage Output Complemental, Totem Pole



Line Driver



Connection Table

Cable's Color	Connection Table	
Output Form	Open Collector Voltage Output Complemental 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

ROTARY ENCODER

Model

INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø88

Shaft Size
18 : Ø18

H88A - 18 - □□□□ - □□ - □

Resolution(P/R)
0512 1024

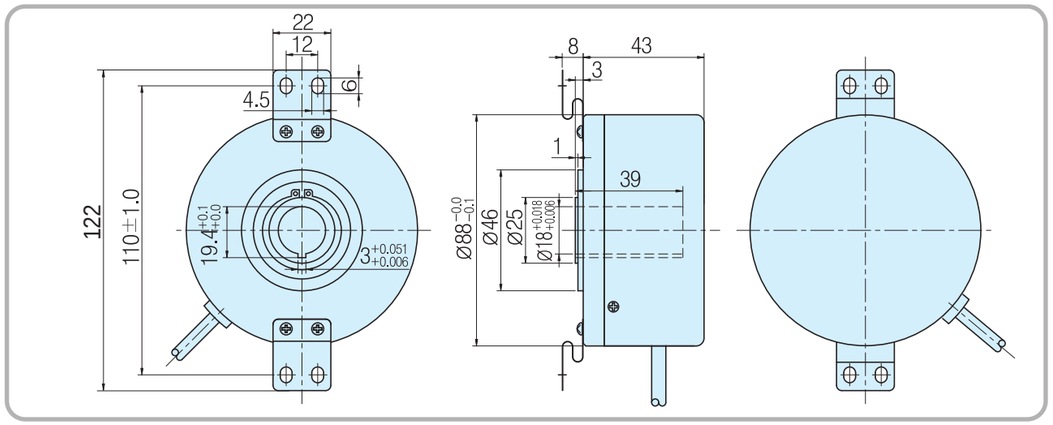
Output Signal
- B : A, B
- Z : A, B, Z
- U : A, $\bar{A}$, B, $\bar{B}$
- V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

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

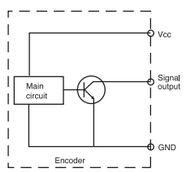
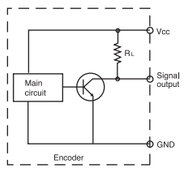
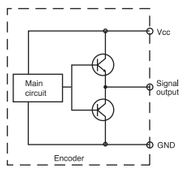
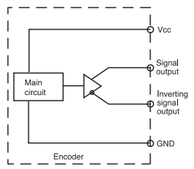
Cable Length
- 1 : 1[M]
- 2 : 2[M]
- 3 : 3[M]
- 4 : 5[M]
- 5 : 10[M]

⚠ hesepc) of powerm ay 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] Ripple p-p : less than 5%	DC +15[V] Ripple p-p : less than 5%	DC +15[V] Ripple p-p : less than 5%	DC +5[V] 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 3μs	Less than 3μs	Less than 1μs	Less than 0.1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]			

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 Axial : 1.9kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	550g

Rigid Spec.

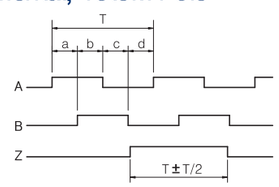
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 80% RH
Preserving Humidity	30% ~ 85% RH
Internal Vibration	5G
Internal Shock	100G
Degree of Protection	IP 50

Output Phase Shift

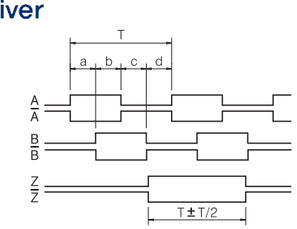
CCW ➡ Counterclockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector, Voltage Output Complemental, Totem Pole



Line Driver



Connection Table

Cable's Color	Connection Table	
Output Form	Open Collector Voltage Output Complemental 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

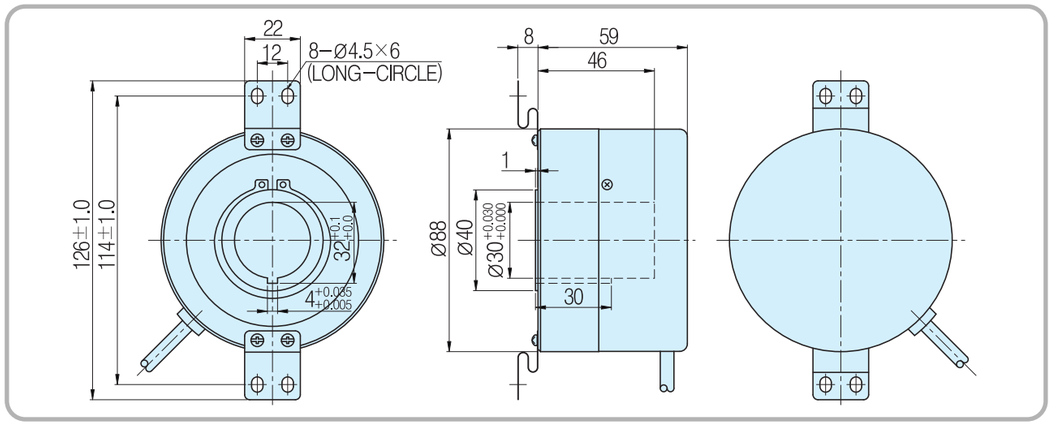
INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø88

Shaft Size
30 : Ø30

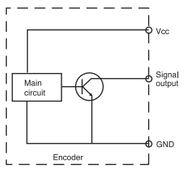
H88 - 30B - □□□□ - □□ - □

Resolution(P/R)	Output Signal	Output Form	Cable Length
0512 1024	B : A, B	O : Open Collector	1 : 1[M] 2 : 2[M] 3 : 3[M] 4 : 5[M] 5 : 10[M]

External Dimension



Output Circuit

Output	Open Collector
Circuit	

ROTARY ENCODER

Electrical Spec.

Output type	Open Collector
Power Supply	DC +15[V] 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 3μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

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 Axial : 2.5kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	3P(AWG26) Shield CABLE
weight	900g

Rigid Spec.

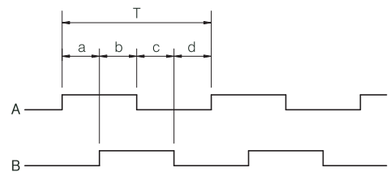
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 80% RH
Preserving Humidity	35% ~ 85% RH
Internal Vibration	5G
Internal Shock	100G
Degree of Protection	IP 50

Output Phase Shift

CCW ➡ Counterclockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± 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

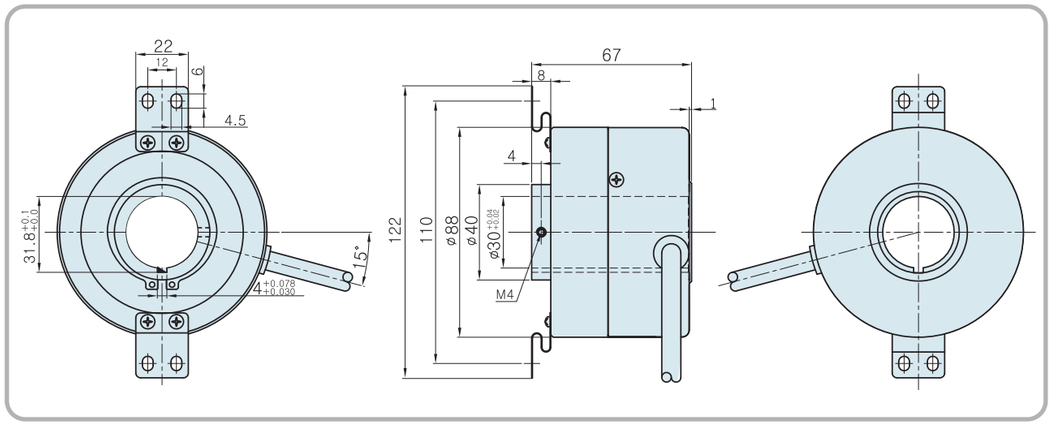
Output Signal
B : A, B
Z : A, B, Z
V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

Output Form
O : Open Collector
C : Complemental
L : Line Driver

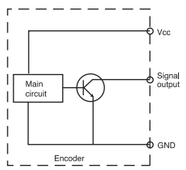
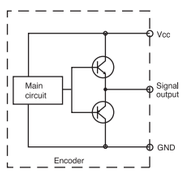
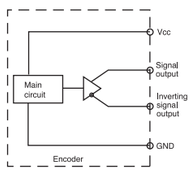
Cable Length
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

⚠ hesepc) of powerm ay 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			

ROTARY ENCODER

Electrical Spec.

Output type	Open Collector	Complemental	Line Driver
Power Supply	DC +15[V] Ripple p-p : less than 5%	DC +15[V] Ripple p-p : less than 5%	DC +5[V], +5~24[V] 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 T_R / T_F	Less than 3μs	Less than 1μs	Less than 0.1μs
	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]		

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 Axial : 2.5kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26) Shield CABLE
weight	600g

Rigid Spec.

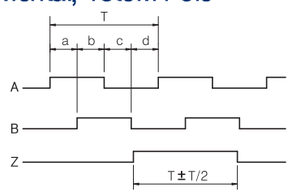
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 80% RH
Preserving Humidity	30% ~ 85% RH
Internal Vibration	5G
Internal Shock	100G
Degree of Protection	IP 50

Output Phase Shift

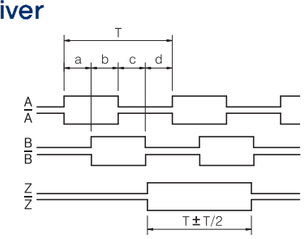
CW ➡ Clockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector, Voltage Output Complemental, Totem Pole



Line Driver

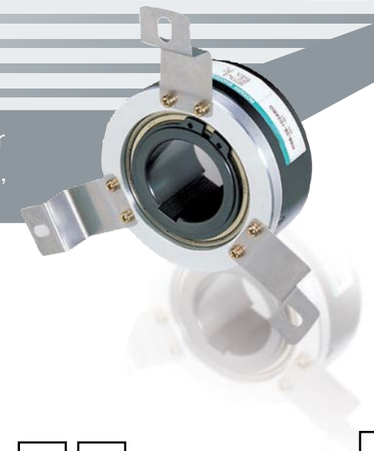


Connection Table

Cable's Color	Connection Table	
Output Form	Open Collector Voltage Output 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

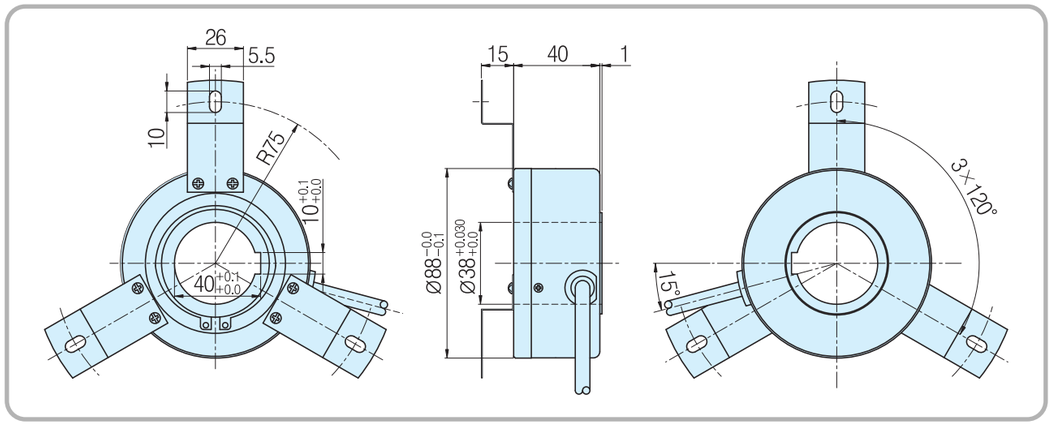
Output Signal
B : A, B
Z : A, B, Z
V : A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$

Output Form
O : Open Collector
C : Complemental
L : Line Driver

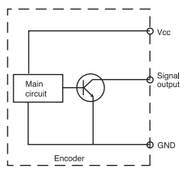
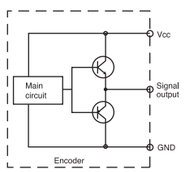
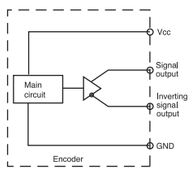
Cable Length
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

⚠ hesepc) of powerm ay 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] Ripple p-p : less than 5%	DC +15[V] Ripple p-p : less than 5%	DC +5[V], +5~24[V] 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 T_R / T_F	Less than 3μs	Less than 1μs	Less than 0.1μs
	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]		

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 Axial : 1.9kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	3P(AWG26) Shield CABLE
weight	930g

Rigid Spec.

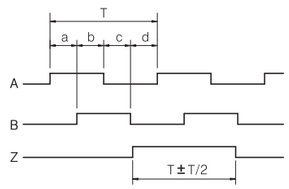
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 80% RH
Preserving Humidity	30% ~ 85% RH
Internal Vibration	5G
Internal Shock	100G
Degree of Protection	IP 50

Output Phase Shift

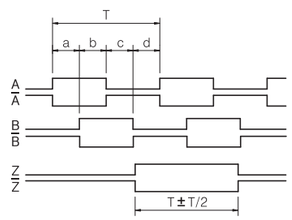
CW ➡ Clockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector



Line Driver



Connection Table

Cable's Color	Connection Table	
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

ROTARY ENCODER

■Features : Elevator, Parking system, Industrial motor
Easy to be attached, Customized design,
aprompt delivery

Model

INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø100

Shaft Size
40 : Ø40

H100-40-□□□□-□□-□

Resolution(P/R)
0512 1024

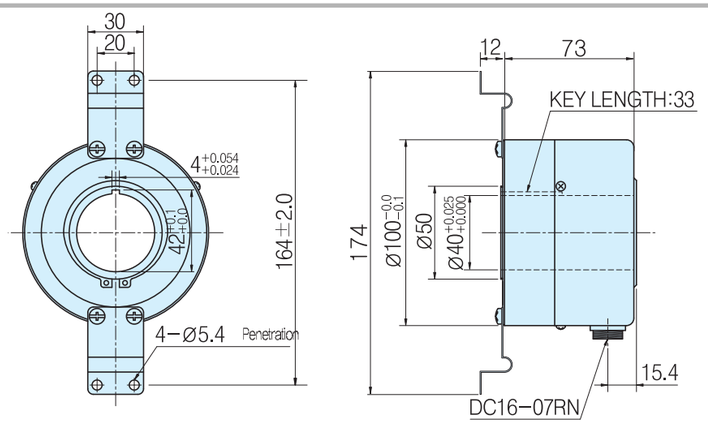
Output Signal
B : A, B
U : A, $\bar{A}$, B, $\bar{B}$

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

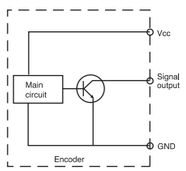
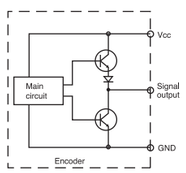
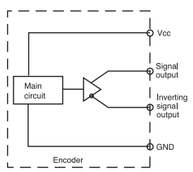
Cable Length
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

⚠ hesepc) of powerm ay 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] Ripple p-p : less than 5%	DC +15[V] Ripple p-p : less than 5%	DC +5[V] Ripple p-p : less than 5%
Consuming Curent (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 3μs	Less than 1μs	Less than 0.1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]		

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 Axial : 2.5kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	3P(AWG26) Shield CABLE
weight	1.2kg

Rigid Spec.

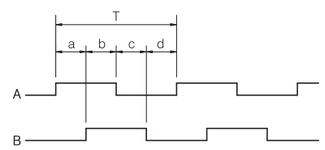
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 80% RH
Preserving Humidity	30% ~ 85% RH
Internal Vibration	5G
Internal Shock	100G
Degree of Protection	IP 50

Output Phase Shift

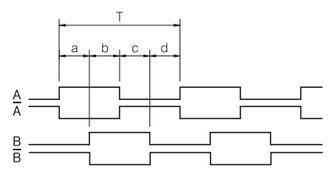
CCW ➡ Courterclockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10

Open Collector, Totem Pole



Line Driver



Connection Table

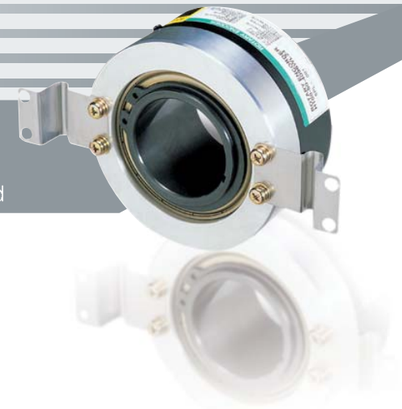
PIN NO	Cable's Color	Connection Table	
Output Form		Open Collector Totem Pole	Line Driver
1	Red	Vcc	Vcc
2	Black	GND	GND
3	Green	A Sig	A Sig
4	Orange	A Sig GND	$\bar{A}$ Sig
5	Brown	B Sig	B Sig
6	White	B Sig GND	$\bar{B}$ Sig
7	Shield	CASE Shield	CASE Shield

INCREMENTAL
HOLLOW TYPE

H108 Series

ROTARY ENCODER

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



Model

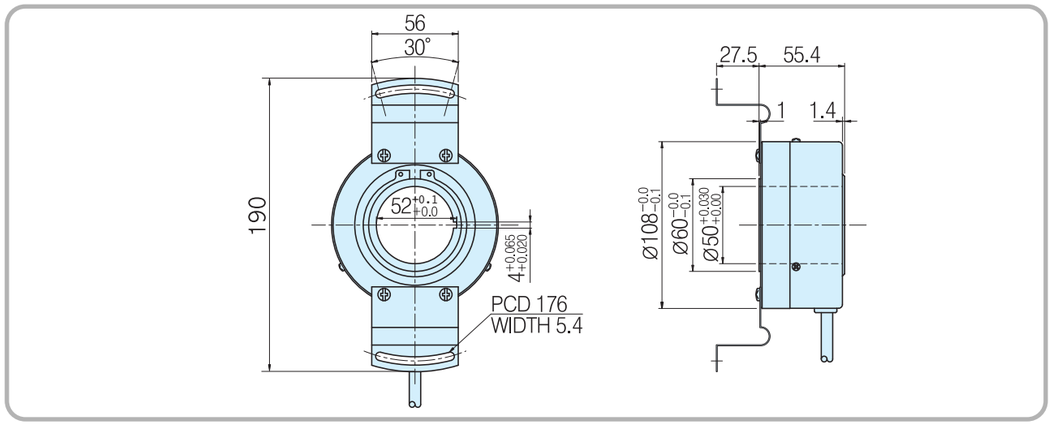
INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø108

Shaft Size
50 : Ø50

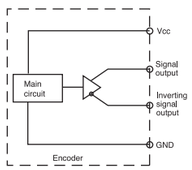
H108 - 50 - □□□□ - □□ - □

Resolution(P/R)	Output Signal	Output Form	Cable Length
4096	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, $\bar{W}$	L : Line Driver	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	Line Driver
Power Supply	DC +5[V] Ripple p-p : less than 5%
Consuming Curent (In case of no load)	200㎃ 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㎲
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

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 : 5.0㎏ Max Axial : 2.5㎏ Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	7P(AWG26) Shield CABLE
weight	1.0㎏

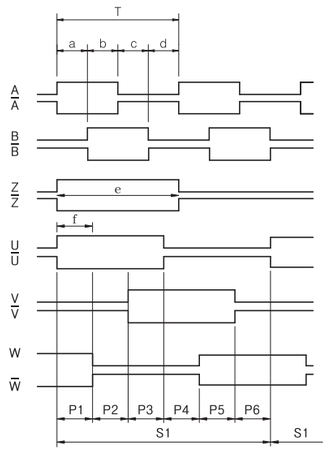
Rigid Spec.

Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
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 ➡ Courterclockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± T/10
e = T ± T/2
f = The center of Z phase and U phase (±1°)
From Uch (rise point) to Zch center



Pole	24
P1	
P2	5°
P3	±
P4	0.9°
P5	
P6	
S1	
S2	30°
- -	

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

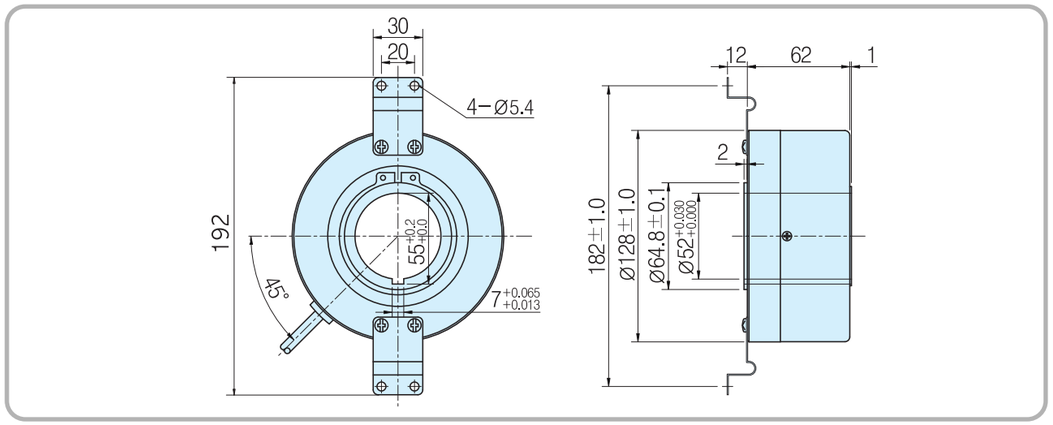
INCREMENTAL
HOLLOW TYPE
Outer Diameter Ø128

Shaft Size
52 : Ø52

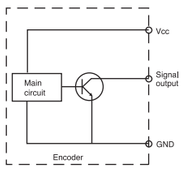
H128 - 52 - □□□□ - □□ - □

Resolution(P/R)	Output Signal	Output Form	Cable Length
1024 8192	B : A, B	O : Open Collector	1 : 1[M] 2 : 2[M] 3 : 3[M] 4 : 5[M] 5 : 10[M]

External Dimension



Output Circuit

Output	Open Collector
Circuit	

ROTARY ENCODER

Electrical Spec.

Output type	Open Collector
Power Supply	DC +15[V] 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 0.1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

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 Axial : 2.5kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	3P(AWG26) Shield CABLE
weight	1.5kg

Rigid Spec.

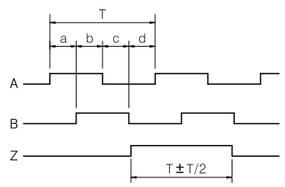
Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 80% RH
Preserving Humidity	35% ~ 85% RH
Internal Vibration	5G
Internal Shock	50G
Degree of Protection	IP 50

Output Phase Shift

CCW ➡ Counterclockwise viewed from shaft end

a + b, c + d = T/2 ± T/10
a, b, c, d = T/4 ± 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

FH40 Series

ROTARY ENCODER

■Characteristics : Various resolutions, 1~2048P/R(40 kinds)
Improving vibration-proof, environment-poof
The same structure with H40 Series

Model

INCREMENTAL
MAGNETIC FLUX
HOLLOW TYPE
Outer Diameter Ø 40

Shaft Size
8 : Ø8

Output form
L : Line Driver

FH40 - 8 - □□□□ - □□□ - □

Resolution (P/R)

A Type	I Type
001 0 00 16 00 20 0025	000 1 00 02 00 04 0008
003 2 00 40 00 50 0064	001 0 00 16 00 20 0025
008 0 01 00 01 25 0128	003 2 00 40 00 50 0060
020 0 02 50 02 56 0400	006 4 00 80 01 00 0120
050 0 05 12 10 24 2048	012 5 01 28 05 12 1024

The min. input frequency

A Type	I Type
A : 2.5Mhz	I : 600kHz
B : 1.3Mhz	J : 150kHz
C : 700kHz	
D : 350kHz	
E : 170kHz	

Output Signal

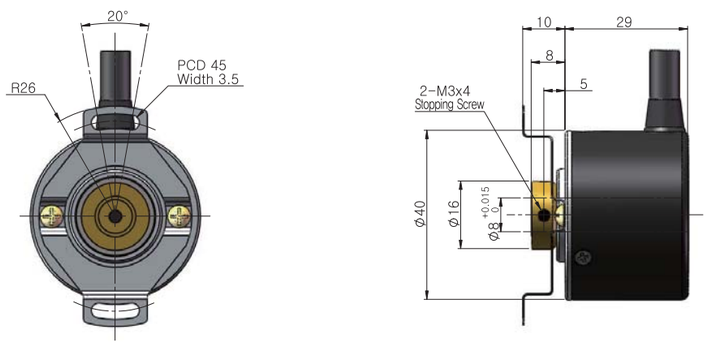
U : A/A,B/B
V : A/A,B/B,Z/Z

Cable Length

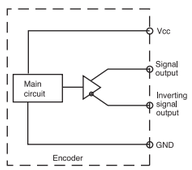
1 : 1[M]
2 : 2[M]
3 : 3[M]
4 : 5[M]
5 : 10[M]

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

External Dimension



Output Circuit

Output	Line Driver
Circuit	

Electrical Spec.

Output type	Voltage Output
Power Supply	DC +5[V] Ripple p-p : less than 5%
Consuming Current (In case of no load)	300mA Max
The min. input frequency	Selecting among A, B, C, D, E / I, J
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 1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

Mechanical Spec.

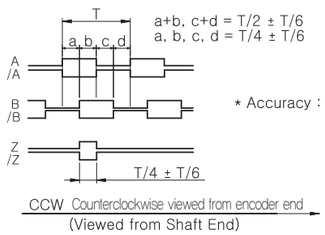
Starting Torque	80g - cm Max
Maximum number of revolution	6000 rpm
Bearing lifetime	27,000[hr](In case of rotating by 5000rpm)
Allowable Shaft Load	Radial : 2.5kg Max Axial : 1.3kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	4P(AWG26)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

Rigid Spec.

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

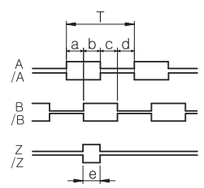
Output Phase Shift

FH40-A Type



* Accuracy : Under ±0.2°

FH40-I Type



* Accuracy : Under ±0.3°
* Minimum Edge Space (a,b,c,d,e)
  - 1024, 512 P/R : 2us - 0.2us(10%)
  - Under 256 P/R : 8us - 0.8us(10%)

Connection Table

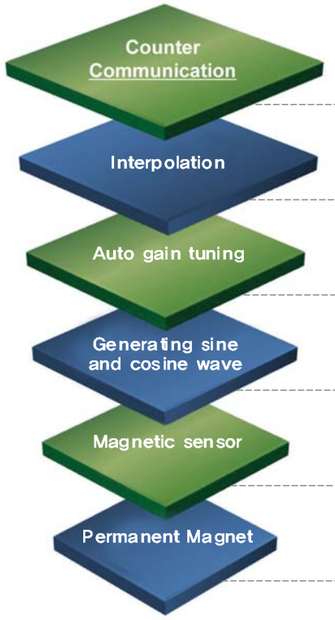
Cable's Color	Connection Table
Output Form	Line Driver
Red	Vcc
Black	GND
Green	A Sig
Blue	/A Sig
White	B Sig
Pink	/B Sig
Yellow	Z Sig
Orange	/Z Sig
Shield	CASE Shield

INCREMENTAL
HOLLOW TYPE

FH40 Series

■Characteristics : Various resolutions, 1~2048P/R(40 kinds)
Improving vibration-proof, environment-poof
The same structure with H40 Series

Principle



- Detecting the angle to calculate position and computing the number of revolution
- High quality interpolator of 13 bit is embedded to realize high resolution
- Gain tuning the created wave form into ideal sine wave
- Auto gain tuning through real time monitoring
- Generating sine and cosine wave depending on the change of a magnetic field
- Detecting the revolution of a magnetic field and generating the sihnal depending on the change of a magnetic field
- Adopting the rare earth magnet(NdFeB) generating a pair of magnetic pole, N-S

Feature

Various Output Signals
- Incremental Square wave (Max. 13bit)
- Absolute Synchronous Interface (Max. 13bit, SSI)
- Sine/Cosine wave (1 cycle/rev)

Vibration-Proof
- When vibration occurs, permeation and reflection type used for optical encoder may generate mechanical interference or distorted wave but magnetic type is very resistant to vibration

Noise-Proof
- To minimize noise, developing the ASIC that integrates sensing part to detect the signal and the circuit part to amplify the signal, the circuit part to output the signal

Environment-Proof
- Optical type may be exposed to signal error due to scattering or interference caused by oil, dirt but magnetic type is hardly affected by oil, dirt.
- Small-sized rare earth magnet(NdFeB) is adopted so when there is a magnetic field, it can work normally. Namely, the affect to the circumstances is minimized.

Auto Gain Tuning
- When the signal becomes weak or stronger due to the change in temperature and mechanical modification, it can monitor the output signal in real time and adjust the gain to maintain optimum signal.

Application

Application cases

Application for environment-proof

It indicates the application under the circumstances that there is oil, dirt in outdoor, it is applied to rotating position detecting sensor for solar cell, positioning sensor for wind power plant, sensors for heavy equipment

Application for vibration-proof and high speed revolution

It is applied to the positioning sensor for motor used for the part that has severe vibration and requires high speed revolution such as nutrunner for a motorcar, servo press equipment.

Low-priced sensor for BLDC Motor

It can be realized as small size and flat type with easy assembly and usage so it can be applied to the sensor for BLDC Motor that is built-in type without a bearing.

Other Applications

- ▶ Rovot joints
- ▶ HMI Device
- ▶ BLDC Motor
- ▶ High-End Potentiometer
- ▶ Power train and engine management system
  - Transmission box
  - Throttle Position Sensor
  - Pedal Position Sensor
- ▶ Brake and stabilization system
  - Steering wheel position sensor
  - Steering torque sensor
- ▶ Comport Zone
  - Headlight control
  - Dash board node

Magnetic ASIC

ABSOLUTE
SHAFT TYPE

SA58 Series

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

Model

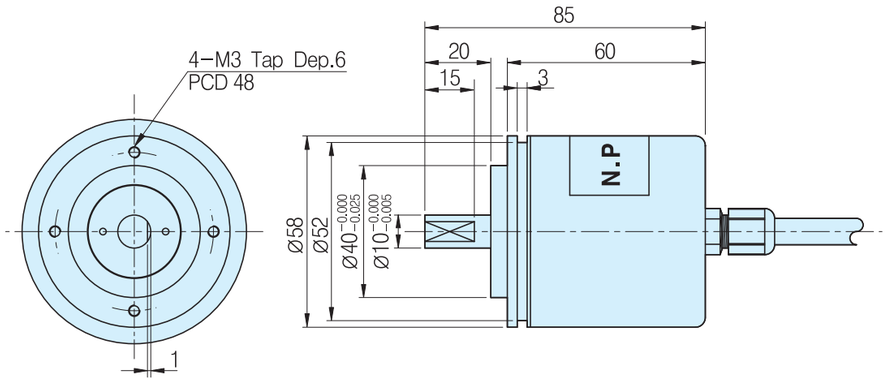
ABSOLUTE
SHAFT TYPE
Outer Diameter Ø58

Shaft Size
10 : Ø10

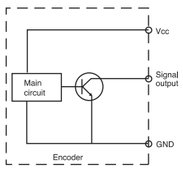
SA58 - 10 - □□□□ - □□ - □

- 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	

ROTARY ENCODER

Electrical Spec.

Output type	Open Collector
Power Supply	DC +5[V] ~ 24[V] 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 0.1μs
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]

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 Axial : 2.5kg Max
Position deflection of allowable shaft	Radial : Less than 0.05 mm Axial : Less than 0.2mm
Connection Table	7P(AWG26) Shield CABLE
weight	500g

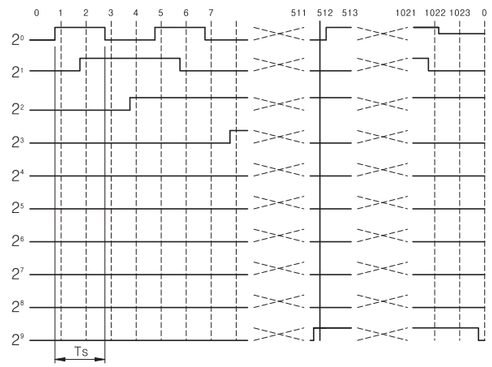
Rigid Spec.

Operating Temp. Range	-10℃ ~ +70℃ (No freezing)
Preserving temp	-20℃ ~ +85℃
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



TS=0.703°±15'

Connection Table

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

MANNUAL
PULSE GENERATOR

SM80 Series

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

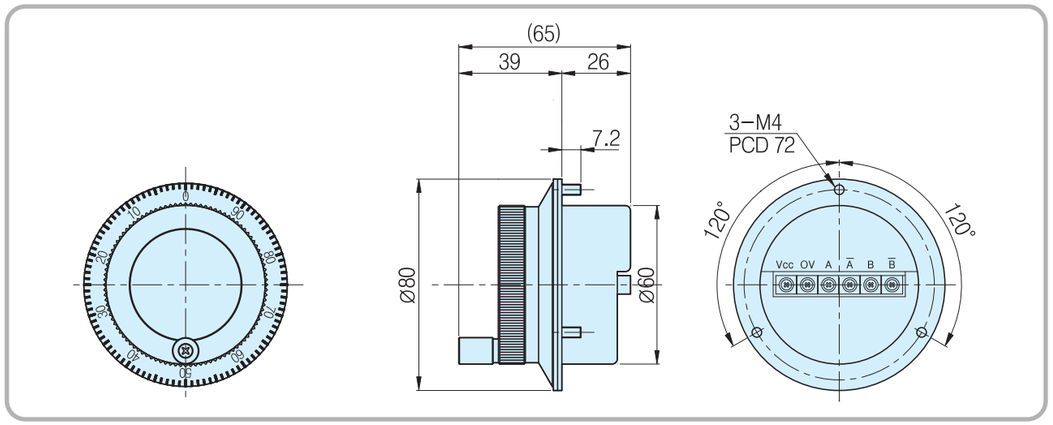
Model

MANNUAL
PULSE GENERATOR
Outer Diameter Ø80

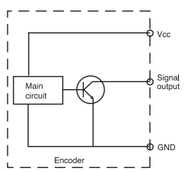
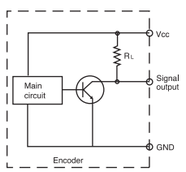
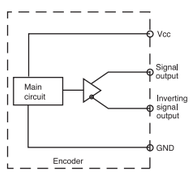
SM80 - N - □□□□ - □□ - □

Resolution(P/R)	Output Signal	Output Form	MPG Color
0100	B : A, B U : A, $\bar{A}$, B, $\bar{B}$	O : Open Collector V : Voltage Output L : Line Driver	1 : Siver(Attaching logo) 2 : Siver(Without logo) 3 : Black(Attaching logo) 4 : Black(Without logo)

External Dimension



Output Circuit

Output	Open Collector	Voltage Output	Line Driver
Circuit			

ROTARY ENCODER

Electrical Spec.

Output type	Open Collector	Voltage Output	Line Driver
Power Supply	DC +5[V] Ripple p-p : less than 5%		
Consuming Curent (In case of no load)	70㎃ Max	70㎃ Max	150㎃ 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㎲	Less than 0.1㎲	Less than 0.1㎲
Common conditions	In case that the cable length of output side is 1[M] and load resistance is less than 1[kΩ]		

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

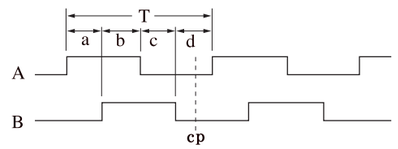
Rigid Spec.

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

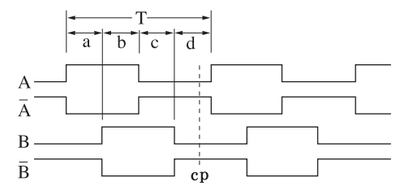
Output Phase Shift

CW ➡ Clockwise viewed from shaft end
a + b, c + d = T/2 ± T/8
a, b, c, d = T/4 ± T/8

Open Collector, Voltage Output



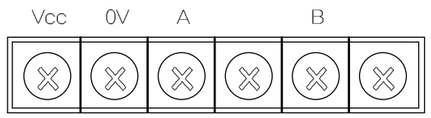
Line Driver



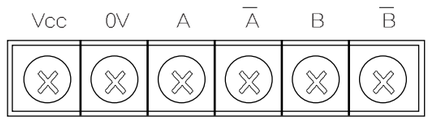
Color	Silver	Black
The logo by color can be attached and detached		

Connection Table

Cable Configuration
Open Collector, Voltage Output



Line Driver



PORTABLE MANNUAL
PULSE GENERATOR

SPM Series

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

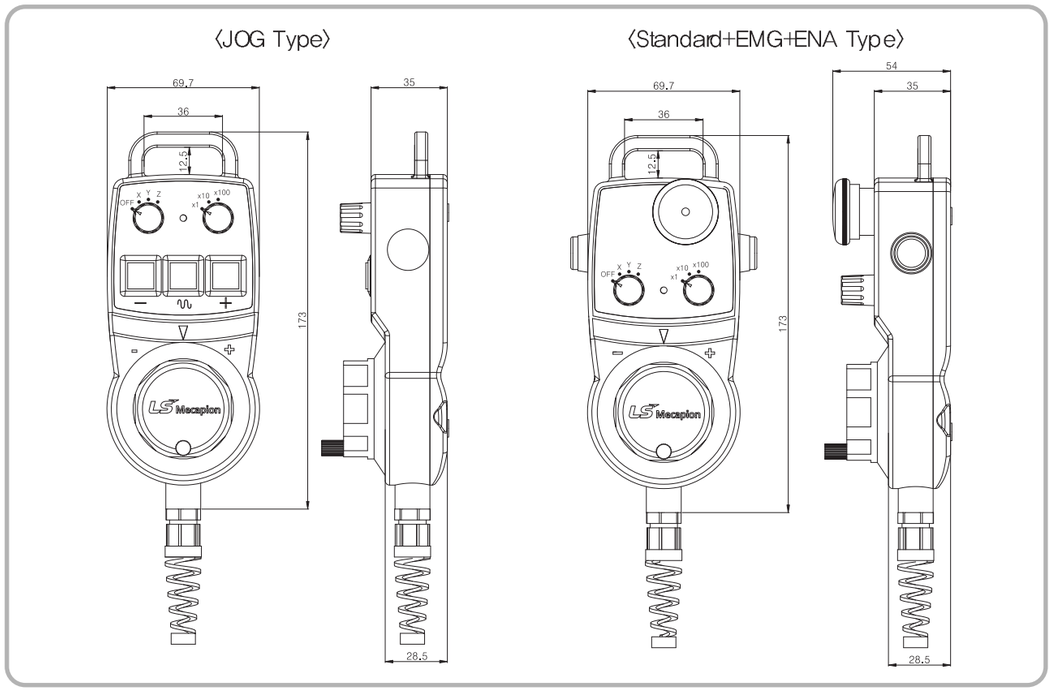
Model

SPM — S01 — A — L — M — 1

Spec	IP Glade	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



ROTARY ENCODER

Electrical Spec.

Output type	Line Driver		
Power Supply	DC +5[V]		
Consuming Current (In case of no load)	50㎃ 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 20㎃	S/W	Emergency S/W
Rising, decline time	Less than 0.1㎲		Enable S/W
Axis	X, Y, Z		JOG S/W

Mechanical Spec.

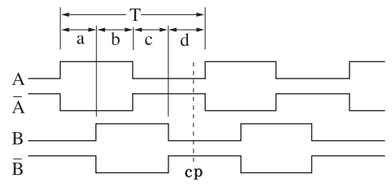
Starting Torque	50g – cm Max
Maximum number of revolution	600 rpm
Bearing lifetime	50,000[hr]
Terminal Block	5268-6(Molex)
Magnet	With / Without

Rigid Spec.

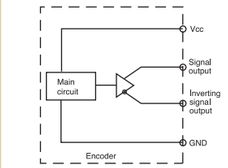
Operating Temp. Range	-10℃ ~ +70℃
Preserving temp	-20℃ ~ +85℃
Using humidity	35% ~ 80% RH
Preserving Humidity	30% ~ 85% RH
Internal Vibration	5G
Internal Shock	10G
Degree of Protection	IP 50

Output Phase Shift

Line Driver



Output Circuit

Output	Line Driver
Circuit	

Connection Table

Wiring Diagram

NO.	Signal	Color
1	H+5V	Red
2	H0V	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	H0V	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

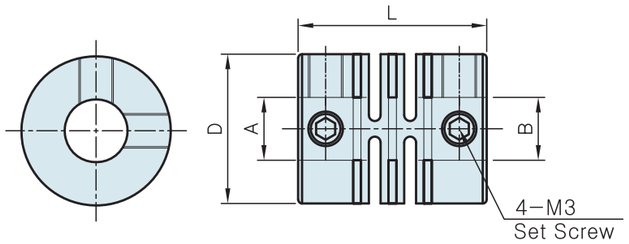
〈Standard+EMG+ENA Type〉

Coupling

■Option

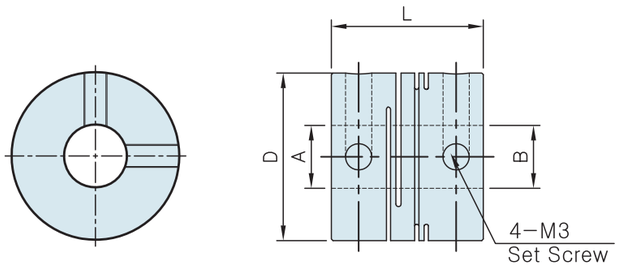
Plastic coupling

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