

**NEMICON**

The General Catalog

**ROTARY ENCODER & SENSORS**



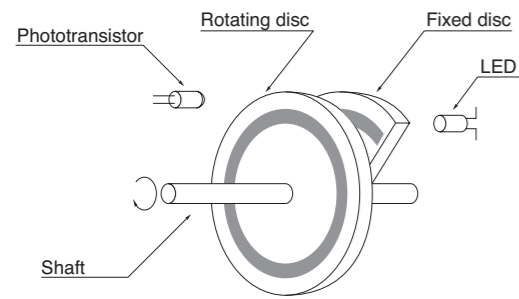
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## Theories of Rotary Encoder

The main part of optical rotary encoder is composed of as the drawing below. Lights of transmitter (LED) go through rotating disc, fixing disc and get to receiver. As disc rotates with shaft, receiver gets varying light and outputs sine wave signals accordingly. Sine wave is then amplified to square wave and thus becomes output signals of encoder.

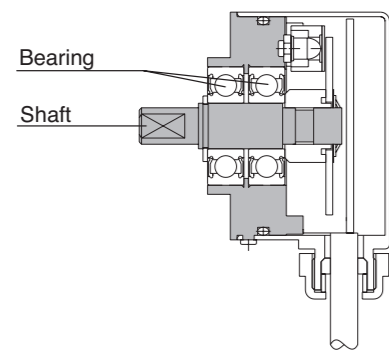


## Construction of Rotary Encoder

Basic construction of the encoder is shown in the below. There are several kinds of the encoders whose constructions are different from each other types, such as the built-in type the hollow shaft type and so on, but the basic theories of them are all the same. The encoder is the precise instrument, and needs the accurate mechanism to maintain the accuracy of the photo-electronic system.

Especially, the thrust deviation of the slotted code wheel and displacement of the disk caused by the temperature change are the main problems.

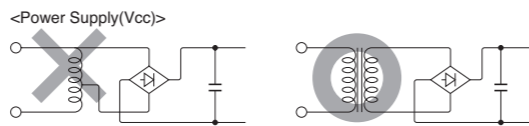
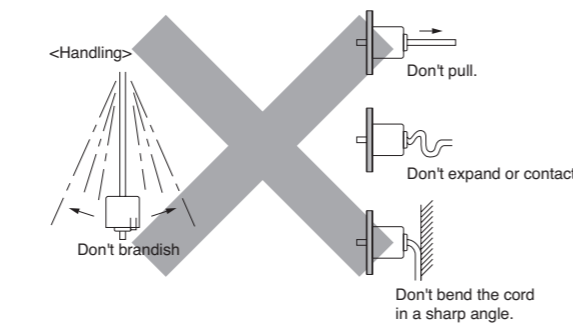
We resolve these problems by our original technologies of the photo-electronic system and the electronic circuit design.



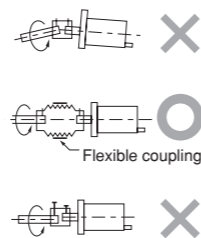
## Precautions for Installation

- 1) Do not give the encoder an excessive shock or vibration because some of the encoders are equipped with a glass disc.
- 2) The shaft of the encoder is hold with a pair of bearings. An excessive load to the shaft may deteriorate the life and/or accuracy of the encoder. Avoid an excessive load to the shaft.
- 3) Enough power supply to encoder should be guaranteed. Unsatisfactory power supply may result in an abnormal output waveform.
- 4) For encoder output connection, use a shielded cable. To avoid AC interface pickup, the cable should be run apart from heavy duty AC carrying lines.  
The maximum length of the cable is 5m for Voltage output, and 10m for Open Collector output, but Line Driver output is preferable if there is interference of noise.
- 5) As some optical components are used in the encoder, the influence of dust, oil, water and etc. should be minimized when installing.
- 6) The specification and mechanical dimensions are subject to be changed without prior notice.

## Precautions for Installation



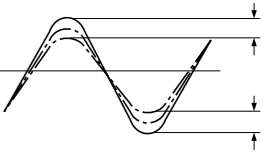
- Connect with a flexible coupling such as a bellows coupling between the encoder and the revolutionary shaft.



Don't bind tightly slipping down their center of the shafts over 0.1mm like both side of drawings above.

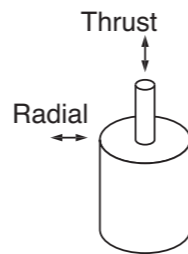
## Explanations on NEMICON Encoder Phraseology

Phraseology	Explanations
<b>Incremental Encoder</b>	Pulse train and sinusoidal signal train are given as incremental data
<b>Absolute Encoder</b>	Mechanical angular position is given as absolute data
<b>Sine Wave</b>	Analog signals of almost sine wave generated for photo sensor
<b>Amplitude</b>	Average amplitude value of output sine wave
<b>Amplitude Variation</b>	Amplitude regulation of output sine wave
<b>Resolution</b>	Output pulse numbers in a revolution of encoder shaft
<b>CW Rotation</b>	Clockwise (see from shaft side)
<b>CCW Rotation</b>	Counter Clockwise (see from shaft side)
<b>2 Signals of 90° Phase Difference</b>	2 signals each 90° phase difference by electrical angle (SigA, SigB)
<b>Index Signal</b>	Datum position signal generated once a revolution (SigZ)
<b>Angular Signal</b>	Magnetic pole position signals for AC Servo-Motor (SigU, SigV, SigW, SigF0, SigF1, SigF2, SigF3)
<b>Pole Numbers</b>	The number of angular signal edges (Number of count up and count down of incremental signal in one rotation.)
<b>Power Supply(Vcc)</b>	Voltage supplied to encoder Apply the normal voltage within limit to encoder
<b>Current Consumption</b>	Current consumed by encoder Power Supply(Vcc) needs current capacity over the current consumption specification



**Explanations on NEMICON Encoder Phraseology**

Phraseology	Explanations
<b>Voltage Output (NPN)</b>	Voltage signal generated output circuit with pull-up resistor on collector of grounded-emitter transistor
<b>Open Collector Output (NPN)</b>	Output with collector opened (No voltage signal) (Users have to add a pull-up resistor.)
<b>Line Driver Output</b>	Differential output by Line Driver IC (Refer to RS422A)
<b>Push-Pull Output</b>	Output circuit with both emitters of NPN and PNP transistor
<b>Maximum Sink Current</b>	Max. sink current of encoder's output circuit
<b>Rise &amp; Fall Time of Output Signal</b>	The time lap between 10% to 90% level of pulse signal edge
<b>Maximum Frequency Response</b>	The frequency which satisfies the specifications of the wave form and duty ratio of A, B phases
<b>Insulation Resistance</b>	Impedance between output and body of encoder (Test by Megger)
<b>Starting Torque</b>	Rotating moment necessary for shaft starting
<b>Shaft Loading</b>	The load put to rotating shaft
<b>Bearing Life</b>	The approximately total bearing rotation in consideration of shaft loading
<b>Maximum Permissible Speed</b>	Maximum rotation allowed mechanical in a minute
<b>Operating Temperature</b>	Temperature range for operation satisfied specification
<b>Storage Temperature</b>	Temperature range for storage no applying satisfied specification



**Table of Rotary Encoder**

○Micro Encoder

	Model	Style	External Dimensions	Power Supply(V <sub>CC</sub> )	Resolution	Page
	7S φ 7.2			DC 4.5~5.5V	100 200 400	12
	18S φ 18			DC 4.5~13.2V 4.5~5.5V	100 500 160 800 200 1000 300 1024 360 1600 400	14
	OME-T φ 18			—	100 256 176 300 200 360 250	16
	OME-N φ 18			—	100 256 157 300 200 360 250	18

○Shaft Encoder

	Model	Style	External Dimensions	Power Supply(V <sub>CC</sub> )	Resolution	Page
	Small & High-Speed Model	OEZ φ 28		DC 4.5~5.5V 10.8~13.2V 21.6~26.4V 4.75~5.25V	36 250 600 50 300 800 60 360 1000 100 400 1024 150 500 1500 200 512	20
	Small Standard Model	OSS φ 30		DC 4.5~5.5V 4.5~13.2V 10.8~13.2V 21.6~26.4V	60 250 100 300 150 360 200 400 500 600	22
	Small Standard Model	38S φ 38		DC 4.5~13.2V 4.5~30V	100 512 2500 200 600 3600 250 800 4000 300 1000 4096 360 1024 400 2000 500 2048	24
	Small & Short delivery Model	38SG φ 38		DC 3.35~5.25V 3.35~34.5V 3.35~13.2V	100 600 200 1000 300 1024 360 1800 400 2000 500 2048	26

Table of Rotary Encoder

○Shaft Encoder


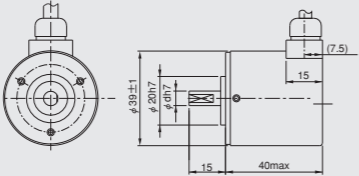

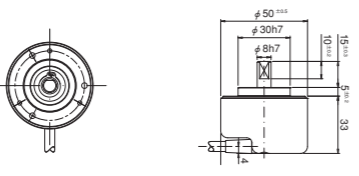

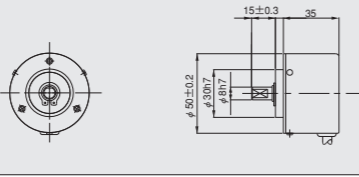

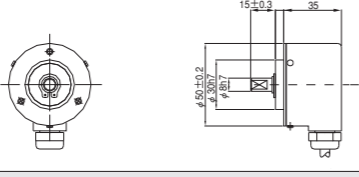

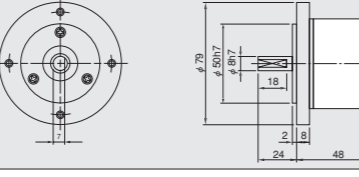

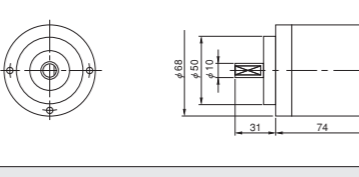

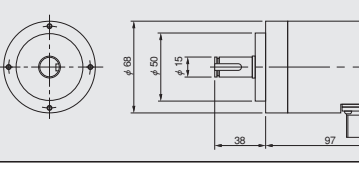
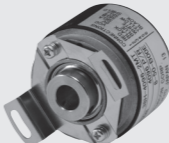
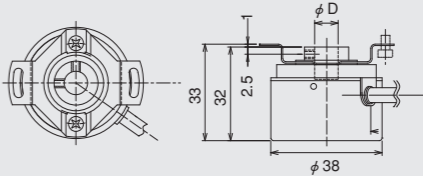

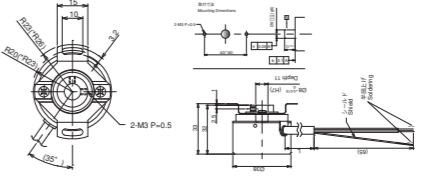

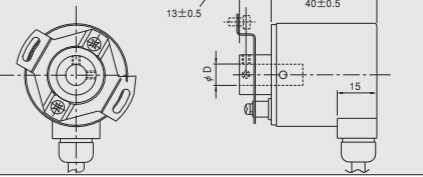
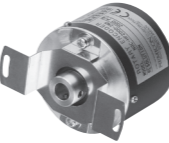
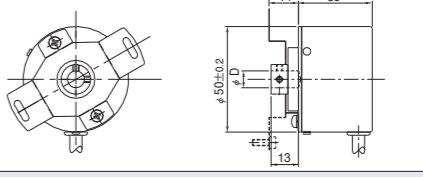
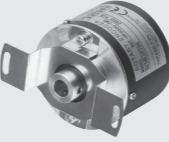
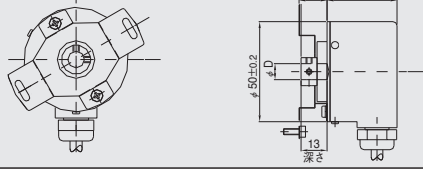
	Model	Style	External Dimensions	Power Supply(V <sub>CC</sub> )	Resolution	Page
Heavy Duty Model	<b>OVF</b> φ 39			DC 4.5~13.2V 10.8~26.4V 4.75~5.25V 4.5~5.5V	20 256 1000 30 300 1024 32 360 1200 40 400 1500 50 500 1800 60 512 2000 100 600 2048 125 800 2500 200 900 3600	28
Heavy Duty Model	<b>50S/ NOC3</b> φ 50			DC 4.5~30V 4.5~5.5V	360 500 1000 1024 2000 5000	30
Standard Model	<b>NOC-S</b> φ 50			DC 4.5~13.2V 10.8~26.4V 4.5~5.5V 4.75~30V	10 300 2048 20 360 2500 30 500 3600 40 600 4096 50 1000 5000 60 1024 100 1250 200 1800 250 2000	32
Heavy Duty Model	<b>NOC-SP</b> φ 50			DC 4.5~13.2V 10.8~26.4V 4.5~5.5V 4.75~30V	10 360 2500 20 500 3600 30 600 4096 40 1000 5000 60 1024 10000 100 1250 200 1800 250 2000 300 2048	34
Low Pulse Model	<b>OEK</b> φ 58			DC 4.5~13.2V 10.8~26.4V	20 50 60 100 200 300 360	36
Heavy Duty Model	<b>OPN</b> φ 68			DC 4.5~13.2V 10.8~26.4V	20 500 2048 50 600 2500 60 1000 3600 100 1024 4096 200 1250 5000 300 1800 360 2000	38
Super Heavy Duty Model	<b>NE</b> φ 68			DC 4.75~5.25V	20 500 2048 50 600 2500 60 1000 3600 100 1024 4096 200 1250 5000 300 1800 360 2000	40

Table of Rotary Encoder

○Shaft Encoder

	Model	Style	External Dimensions	Power Supply(V <sub>CC</sub> )	Resolution	Page
Small Standard Model	<b>38H</b> φ 38			DC 4.5~13.2V 4.5~30V	100 512 2500 200 600 3600 250 800 4000 300 1000 4096 360 1024 400 2000 500 2048	44
Small & Short delivery Model	<b>38HG</b> φ 38			DC 3.35~5.25V 3.35~34.5V 3.35~13.2V	100 600 200 1000 300 1024 360 1800 400 2000 500 2048	46
Heavy Duty Model	<b>HEF</b> φ 39			DC 4.5~13.2V 10.8~26.4V 4.75~5.25V	20 256 1024 30 300 1200 32 360 1500 40 400 1800 50 500 2000 60 512 2048 100 600 2500 125 800 3600 200 900 250 1000	48
Hollow Shaft Model	<b>NOC-H</b> φ 50			DC 4.5~13.2V 10.8~26.4V 4.5~5.5V 4.75~30V	10 250 1800 20 300 2000 30 360 2048 40 500 2500 50 500 3600 60 1000 4096 100 1024 5000 200 1250	50
Heavy Duty Model	<b>NOC-HP</b> φ 50			DC 4.5~13.2V 10.8~26.4V 4.5~5.5V 4.75~30V	10 250 1800 20 300 2000 30 360 2048 40 500 2500 50 600 3600 60 1000 4096 100 1024 5000 200 1250 10000	52

○Built-in Encoder

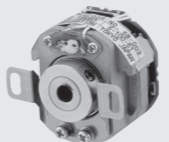
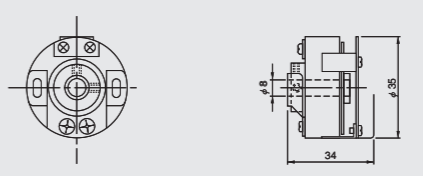

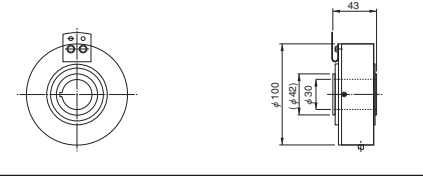
	Model	Style	External Dimensions	Power Supply(V <sub>CC</sub> )	Resolution	Page
Standard Built-in Model	<b>SBY</b> φ 35			DC 4.75~5.25V	100 1000 1024 2000 2500 3000	54
Big Size Built-in Model	<b>SBH</b> φ 100			DC 4.5~5.5V 10.8~13.2V 4.75~5.25V	512 1024 *4096 *8192 *10000	56

Table of Rotary Encoder

○Modular Encoder

	Model	Style	External Dimensions	Power Supply(V <sub>CC</sub> )	Resolution	Page
Small Standard Model	18M φ 18			DC 4.5~13.2V 4.5~5.5V	200 1000 300 1024 360 1600 400 500 800	58
Small Standard Model	38M φ 38			DC 4.5~13.2V 4.5~30V	200 1024 250 2000 300 2048 360 2500 500 3600 512 4000 1000 4096	60

○Absolute Encoder / Multi Turn


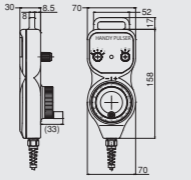

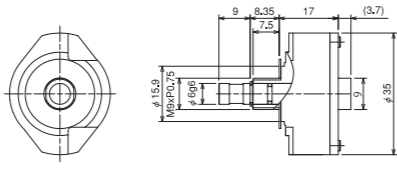

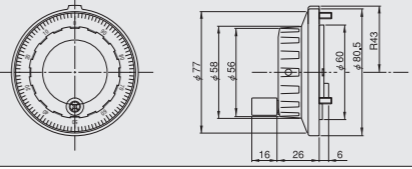

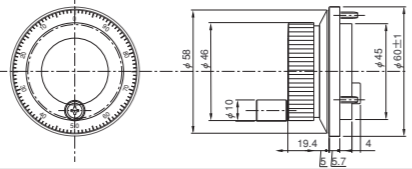

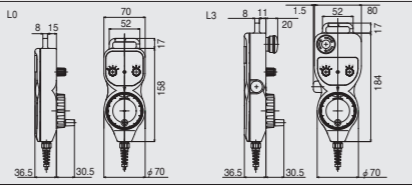

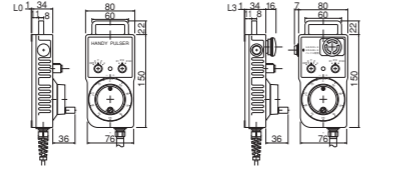
	Model	Style	External Dimensions	Power Supply(V <sub>CC</sub> )	Resolution	Page
Battery-less Full magnetic	N33MA φ 33			DC 5V 7V~12V	MT:24bits ST:18bits	64
Battery-less Module type	N35MA φ 35			DC 5V	MT:16bits ST:20bits	66
Battery-backup Housed encoder	37HA-MB φ 37			DC 5V	MT:16bits ST:23bits	68
Battery-less Housed encoder	38HA-MS φ 38			DC 5V	MT:16bits ST:23bits	70

Table of Rotary Encoder

○Absolute Encoder / Single Turn

	Model	Style	External Dimensions	Power Supply(V <sub>CC</sub> )	Resolution	Page
Module type Compact	N35ST			DC 5V	17bit 19bit 21bit 23bit	72
Absolute Model	AEW2 φ 38			DC 4.5~13.2V 10.8~26.4V	6bit 8bit	74
Heavy Duty IP65	ASC-SP φ 50			DC 4.5~13.2V 10.8~26.4V	8bit 10bit (720) 10bit (1024) 12bit	76
Hollow Shaft	AHS2 φ 38			DC 4.5~13.2V 10.8~26.4V	6bit 8bit	78
Heavy Duty Hollow Shaft IP65	ASC-HP φ 50			DC 4.5~13.2V 10.8~26.4V	8bit 10bit (720) 10bit (1024) 12bit	80

○Manual Encoder

	Model	Style	External Dimensions	Power Supply (V <sub>CC</sub> )	Resolution	Page
Handy Pendant	HP-M			DC 4.5~13.2V 4.5~5.5V 4.75~5.25V	25 100	94
Manual Pulse Generator	35PG φ 35			DC 4.5~5.5V	100	84
Manual Pulse Generator	UFO φ 80			DC 4.5~13.2V 4.5~5.5V 10.8~13.2V 4.75~5.25V	25 100	86
Manual Pulse Generator	UFO-M2 φ 60			DC 4.5~13.2V 4.5~5.5V 10.8~13.2V 4.75~5.25V	25 100	88
Handy Pendant	HP-U			DC 4.5~13.2V 4.5~5.5V 4.75~5.25V	100	90
Handy Pendant	HP-V			DC 4.5~13.2V 4.5~5.5V 10.8~13.2V 4.75~5.25V	25 100	92

# Incremental Shaft Encoder

Micro Encoder

7S ..... 12  
 18S ..... 14  
 OME-T ..... 16  
 OME-N ..... 18

Shaft Encoder

OEZ ..... 20  
 OSS ..... 22  
 38S ..... 24  
 38SG ..... 26  
 OVF ..... 28  
 50S/NOC3 ..... 30  
 NOC-S ..... 32  
 NOC-SP ..... 34  
 OEK ..... 36  
 OPN ..... 38  
 NE ..... 40

※ Pole number is determined by the poles of the motor. Please advise the poles number.

# MINIATURE TYPE

# 7S Model



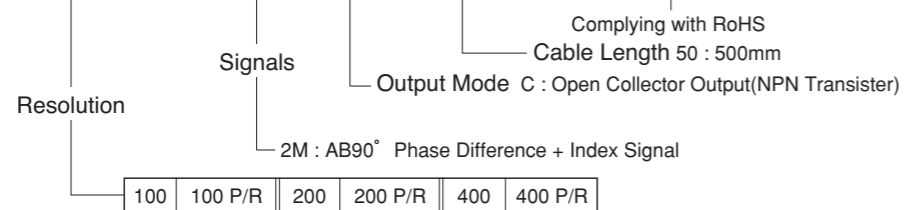
## Miniature Model

- Ultra Micro Encoer : OD7.2mm, Height10.5mm.
- High Resolution : Up to 400 resolution.

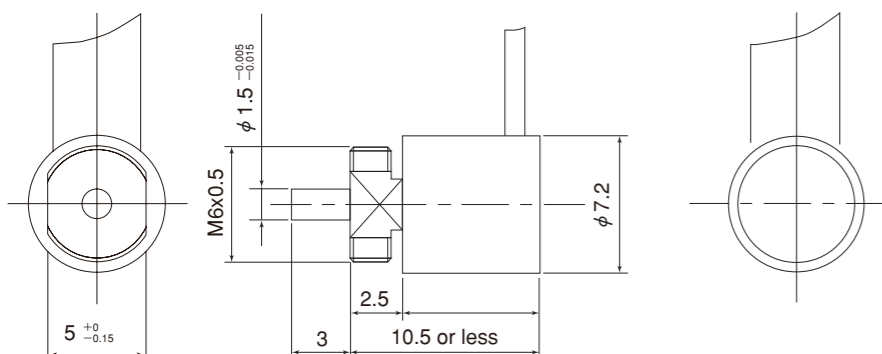


### Model

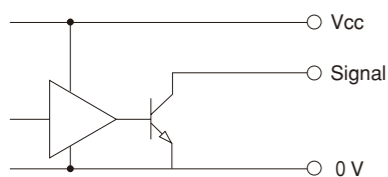
# 7S- [ ] [ ] -2MC-50-00E



### External Dimension



### Output Circuit



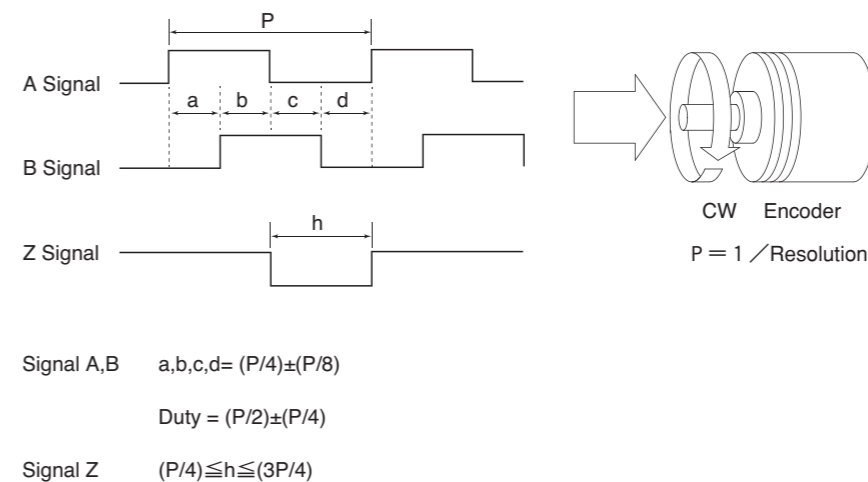
### Electrical Spec

Power Supply(Vcc)	DC 4.5 to 5.5V (Ripple 100mV(P-P))
Current Consumption	30mA Max
Output Mode	Open Collector
Output Voltage	[H] - [L] : 0.4V Max
Pull-up voltage	13.2V Max
Maximum Sink Current	20mA
Maximum Frequency Response	100kHz
Rise & Fall Time	1 μs Max

### Electrical Connections

No.	Color	Signal
1	Red	Vcc
2	White	0V
3	Blue	Sig B
4	White	Sig A
5	Blue	Sig Z

### Wave Form



### Mechanical Spec

Starting Torque	3.0×10 <sup>-4</sup> N·m Max
Angular Acceleration	1×10 <sup>5</sup> rad/s <sup>2</sup>
Shaft Loading	Thrust 0.98N
	Radial 1.90N
Moment of Inertia	1×10 <sup>-9</sup> kg·m <sup>2</sup>
Maximum Permissible Speed	6000min <sup>-1</sup>
Net Weight	5g Max (Without Cable)

### Environmental Spec

Operating Temperature	-10°C~+80°C
Storage Temperature	-20°C~+80°C
Humidity	RH90% Max No Condensation
Vibration	55 Hz / 1.5mm X, Y, Z Each 2h
Shock	490m/s <sup>2</sup> X, Y, Z Each 3 times



MINIATURE TYPE

18S Model



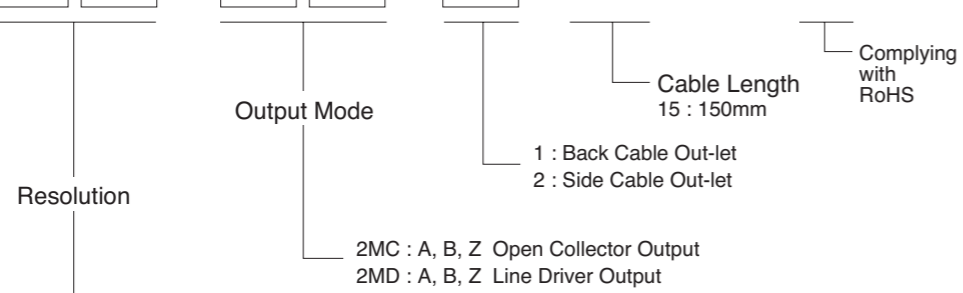
Miniature Model

- Small-size Encoder with OD 18mm.
- Shaft Diameter of 2.5mm is Available for OD 18mm House Encoder.



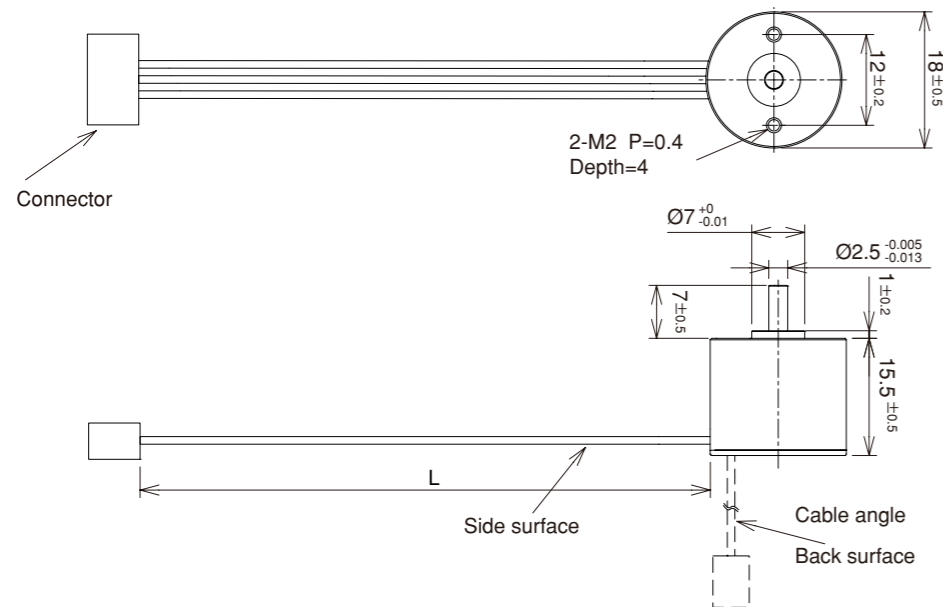
Model

18S- [ ] - [ ] - [ ] -15-00E

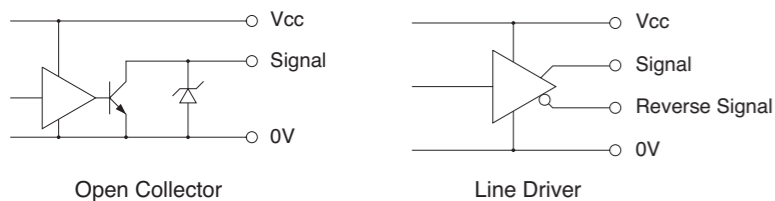


100	100 P/R	360	360 P/R	1000	1000P/R
160	160 P/R	400	400 P/R	1024	1024P/R
200	200 P/R	500	500 P/R	1600	1600P/R
300	300 P/R	800	800 P/R	-	-

External Dimension



Output Circuit



Electrical Spec

TYPE	2MC	2MD
Power Supply(Vcc)	DC 4.5 to 13.2V (Ripple 100mV (P-P))	DC 4.5 to 5.5V (Ripple 100mV (P-P))
Current Consumption	30mA Max	
Output Voltage	"H"	2.5V Min
	"L" *1	0.5V Max
Maximum Sink Current	20mA	
Maximum Frequency Response	400P/R or less	120kHz
	500P/R or more	240kHz
Rise & Fall Time	1μs Max	100ns Max

\*1) at Maximum Sink Current

Electrical Connections

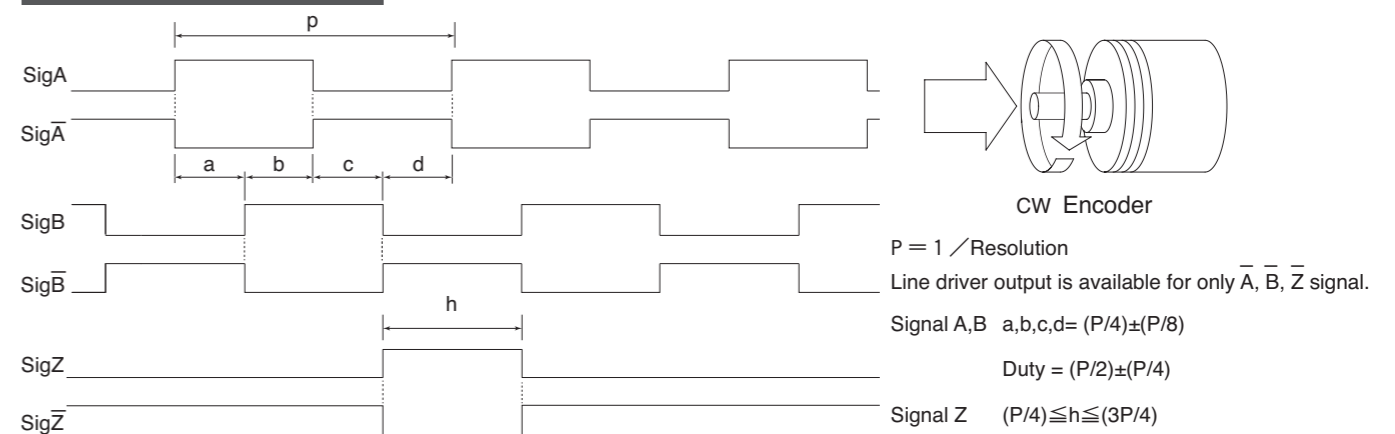
Connector Hirose Electric Co., Ltd. DF3-5S-2C

Open Collector		
1	Brown	Vcc
2	Red	0V
3	Orange	Sig A
4	Yellow	Sig B
5	Green	Sig Z

Connector Hirose Electric Co., Ltd. DF3-9S-2C

Line Driver		
1	Brown	Vcc
2	Red	0V
3	Orange	Sig A
4	Yellow	Sig A
5	Green	Sig B
6	Blue	Sig B
7	Purple	Sig Z
8	Gray	Sig Z
9	N.C	N.C

Wave Form



Mechanical Spec

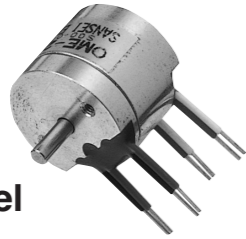
Starting Torque	4.9×10 <sup>-4</sup> N·m Max	
Shaft Loading	Thrust	4.9N
	Radial	2.94N
Moment of Inertia	1×10 <sup>-8</sup> kg·m <sup>2</sup>	
Angular Acceleration	1×10 <sup>-5</sup> rad/s <sup>2</sup>	
Maximum Permissible Speed	6000min <sup>-1</sup>	
Net Weight	20g Max (Without Cable)	

Environmental Spec

Operating Temperature	-10°C~+85°C
Storage Temperature	-30°C~+85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

MINIATURE TYPE

OME-T Model



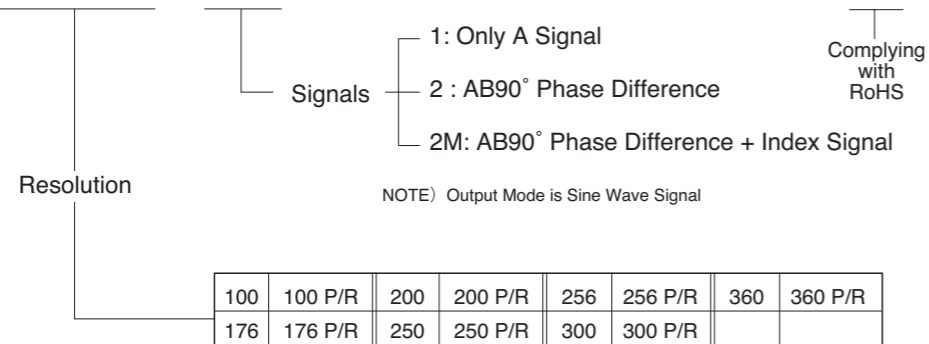
Miniature Model

- It has Z Signal of Datum Position.
- Micro Encoder  $\phi 18\text{mm}$  / Shaftdia :  $\phi 2.5\text{mm}$ .

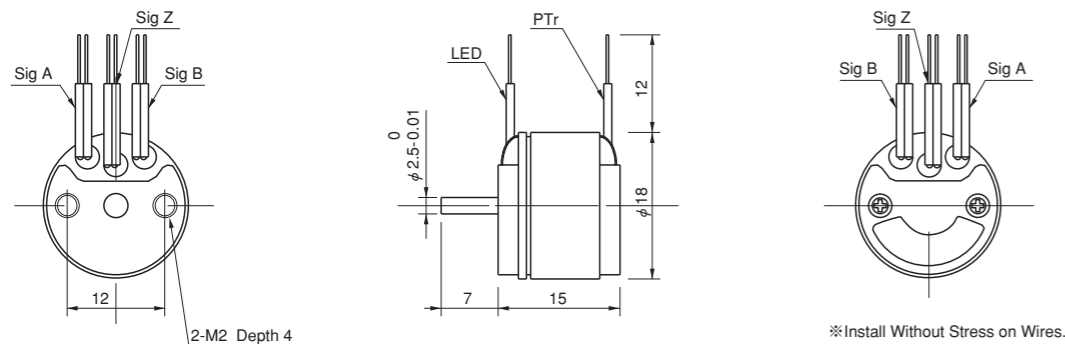


Model

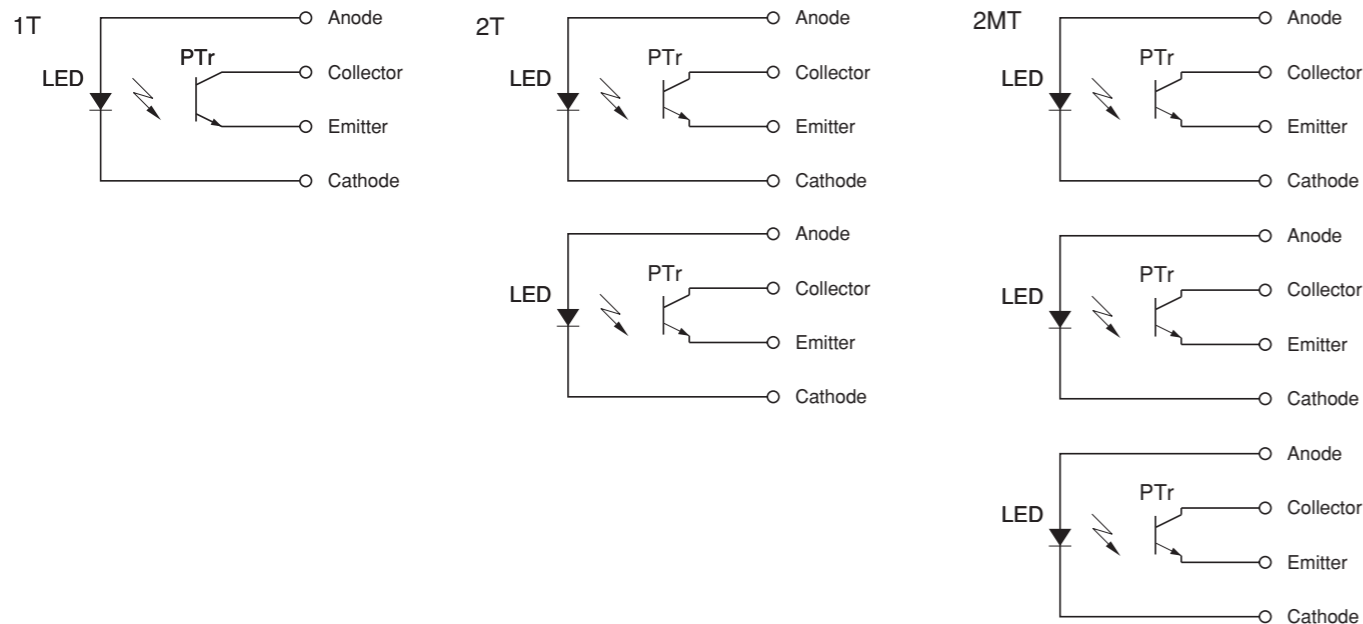
OME- [ ] - [ ] - [ ] T-070-000-00E



External Dimension



Output Circuit



Electrical Spec

TYPE	1T	2T	2MT
LED Current	IF = 26 mA Max		
Maximum Frequency Response	10 kHz		
Output Signal Amplitude	150 mVp-p Min		
Output Variation Amplitude (%)	40 % Max		

Electrical Connections

Color	Signal
Red	Anode
Black	Cathode
Blue	Collector
White	Emitter

Max. Rating of Electronic Elements

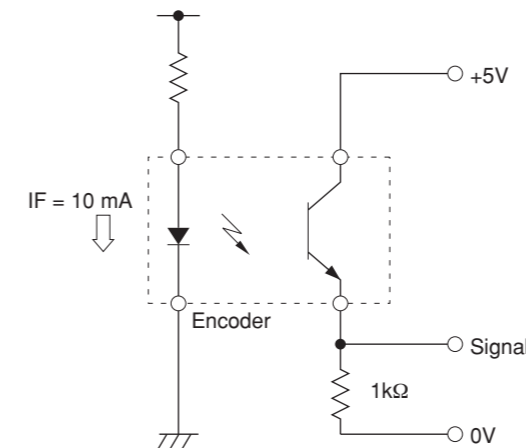
LED Light Emitting Diode

Forward Current	IF ; 60 mA
Reverse Voltage	VR ; 4 V
Power Dissipation	95 mW
Power Dissipation(25 to 70°C)	-1.73 m W / °C

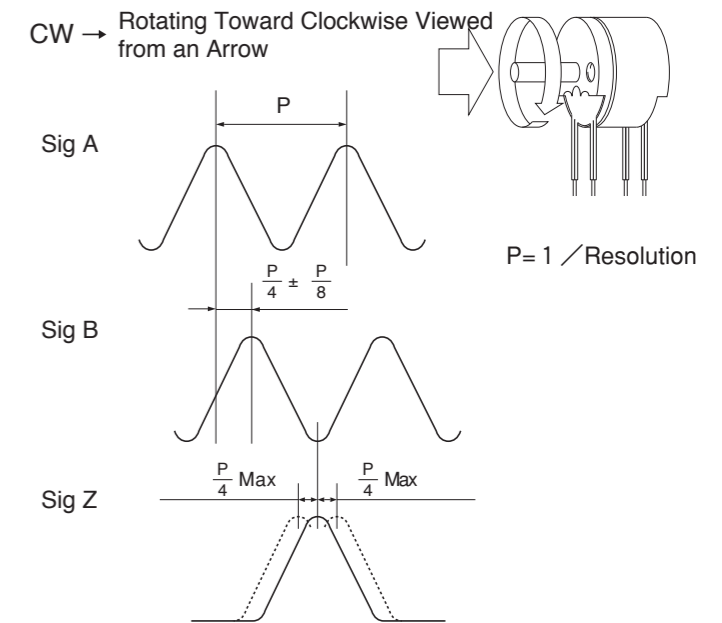
PTr Photo Transistor

Collector-Emitter Voltage	V <sub>CEO</sub> ; 20 V
Emitter-Collector Voltage	V <sub>ECO</sub> ; 5 V
Collector Current	I <sub>c</sub> ; 20 mA
Collector Power Dissipation	P <sub>c</sub> ; 75 mW
Power Dissipation(25 to 70°C)	-1.0 m W / °C

Test Circuit



Wave Form



Mechanical Spec

Starting Torque	4.9×10 <sup>-5</sup> N·m Max	
Shaft Loading	Thrust	1.96N
	Radial	1.96N
Moment of Inertia	1×10 <sup>-8</sup> kg·m <sup>2</sup>	
Maximum Permissible Speed	6000min <sup>-1</sup>	
Net Weight	25g Max	

Environmental Spec

Operating Temperature	0°C~+50°C
Storage Temperature	-20°C~+80°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	294m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times

MINIATURE TYPE

OME-N Model



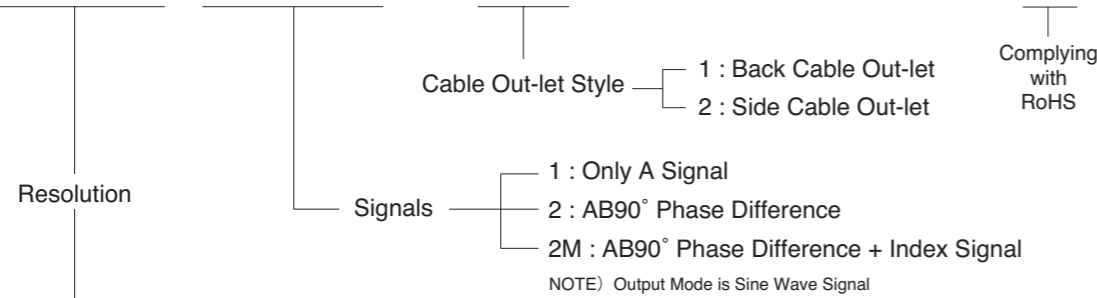
Miniature Model

- With Connector to Reduce Wiring Work.
- It has Z Signal of Datum Position.



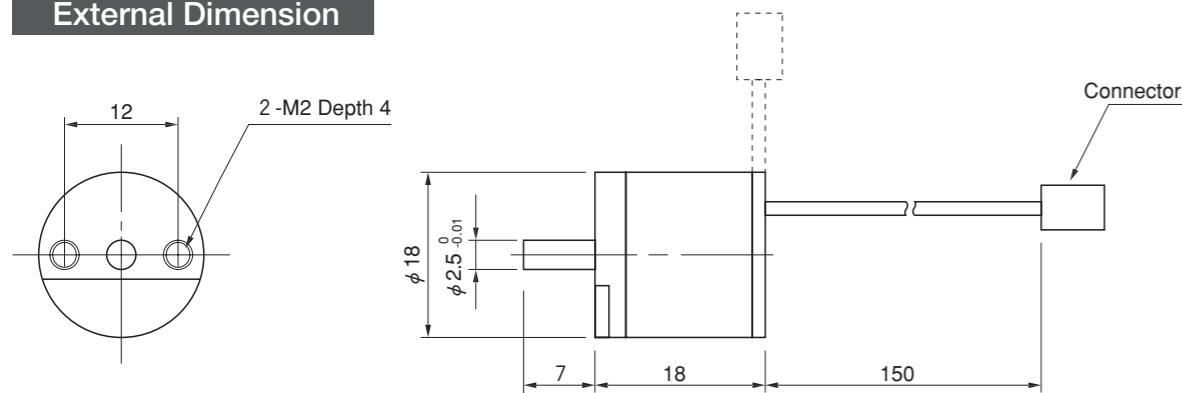
Model

OME- [ ] - [ ] - [ ] - [ ] N - [ ] 00-015-00E

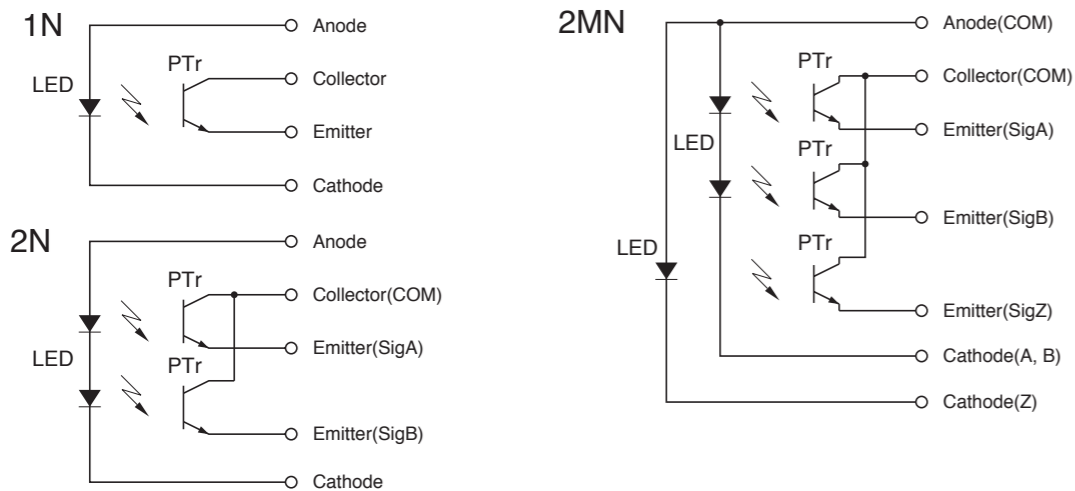


100	100P/R	200	200P/R	256	256P/R	360	360P/R
157	157P/R	250	250P/R	300	300P/R		

External Dimension



Output Circuit



Electrical Spec

TYPE	1N	2N	2MN
LED Current	IF = 26 mA Max		
Maximum Frequency Response	10 kHz		
Output Signal Amplitude	150 mVp-p Min		
Output Variation Amplitude (%)	40 % Max		

Max. Rating of Electronic Elements

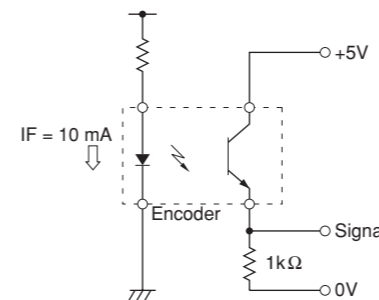
LED Light Emitting Diode

Forward Current	IF ; 60 mA
Reverse Voltage	VR ; 4 V
Power Dissipation	95 mW
Power Dissipation(25 to 70°C)	-1.73 m W / °C

PTr Photo Transistor

Collector-Emitter Voltage	V <sub>CEO</sub> ; 20 V
Emitter-Collector Voltage	V <sub>ECO</sub> ; 5 V
Collector Current	I <sub>c</sub> ; 20 mA
Collector Power Dissipation	P <sub>c</sub> ; 75 mW
Power Dissipation(25 to 70°C)	-1.0 m W / °C

Test Circuit



Mechanical Spec

Starting Torque	4.9×10 <sup>-4</sup> N·m Max	
Shaft Loading	Thrust	1.96N
	Radial	1.96N
Moment of Inertia	1×10 <sup>-8</sup> kg·m <sup>2</sup>	
Maximum Permissible Speed	6000min <sup>-1</sup>	
Net Weight	20g Max	

Electrical Connections

1N Connector Hirose Electric Co., Ltd. DF3-4S-2C

Pin#	Color	Signal
1	Black	Anode
2	Brown	Cathode
3	Red	Collector
4	Orange	Emitter

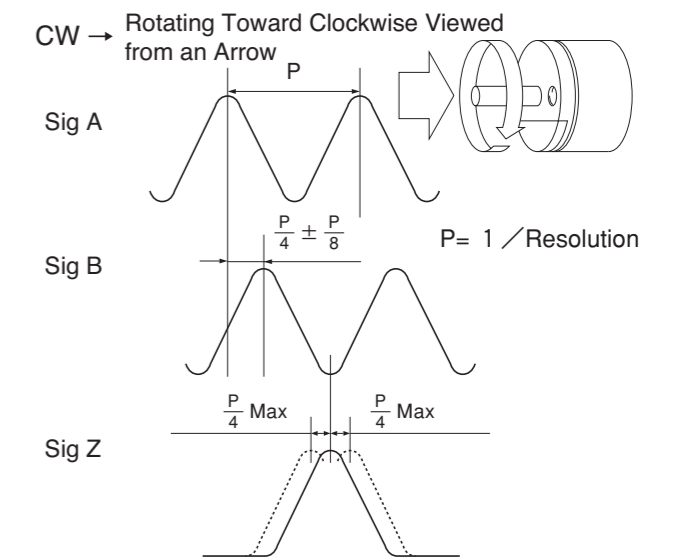
2N Connector Hirose Electric Co., Ltd. DF3-5S-2C

Pin#	Color	Signal
1	Black	Anode
2	Brown	Cathode
3	Red	Collector (COM)
4	Orange	Emitter (A)
5	Yellow	Emitter (B)

2MN Connector Hirose Electric Co., Ltd. DF3-7S-2C

Pin#	Color	Signal
1	Black	Anode (COM)
2	Brown	Cathode (A, B)
3	Red	Collector (COM)
4	Orange	Emitter (A)
5	Yellow	Emitter (B)
6	Green	Emitter (Z)
7	Blue	Cathode (Z)

Wave Form



Environmental Spec

Operating Temperature	0°C~+50°C
Storage Temperature	-20°C~+80°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	294m/s <sup>2</sup> ,11ms X, Y, Z Each 3 times

SHAFT TYPE

OEZ Model



Small High-Speed Model

- High Speed Response Frequency 150kHz.
- Up to 1500P/R.



Model

OEZ- [ ] -2M [ ] - [ ] - [ ] -00E

Resolution			
0036	36P/R	04	400P/R
005	50P/R	05	500P/R
006	60P/R	0512	512P/R
01	100P/R	06	600P/R
015	150P/R	08	800P/R
02	200P/R	10	1000P/R
025	250P/R	1024	1024P/R
03	300P/R	15	1500P/R
036	360P/R		

**Power Supply(Vcc)**

- 05 : 5V
- 12 :12V
- 24 :24V

**Cable Length**

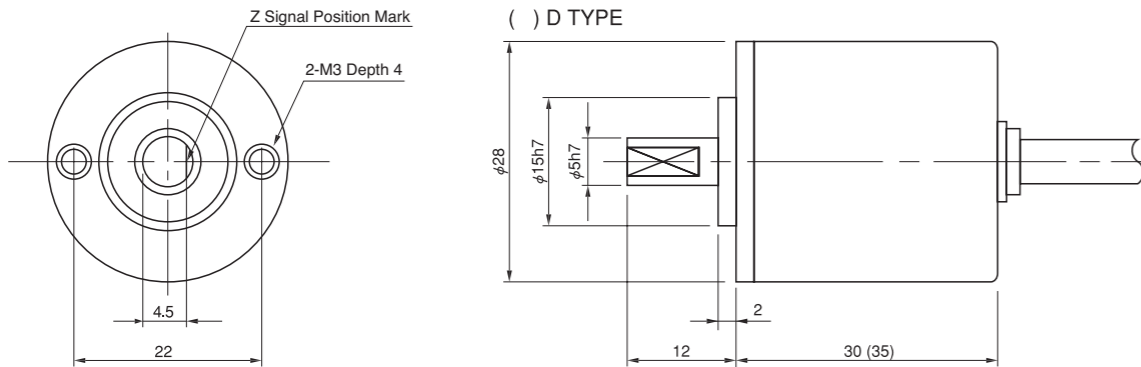
- 050 :500mm (Standard)
- 100 :1000mm
- 300 :3000mm

**Output Mode**

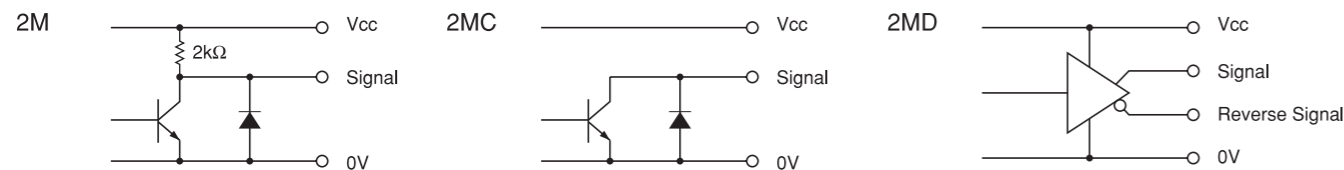
- No Indication : Voltage Output(Except 24V mode)
- C : Open Collector Output
- D : Line Driver Output(The Power Supply(Vcc) is only 5V)

**Signals** — 2M : AB90° Phase Difference + Index Signal

External Dimension



Output Circuit



Electrical Spec

TYPE	2M	2MC	2MC-24	2MD
Power Supply(Vcc)	DC4.5~5.5V DC10.8~13.2V		DC21.6~26.4V	DC4.75~5.25V
Current Consumption	80mA Max	60mA Max		150mA Max
Output Voltage	"H"	Vcc-1V Min		2.5V Min
	"L"※1	0.5V Max		
Maximum Sink Current	20 mA			
Rise & Fall Time	1μs Max			200 ns Max
Maximum Frequency Response	150kHz			
Withstanding Voltage of Output Tr.		50 V Max		

※1) at Maximum Sink Current

Wave Form

CW → Rotating Toward Clockwise Viewed from an Arrow

Rising point of A-Signal is always at one point while Z-Signal is at H-Level in CW.

$P = \frac{1}{\text{Resolution}}$

$a, b, c, d = \frac{P}{4} \pm \frac{P}{8} \quad \frac{P}{2} \leq h \leq \frac{3P}{2}$

Wave Ratio (Duty);  $50 \pm 25 (\%)$

Electrical Connections

Color	Signal	Color	Signal
Red	Power Supply(Vcc)	White	Signal B
Black	0V	Gray	Signal B
Green or Blue	Signal A	Yellow	Signal Z
White	Signal B	Orange	Signal Z
Yellow	Signal Z		
Shield	NC		

Mechanical Spec

Starting Torque	9.8×10 <sup>-4</sup> N·m Max
Angular Acceleration	1×10 <sup>5</sup> rad/s <sup>2</sup>
Shaft Loading	Thrust 4.9N
	Radial 9.8N
Moment of Inertia	2×10 <sup>-7</sup> kg·m <sup>2</sup>
Maximum Permissible Speed	6000min <sup>-1</sup>
Net Weight	60g Max

Environmental Spec

Operating Temperature	-10°C~+70°C
Storage Temperature	-30°C~+80°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50



# SHAFT TYPE

# 38S Model



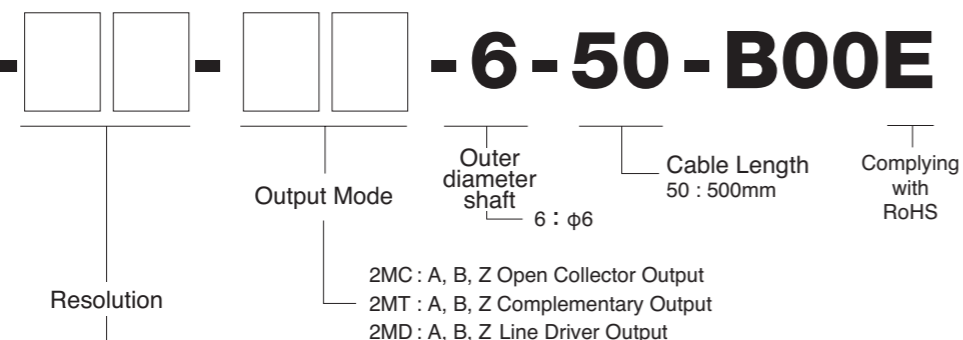
## Small Standard Model

Wide Range of Resolution from 100 to 4096 P/R.



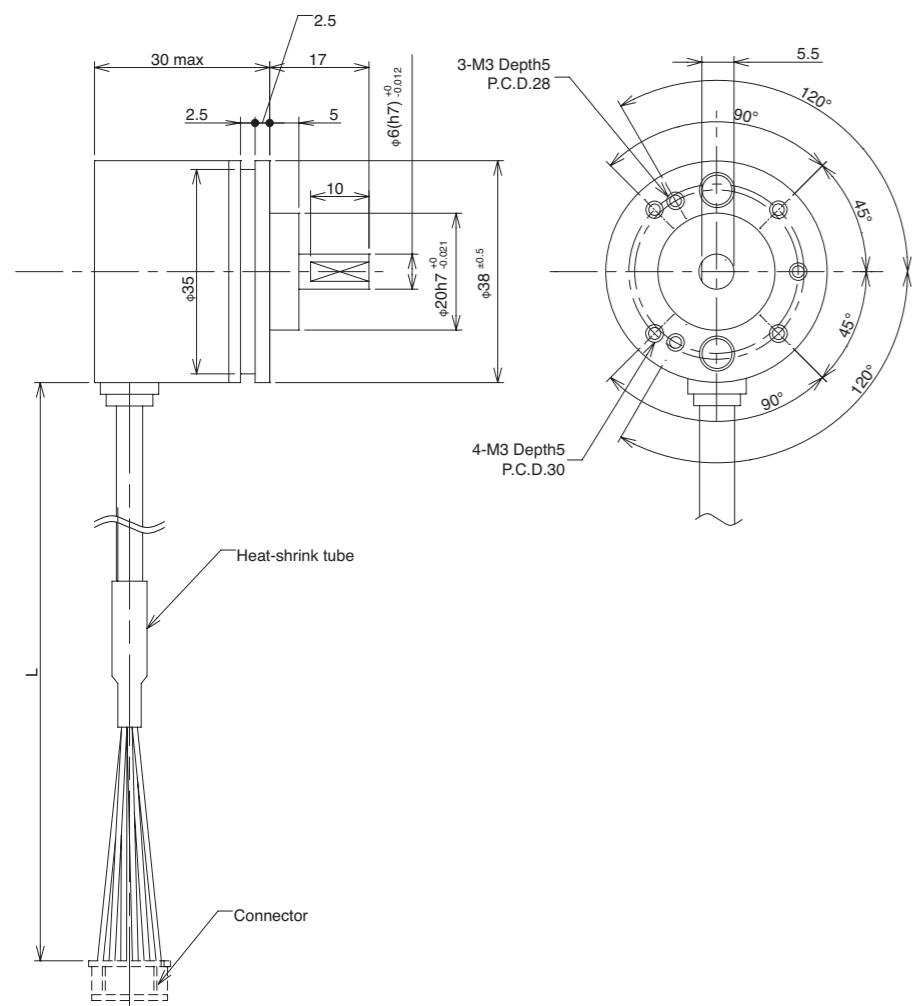
### Model

# 38S - [ ] - [ ] - 6 - 50 - B00E

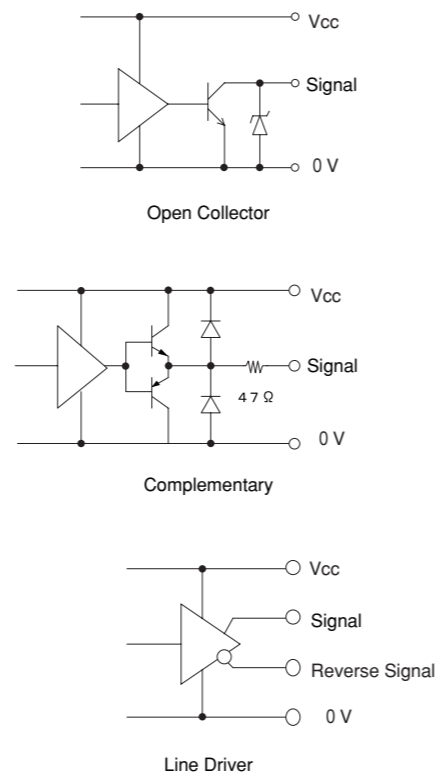


100	100 P/R	360	360 P/R	600	600 P/R	2000	2000 P/R	4000	4000 P/R
200	200 P/R	400	400 P/R	800	800 P/R	2048	2048 P/R	4096	4096 P/R
250	250 P/R	500	500 P/R	1000	1000 P/R	2500	2500 P/R	-	-
300	300 P/R	512	512 P/R	1024	1024 P/R	3600	3600 P/R	-	-

### External Dimension



### Output Circuit

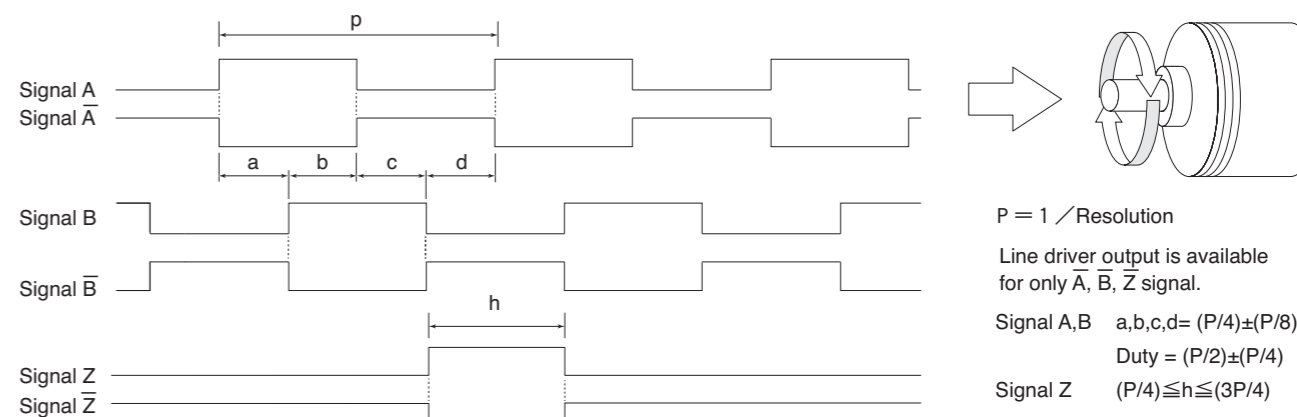


### Electrical Spec

TYPE	2MC	2MT	2MD
Power Supply(Vcc)	DC 4.5 to 30V (Ripple 3% or less(P-P))		DC 4.5 to 13.2V (Ripple 3% or Less(P-P))
Current Consumption	30mA Max	60mA Max	30mA Max
Output Voltage	"H"	Vcc -3V Min	2.5V Min
	"L" *1	0.5V Max	0.5V Max
Maximum Sink Current	40mA		20mA
Maximum Frequency Response	1024P/R or less	120kHz	
	2000P/R or more	240kHz	
Rise & Fall Time	1μs Max	200ns Max	100ns Max

\*1) at Maximum Sink Current

### Wave Form



### Electrical Connections

Connector Hirose Electric Co., Ltd. DF3-6S-2C

Open Collector • Complementary		
1	Red	Vcc
2	Black	0 V
3	Blue	Sig A
4	White	Sig B
5	Yellow	Sig Z
6	Shield	N.C

Connector Hirose Electric Co., Ltd. DF3-9S-2C

Line Driver		
1	Red	Vcc
2	Black	0 V
3	Green	Sig A
4	Blue	Sig A-bar
5	White	Sig B
6	Gray	Sig B-bar
7	Yellow	Sig Z
8	Orange	Sig Z-bar
9	Shield	N.C

### Mechanical Spec

Starting Torque	0.98×10 <sup>-3</sup> N·m Max
Angular Acceleration	1×10 <sup>5</sup> rad·s <sup>2</sup>
Shaft Loading	Thrust 19.6N
	Radial 29.4N
Moment of Inertia	8×10 <sup>-7</sup> kg·m <sup>2</sup>
Maximum Permissible Speed	6000min <sup>-1</sup>
Net Weight	100g Max(Without Cable)

### Environmental Spec

Operating Temperature	-10°C~+85°C
Storage Temperature	-30°C~+85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X, Y, Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

SHAFT TYPE

38SG Model



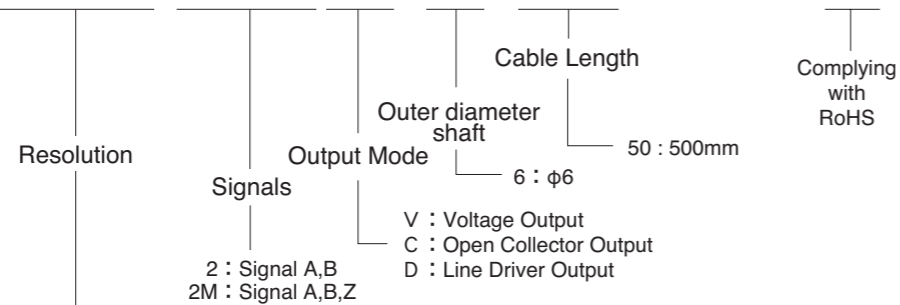
Small & Short delivery Model

Compact Sized Encoder with OD38mm x L30mm.

Model

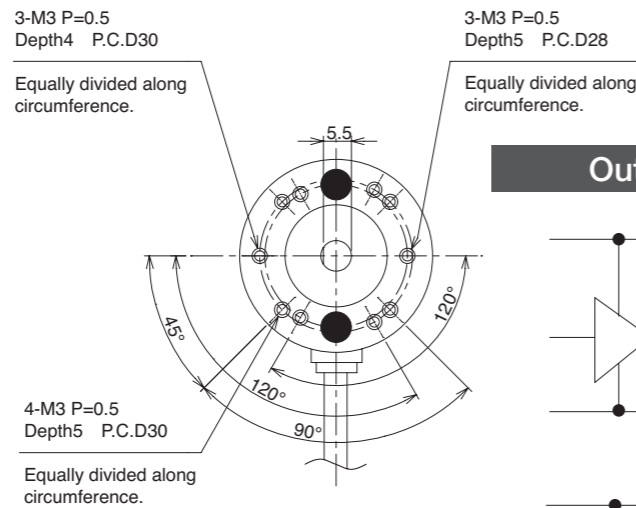
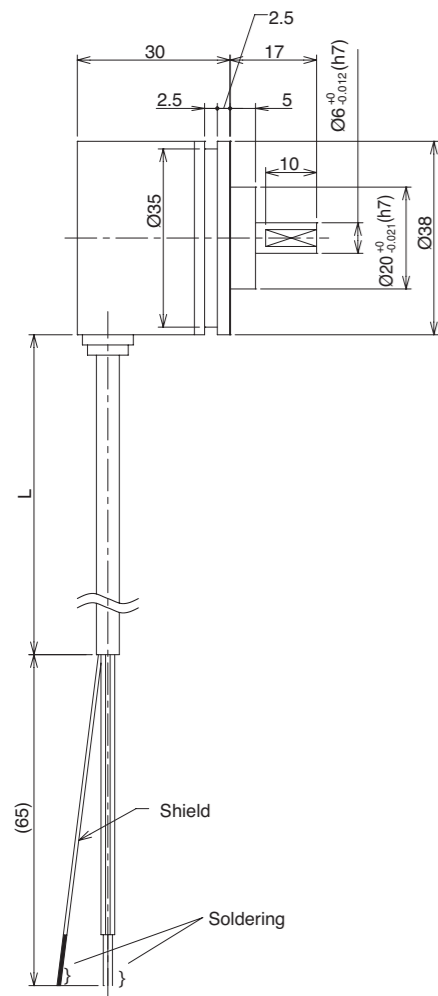


38SG- - - -6-50-N 00E

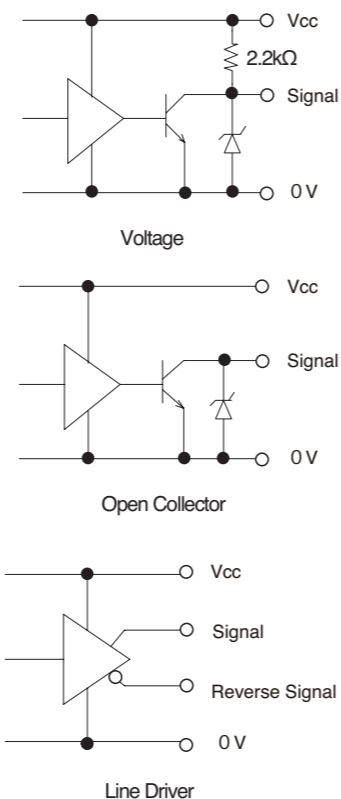


Signal A,B,Z	500	500P/R	1000	1000P/R	1024	1024P/R	1800	1800P/R	2000	2000P/R	2048	2048P/R
Signal A,B	100	100P/R	200	200P/R	300	300P/R	360	360P/R	400	400P/R	600	600P/R

External Dimension



Output Circuit

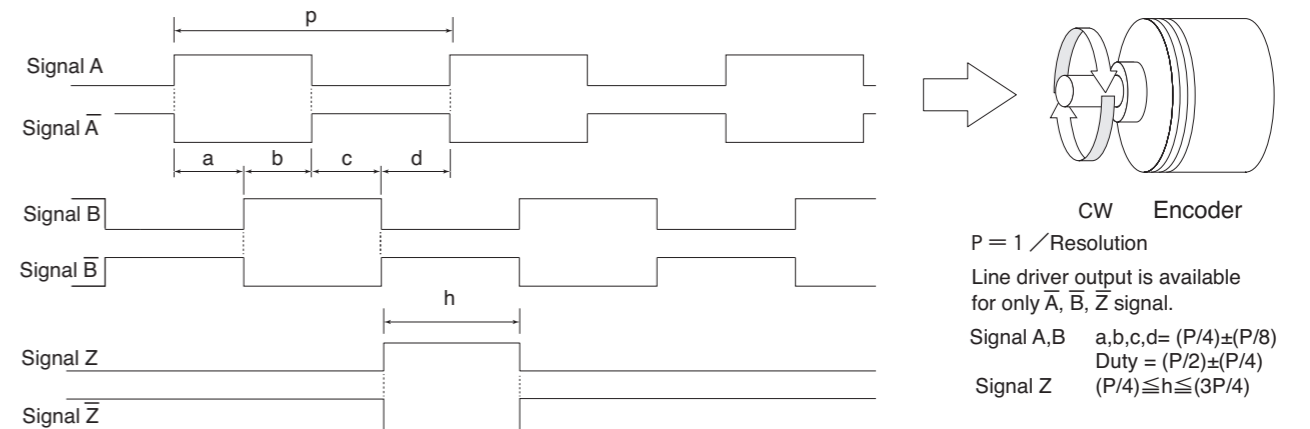


Electrical Spec

TYPE	2V 2MV	2C 2MC	2D 2MD
Power Supply(Vcc)	DC 3.35V to 13.2V (Ripple 3% or less (P-P))	DC 3.35V to 34.5V (Ripple 3% or less (P-P))	DC 3.35 to 5.25V (Ripple 3% or Less(P-P))
Current Consumption	400mA Max		
Output Voltage	"H"	Vcc-1V Min	2.5V Min
	"L" *1	0.4V Max	
Maximum Sink Current	20mA	35mA	20mA
Maximum Frequency Response	120kHz		
Rise & Fall Time	1µs Max (sink current 10mA / cable length 2m)	1µs Max (load 1kΩ / cable length 2m)	100ns Max (current ±20mA)

\*1) at Maximum Sink Current

Wave Form



Electrical Connections

Voltage / Open Collector		Line Driver	
Red	Vcc	Red	Vcc
Black	0 V	Black	0 V
Blue	Sig A	Green	Sig A
White	Sig B	Blue	Sig A
Yellow	Sig Z	White	Sig B
Shield	N.C	Gray	Sig B
		Yellow	Sig Z
		Orange	Sig Z
		Shield	N.C

Mechanical Spec

Starting Torque	0.98x10 <sup>-3</sup> N·m Max
Shaft Loading	Thrust: 19.6N
	Radial: 29.4N
Moment of Inertia	1x10 <sup>-6</sup> kg·m <sup>2</sup>
Maximum Permissible Speed	6000min <sup>-1</sup>

Environmental Spec

Operating Temperature	-10°C ~ +85°C
Storage Temperature	-30°C ~ +85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

# SHAFT TYPE

# OVF Model



## Heavy Duty 39mm Diameter Encoder

- Most Advanced IP65 Encoder.
- Mating Shaft Diameter Up to 8mm.



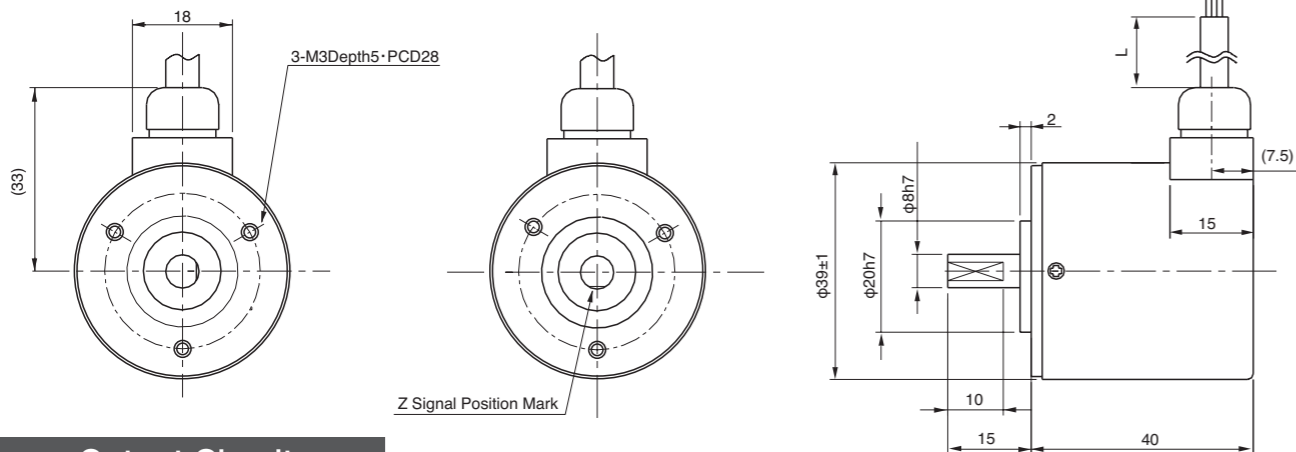
### Model

**OVF-**   **-2M**        **00E**

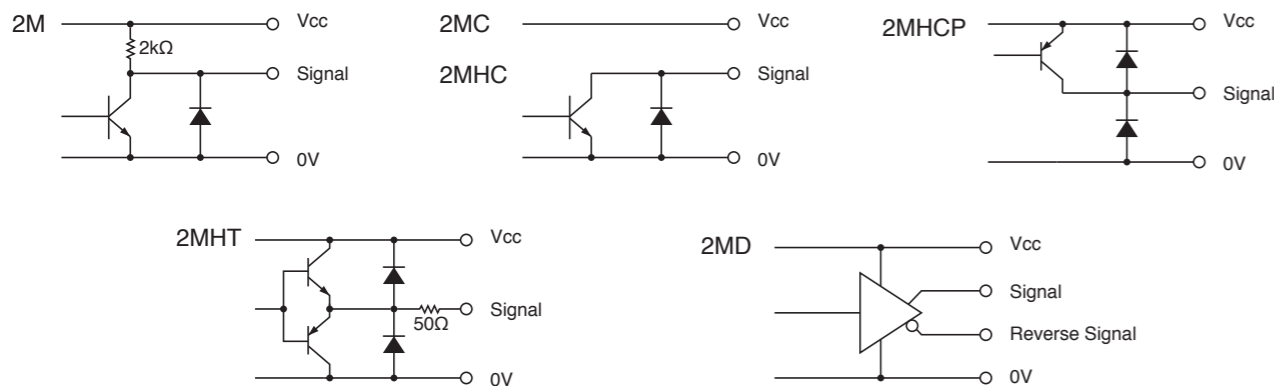
Resolution	
002	20P/R
003	30P/R
0032	32P/R
004	40P/R
005	50P/R
006	60P/R
01	100P/R
0125	125P/R
02	200P/R
025	250P/R
0256	256P/R
03	300P/R
036	360P/R
04	400P/R
05	500P/R
0512	512P/R
06	600P/R
08	800P/R
09	900P/R
10	1000P/R
1024	1024P/R
12	1200P/R
15	1500P/R
18	1800P/R
20	2000P/R
2048	2048P/R
25	2500P/R
36	3600P/R

- Outer diameter shaft**
- 800 : φ8
  - (635 : φ6.35)\*
  - (600 : φ6)\*
  - (500 : φ5)\*
- Cable Length**
- 050 : 500mm (Standard)
  - 100 : 1000mm
  - 300 : 3000mm
- Output Mode**
- No Indication : Voltage Output
  - C : Open Collector Output
  - HC : Open Collector Output / High Voltage
  - HCP : PNP Mode Open Collector Output / High Voltage
  - HT : Push-Pull Output / High Voltage
  - D : Line Driver Output
- Signals** 2M: AB90° Phase Difference + Index Signal
- Low Power Consumption C-MOS Output Available
- Complying with RoHS
- No Indication : Other than D output
  - No Indication : D output with LS
  - C : D output with C-MOS

### External Dimension



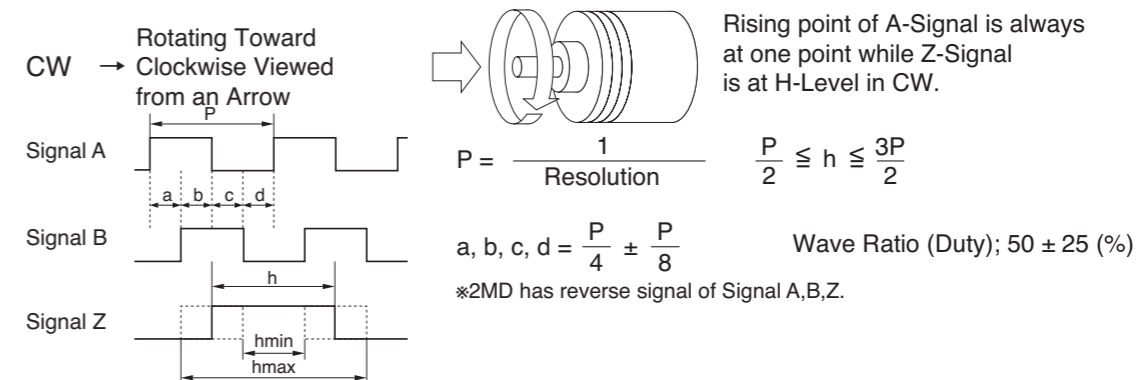
### Output Circuit



### Electrical Spec

TYPE	*1) at Maximum Sink Current		*2) Maximum Source Current			
	2M	2MC	2MHC	2MHCP	2MHT	2MD
Power Supply(Vcc)	DC4.5~13.2 V		DC10.8~26.4 V			DC4.75~5.25V C-MOS DC4.5~5.5V
Current Consumption	80 mA Max	60 mA Max		100 mA Max	60 mA Max	150 mA Max C-MOS60 mA Max
Output Voltage	"H"	Vcc-1V Min	Vcc-1V Min *2		Vcc-3V Min	2.5 V Min
	"L" *1	0.5 V Max			3 V Max	0.5 V Max
Maximum Sink Current	20 mA			40 mA	20 mA	
Rise & Fall Time	1 μs Max				200 nsMax	
Maximum Frequency Response	200 kHz		50 kHz	200 kHz		
Withstanding Voltage of Output Tr.	50 V Max					

### Wave Form



### Electrical Connections

Color	Signal	Color	Signal
Red	Power Supply(Vcc)	White	Signal B
Black	0V	Gray	Signal B
Green or Blue	Signal A	Yellow	Signal Z
White	Signal B	Orange	Signal Z
Yellow	Signal Z		
Shield	NC		

### Mechanical Spec

Starting Torque	4.9×10 <sup>-4</sup> N · m Max	
Angular Acceleration	1×10 <sup>5</sup> rad/s <sup>2</sup>	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Moment of Inertia	1.2×10 <sup>-6</sup> kg · m <sup>2</sup> Max	
Maximum Permissible Speed	5000min <sup>-1</sup>	
Net Weight	140g Max	

### Environmental Spec

Operating Temperature	-10°C~+70°C
Storage Temperature	-30°C~+80°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	294m/s <sup>2</sup> ,11ms X, Y, Z Each 3 times
Ingress Protection	IP65



SHAFT TYPE

# 50S/NOC3

Model



## Heavy Duty Model

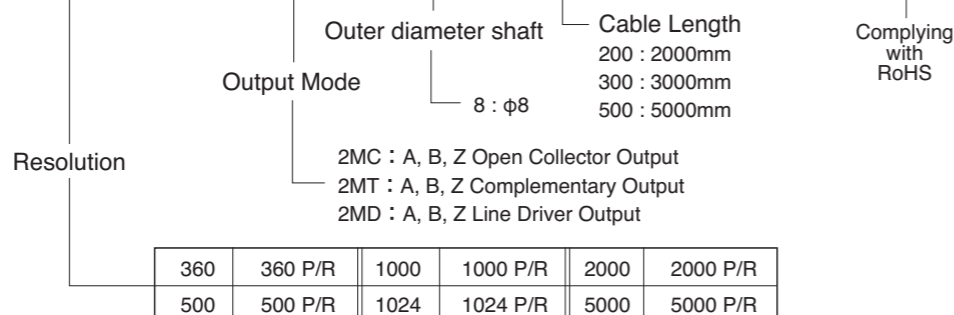
- Compact Sized Encoder with OD50mm x L33mm.
- High Specification Type with Up to 5000P/R.



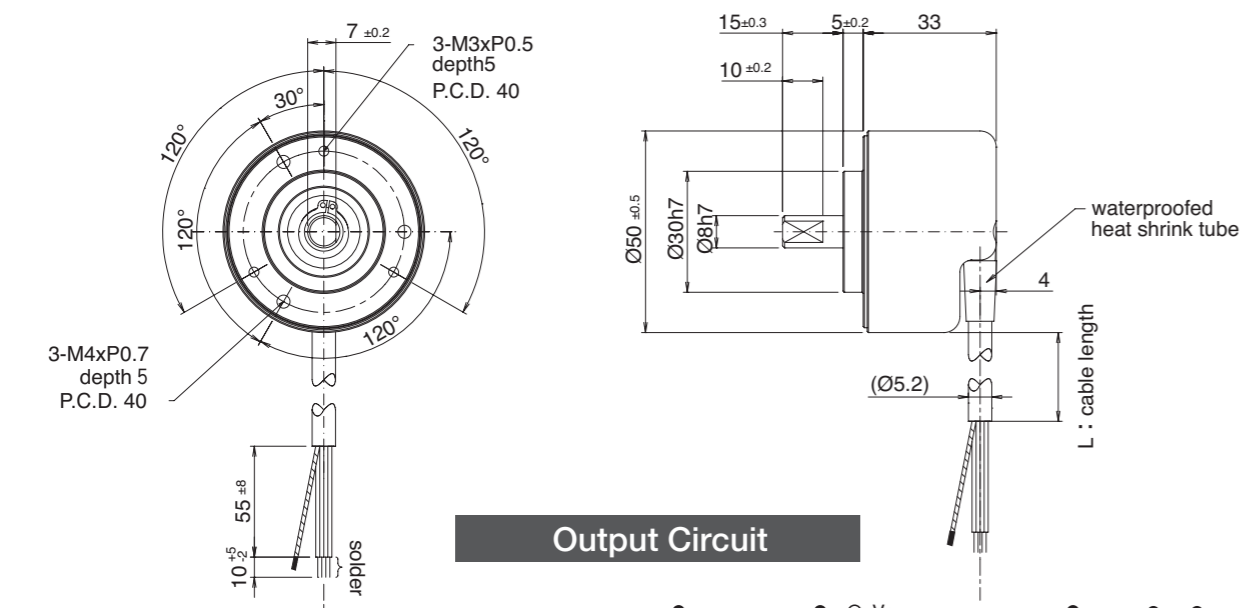
# Model

# 50S - [ ] - [ ] - 8 - [ ] - [ ] - 00E

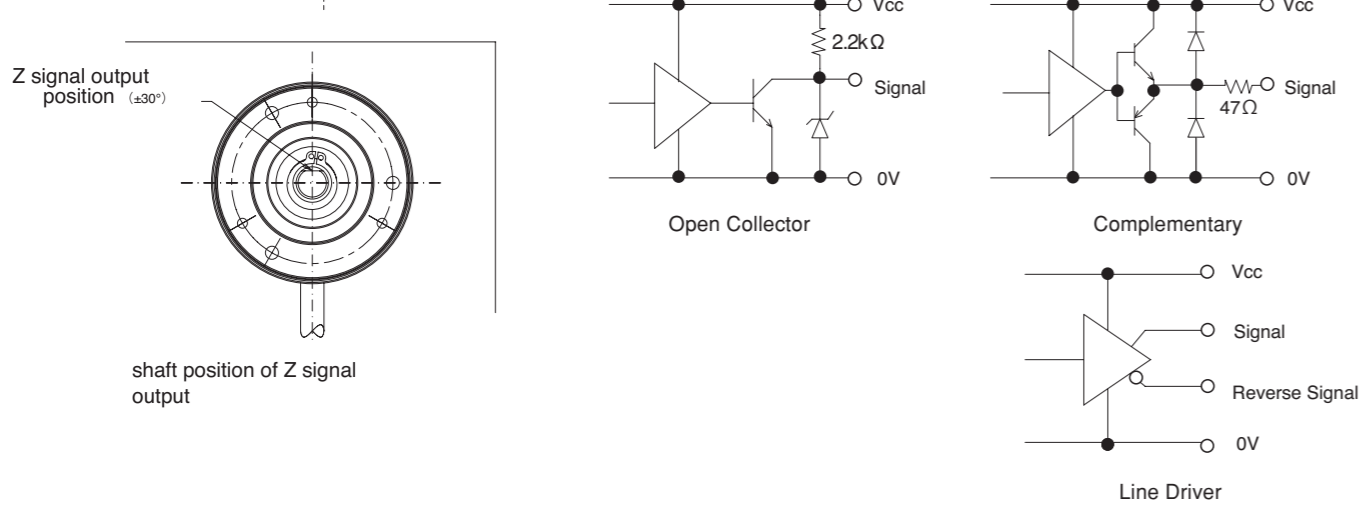
# NOC3-SP



### External Dimension



### Output Circuit

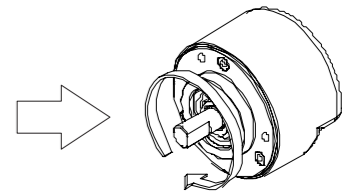
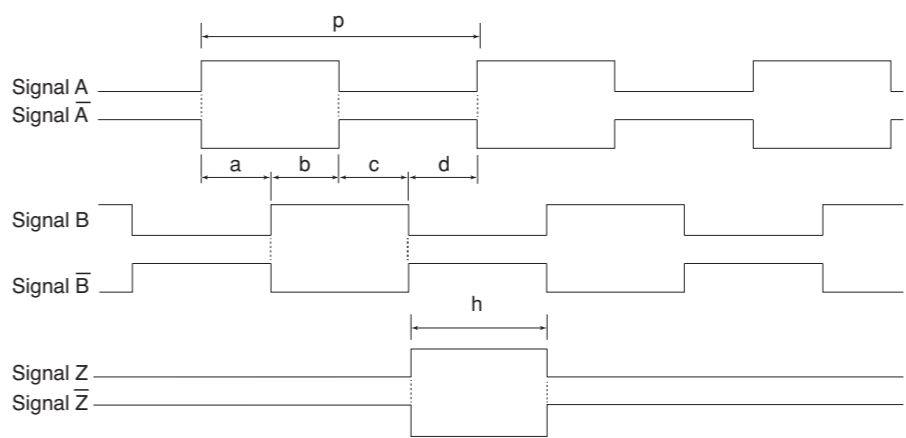


### Electrical Spec

TYPE		2MC	2MT	2MD
Power Supply(Vcc)		DC 4.5 to 30V (Ripple 3% or less (P-P))		DC 4.5 to 5.5V (Ripple 3% or less (P-P))
Current Consumption		30mA Max	60mA Max	30mA Max
Output Voltage	"H"	-	Vcc - 3V Min	2.5V Min
	"L" *1	0.5V Max	3V Max	0.5V Max
Maximum Sink Current		40mA		20mA
Maximum Frequency Response	500P/R or less	120kHz		
	1000P/R or more	240kHz		
Rise & Fall Time		1 μs Max	200ns Max	100ns Max

\*1) at Maximum Sink Current

### Wave Form



CW → Rotating Toward Clockwise Viewed from an Arrow

$P = 1 / \text{Resolution}$   
Line driver output is available for only A, B, Z signal.  
Signal A,B  $a, b, c, d = (P/4) \pm (P/8)$   
Duty =  $(P/2) \pm (P/4)$   
Signal Z  $(P/4) \leq h \leq (3P/4)$

### Electrical Connections

Open Collector · Complementary		Line Driver	
Red	Vcc	Red	Vcc
Black	0V	Black	0V
Blue	Sig A	Green	Sig A
White	Sig B	Blue	Sig A-bar
Yellow	Sig Z	White	Sig B
Shield	N.C	Gray	Sig B-bar
-	-	Yellow	Sig Z
-	-	Orange	Sig Z-bar
-	-	Shield	N.C

### Mechanical Spec

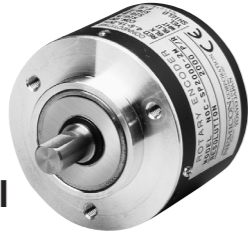
Starting Torque	9.8×10 <sup>-3</sup> N·m Max(at 25°C)
Angular Acceleration	1×10 <sup>5</sup> rad·s <sup>2</sup>
Shaft Loading	Thrust 49.0N
	Radial 78.4N
Moment of Inertia	8×10 <sup>-7</sup> kg·m <sup>2</sup>
Maximum Permissible Speed	5000min <sup>-1</sup>
Net Weight	250g Max (Without Cable)

### Environmental Spec

Operating Temperature	-10°C~+85°C
Storage Temperature	-30°C~+85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	980m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65

SHAFT TYPE

NOC-S Model



Standard Model of 50mm Diameter Encoder

- Standard Low Cost Versions of 10~5000 P/R.
- NOC2-S: Dedicated 2 signal(500 P/R and 1000 P/R).



Model

NOC-S [Resolution] -2M [Cable Length] - [Output Mode] - [Cable Length] - [Style] E

Resolution	Resolution	Resolution	Resolution
10	10P/R	600	600P/R
20	20P/R	1000	1000P/R
30	30P/R	1024	1024P/R
40	40P/R	1250	1250P/R
50	50P/R	1800	1800P/R
60	60P/R	2000	2000P/R
100	100P/R	2048	2048P/R
200	200P/R	2500	2500P/R
250	250P/R	3600	3600P/R
300	300P/R	4096	4096P/R
360	360P/R	5000	5000P/R
500	500P/R		

**Resolution**  
S: Shaft

**Outer diameter shaft**  
8 : φ 8  
※ (9525 : φ 9.525)  
※ (10 : φ 10)  
※: Option

**Cable Length**  
050 : 500mm (Standard)  
100 : 1000mm  
300 : 3000mm

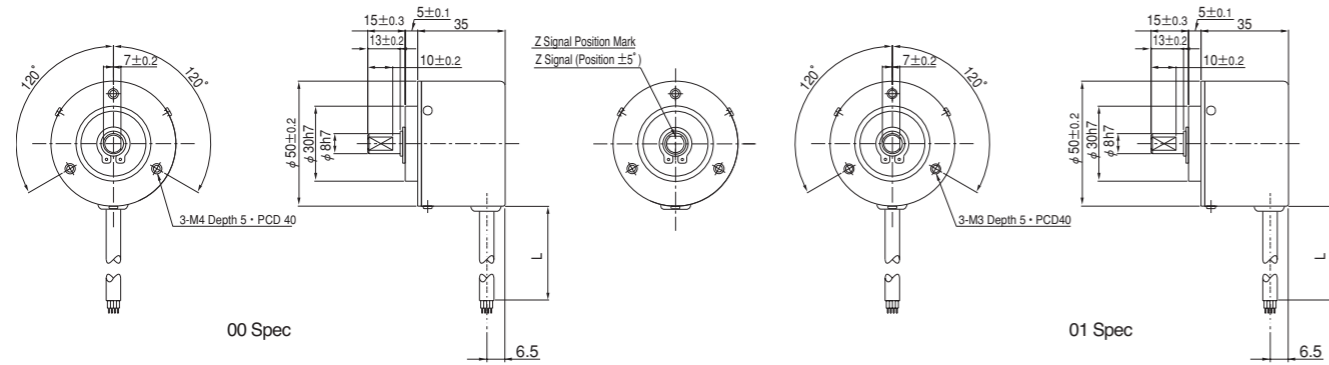
**Complying with RoHS**  
00 : M4 3-M4 Depth5  
01 : M3 3-M3 Depth5

**Output Mode**  
No Indication : Voltage Output  
C : Open Collector Output  
HC : Open Collector Output / High Voltage  
HCP : PNP Mode Open Collector Output / High Voltage  
HT : Push-Pull Output / High Voltage  
D : Line Driver Output Standard C-MOS  
WT : Push-Pull Output / Wide Voltage

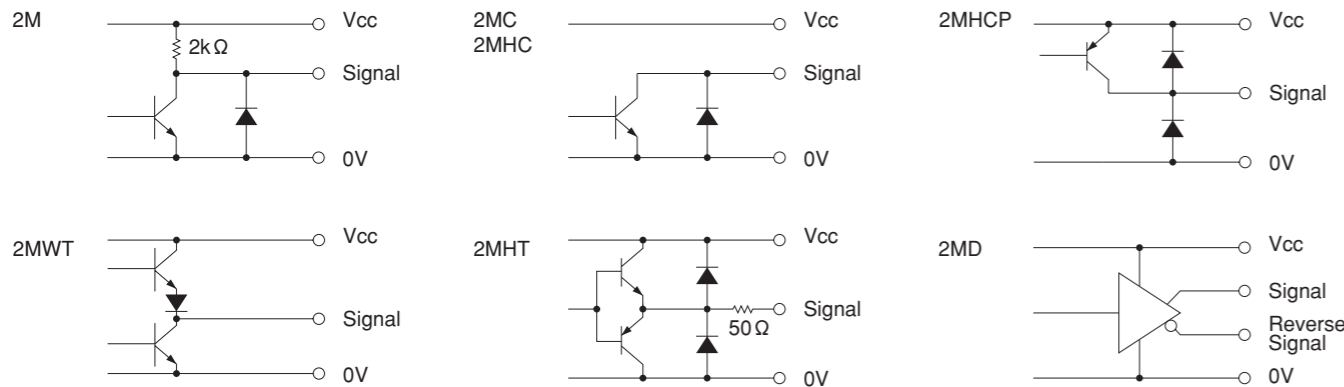
**Signals 2M : AB90° Phase Difference + Index Signal**

**No Indication: Other than D output**  
**No Indication: D output with LS**  
**C : D output with C-MOS**

External Dimension



Output Circuit



Electrical Spec

TYPE	2M		2MC		2MHC		2MHCP		2MHT		2MD		2MWT	
	※1) at Maximum Sink Current ※2) Maximum Source Current													
Power Supply(Vcc)	DC4.5~13.2 V				DC10.8 ~ 26.4 V				DC4.5~5.5V (C-MOS)		DC 4.75~30V			
Current Consumption	90 mA Max		70 mA Max		100 mAMax		90 mA Max		70 mA Max (C-MOS)		60 mA Max			
Output Voltage	"H"		Vcc-1V Min		Vcc-1V Min		Vcc-3V Min		2.5 V Min		Vcc-2.5V Min			
	"L" ※1		0.5 V Max		3 V Max		0.5 V Max		0.4 V Max					
Maximum Sink Current	20 mA				40 mA		20 mA		30 mA					
Rise & Fall Time	1 μs Max				200 ns Max		3 μs Max							
Maximum Frequency Response	200 kHz				50 kHz		200 kHz		100 kHz					
Withstanding Voltage of Output Tr.	50 V Max													

Wave Form

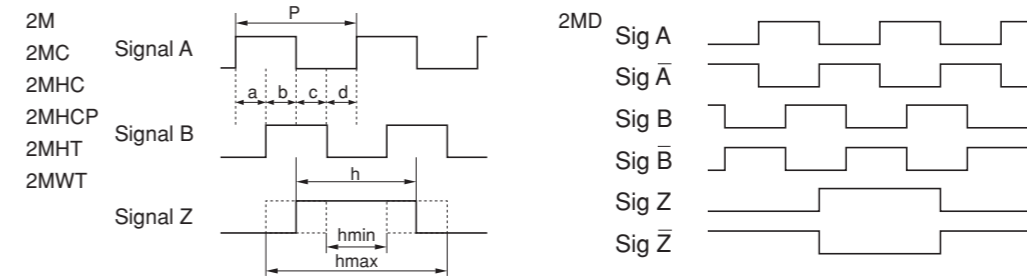
CW → Rotating Toward Clockwise Viewed from an Arrow

$P = \frac{1}{\text{Resolution}}$

$a, b, c, d = \frac{P}{4} \pm \frac{P}{8} \quad \frac{P}{2} \leq h \leq \frac{3P}{2}$

Wave Ratio (Duty); 50 ± 25 (%)

Rising point of A-Signal is always at one point while Z-Signal is at H-Level in CW.



Electrical Connections

Color	Signal	Color	Signal
Red	Power Supply(Vcc)	White	Signal B
Black	0V	Gray	Signal B̄
Green or Blue	Signal A	Yellow	Signal Z
White	Signal B	Orange	Signal Z̄
Yellow	Signal Z		
Shield	NC		

Mechanical Spec

Starting Torque	9.8×10 <sup>-4</sup> N · m Max	
Angular Acceleration	1×10 <sup>5</sup> rad/s <sup>2</sup>	
Shaft Loading	Thrust	49N
	Radial	78.4N
Moment of Inertia	3×10 <sup>-6</sup> kg · m <sup>2</sup>	
Maximum Permissible Speed	5000min <sup>-1</sup>	
Net Weight	200g Max	

Environmental Spec

Operating Temperature	-10°C~+70°C
Storage Temperature	-30°C ~ +85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	980m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

SHAFT TYPE

NOC-SP Model



Heavy Duty Model 50mm Diameter Encoder (IP65)

•Standard Versions of 10~10000P/R for High Accurate Application.



Model NOC-SP -2M - - - - E

Style  
S: Shaft  
P: Dust-Proof & Water-Proof

Resolution	10	20	30	40	50	60	100	200	250	300	360	500
	10P/R	20P/R	30P/R	40P/R	50P/R	60P/R	100P/R	200P/R	250P/R	300P/R	360P/R	500P/R
	600	1000	1024	1250	1800	2000	2048	2500	3600	4096	5000	10000
	600P/R	1000P/R	1024P/R	1250P/R	1800P/R	2000P/R	2048P/R	2500P/R	3600P/R	4096P/R	5000P/R	10000P/R

\*10000 P/R(Line Driver Only)

Cable Length  
050 : 500mm (Standard)  
100 : 1000mm  
300 : 3000mm

Outer diameter shaft  
8 : φ8  
\*(9525 : φ9.525)  
\*(10 : φ10)  
\* Option

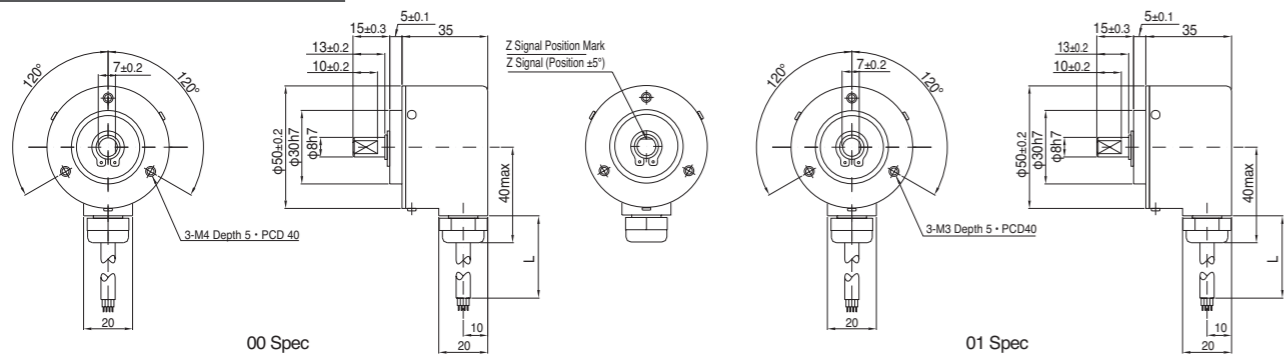
Complying with RoHS  
00 : PCD40 3-M4 Depth 5  
01 : PCD40 3-M3 Depth 5

Output Mode  
No Indication : Voltage Output  
C : Open Collector Output  
HC : Open Collector Output / High Voltage  
HCP : PNP Mode Open Collector Output / High Voltage  
HT : Push-Pull Output / High Voltage  
D : Line Driver Output Standard C-MOS  
WT : Push-Pull Output / Wide Voltage

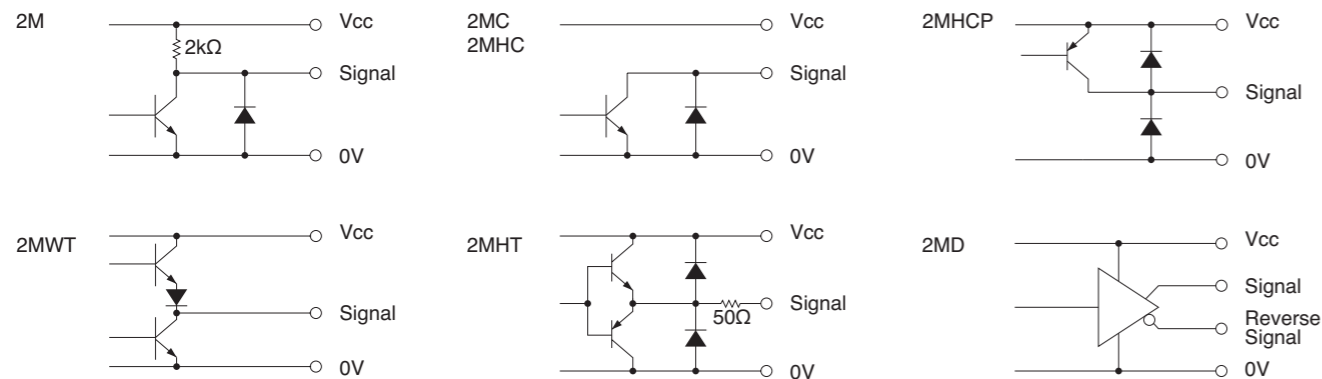
No Indication : Other than D output  
C : D output with LS  
C : D output with C-MOS

Signals 2M : AB90° Phase Difference + Index Signal

External Dimension



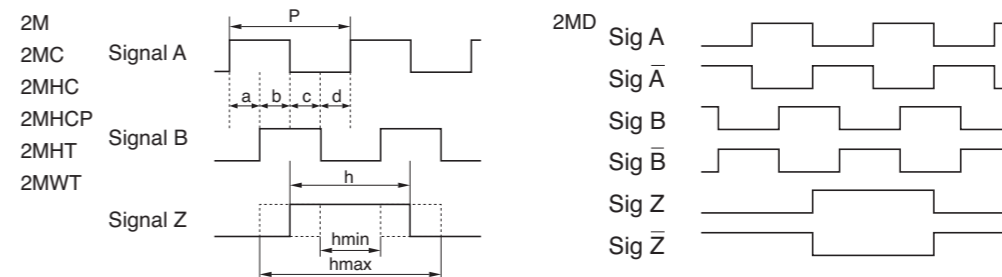
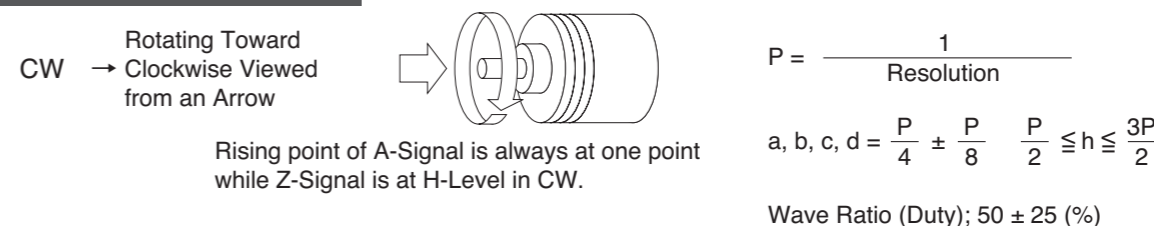
Output Circuit



Electrical Spec

TYPE	*1) at Maximum Sink Current				*2) Maximum Source Current		
	2M	2MC	2MHC	2MHCP	2MHT	2MD	2MWT
Power Supply(Vcc)	DC4.5~13.2 V			DC10.8~26.4 V		DC4.5~5.5V (C-MOS)	DC 4.75~30V
Current Consumption	90 mA Max	70 mA Max		100 mA Max	90 mA Max	70 mA Max (C-MOS)	60 mA Max
Output Voltage	"H"	Vcc-1V Min	Vcc-1V Min		Vcc-3V Min	2.5 V Min	Vcc-2.5V Min
	"L" *1	0.5 V Max			3 V Max	0.5 V Max	0.4 V Max
Maximum Sink Current	20 mA				40 mA	20 mA	30 mA
Rise & Fall Time	1 μs Max					200 ns Max	3 μs Max
Maximum Frequency Response	200 kHz			50 kHz	200 kHz (~5000P/R) 1 MHz (10000P/R)		100 kHz
Withstanding Voltage of Output Tr.	50 V Max						

Wave Form



Electrical Connections

Model	Color	Signal	Color	Signal
2M	Red	Power Supply(Vcc)		
2MC	Black	0V		
2MHC	Green or Blue	Signal A		
2MHCP	White	Signal B		
2MHT	Yellow	Signal Z		
2MWT	Shield	NC		
2MD	Red	Power Supply(Vcc)	White	Signal B
	Black	0V	Gray	Signal B
	Green	Signal A	Yellow	Signal Z
	Blue	Signal A	Orange	Signal Z
	Shield	NC		

Mechanical Spec

Starting Torque	9.8X10 <sup>-3</sup> N · m Max
Angular Acceleration	1X10 <sup>5</sup> rad/s <sup>2</sup>
Shaft Loading	Thrust : 49N
	Radial : 78.4N
Moment of Inertia	3X10 <sup>-6</sup> kg · m <sup>2</sup>
Maximum Permissible Speed	Instantaneous : 5000min <sup>-1</sup> Continuous : 3000min <sup>-1</sup>
Net Weight	250g Max

Environmental Spec

Operating Temperature	-10°C~+70°C
Storage Temperature	-30°C~+85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X, Y, Z Each 2h
Shock	980m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65

SHAFT TYPE

OEK Model



Low Pulse Model

- Robust Encoder with Flange.
- Water Drip-Proof Bearing Type



Model

OEK- [ ] - [ ] - [ ] -050-00E

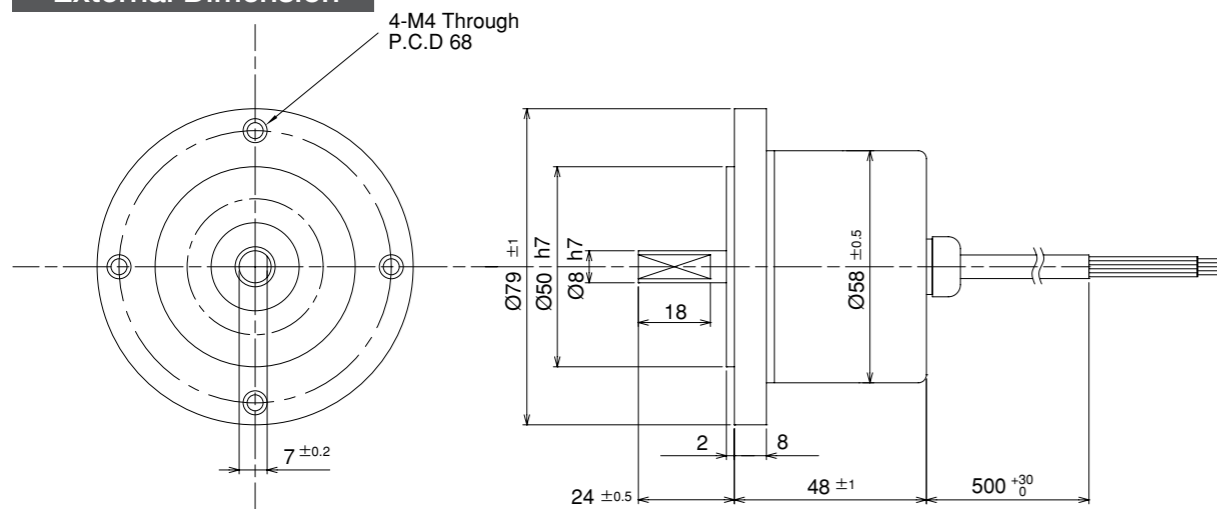
Resolution: [ ]  
 Signals: [ ]  
 Output Mode: [ ]  
 Cable Length 050 : 500mm  
 Complying with RoHS

No Indication : Voltage Output  
 C : Open Collector Output  
 HC : Open Collector Output / High Voltage

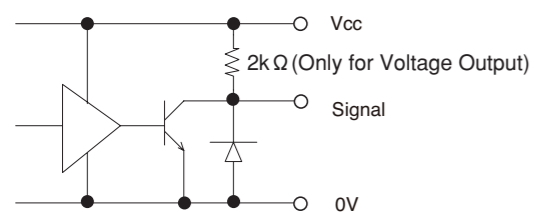
1 : Only A Signal  
 2 : AB90° Phase Difference  
 2M : AB90° Phase Difference + Index Signal

20	20 P/R	60	60 P/R	200	200 P/R	360	360 P/R
50	50 P/R	100	100 P/R	300	300 P/R	-	-

External Dimension



Output Circuit

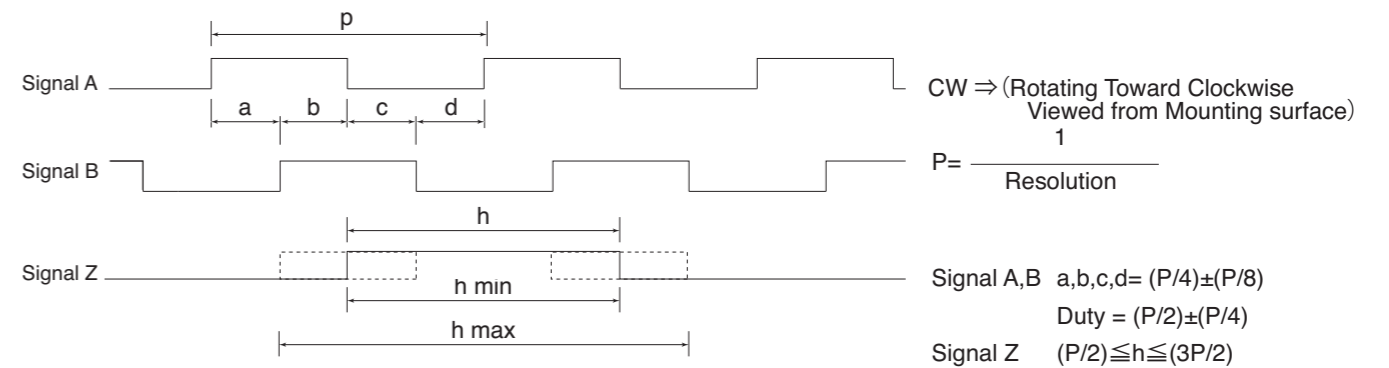


Electrical Spec

TYPE	1	2	2M	1C	2C	2MC	1HC	2HC	2MHC
Power Supply(Vcc)	DC4.5~13.2 V						DC10.8~26.4 V		
Current Consumption	80 mA Max			60 mA Max					
Output Voltage	“H”		Vcc-1V Min			—			
	“L” ※1		0.5 V Max						
Maximum Sink Current	20 mA								
Rise & Fall Time	1 μs Max								
Maximum Frequency Response	200 kHz								
Withstanding Voltage of Output Tr.	—						50 V Max		

※1) at Maximum Sink Current

Wave Form



Electrical Connections

Color	Signal
Red	Power Supply(Vcc)
Black	0V
Green or Blue	Signal A
White	Signal B
Yellow	Signal Z
Shield	NC

Mechanical Spec

Starting Torque	19.6x10 <sup>-3</sup> N · m Max	
Angular Acceleration	1x10 <sup>5</sup> rad/s <sup>2</sup>	
Shaft Loading	Thrust	29.4N
	Radial	49N
Moment of Inertia	4x10 <sup>-6</sup> kg · m <sup>2</sup>	
Maximum Permissible Speed	6000min <sup>-1</sup>	
Net Weight	500g Max	

Environmental Spec

Operating Temperature	-10°C~+70°C
Storage Temperature	-30°C~+80°C
Humidity	RH 85% Max No Condensation
Vibration	10~55Hz / 1.5mm X, Y, Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times

SHAFT TYPE

OPN Model



Heavy Duty Model

- Heavy-Duty Type.
- Easy Mounting (with Flange Type).



Model

OPN - [ ] - 2M [ ] - [ ] -000-00E

Resolution	
002	20P/R 1024 1024P/R
005	50P/R 1250 1250P/R
006	60P/R 18 1800P/R
01	100P/R 20 2000P/R
02	200P/R 2048 2048P/R
03	300P/R 25 2500P/R
036	360P/R 36 3600P/R
05	500P/R 4096 4096P/R
06	600P/R 50 5000P/R
10	1000P/R

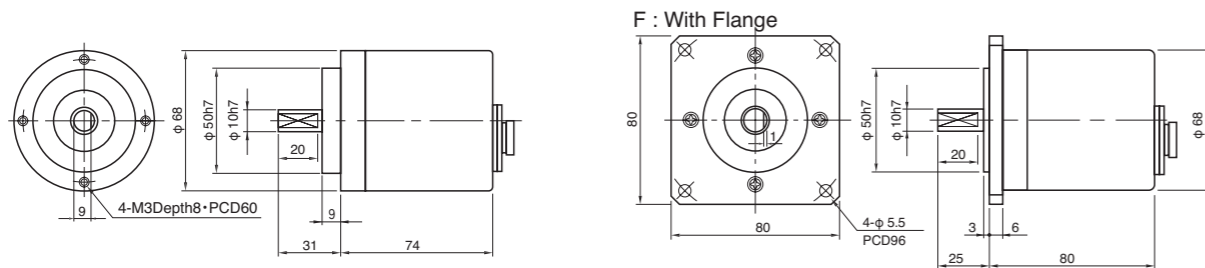
Output Mode  
 No Indication: Voltage Output  
 C : Open Collector Output  
 HC : Open Collector Output / High Voltage

Flange Style  
 0 : No Flange  
 F : With Flange

Signals — 2M : AB90° Phase Difference + Index Signal

Complying with RoHS

External Dimension



Output Circuit

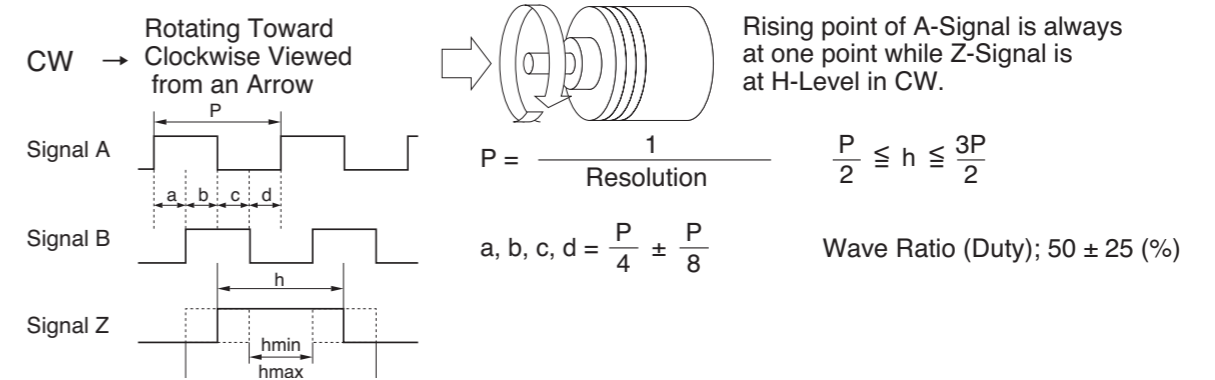


Electrical Spec

TYPE		2M	2MC	2MHC
Power Supply(Vcc)		DC4.5 ~ 13.2V		DC 10.8 ~ 26.4V
Current Consumption		90 mA Max	70 mA Max	
Output Voltage	"H"	Vcc-1V Min	—	
	"L" *1	0.5 V Max		
Maximum Sink Current		30 mA		
Rise & Fall Time		1 μs Max		
Maximum Frequency Response		200 kHz		
Withstanding Voltage of Output Tr.		50 V Max		

\*1) at Maximum Sink Current

Wave Form



Electrical Connections

Receptacle Sanwa Connector Ltd. SCK-2007

Pin#	Signal	Pin#	Signal
1	Power Supply(Vcc)	6	0V
2	F, G	7	0V
3	Signal Z		
4	Signal B		
5	Signal A		

Mechanical Spec

Starting Torque	19.6x10 <sup>-3</sup> N · m Max
Angular Acceleration	1x10 <sup>5</sup> rad/s <sup>2</sup>
Shaft Loading	Thrust 39.2N
	Radial 78.4N
Moment of Inertia	6x10 <sup>-6</sup> kg · m <sup>2</sup>
Maximum Permissible Speed	5000min <sup>-1</sup>
Net Weight	700g Max

Environmental Spec

Operating Temperature	-10°C~+70°C
Storage Temperature	-30°C~+80°C
Humidity	RH 85% Max No Condensation
Vibration	10~55Hz/1.5mm X, Y, Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP54

# SHAFT TYPE

# NE Model



## Super Heavy Duty Model

- Durable for Heavy Shaft Loading.
- Up to 5000 P/R.



### Model

# NE- [ ] [ ] -2MD- [ ] [ ] [ ] [ ] - [ ] [ ] E

Resolution

002	20P/R	1024	1024P/R
005	50P/R	1250	1250P/R
006	60P/R	18	1800P/R
01	100P/R	20	2000P/R
02	200P/R	2048	2048P/R
03	300P/R	25	2500P/R
036	360P/R	36	3600P/R
05	500P/R	4096	4096P/R
06	600P/R	50	5000P/R
10	1000P/R		

Complying with RoHS

- 00 : 5000min<sup>-1</sup>Spec,IP54,Without additional Connector
- 01 : 5000min<sup>-1</sup>Spec,IP54,With additional Connector\*
- 04 : 9000min<sup>-1</sup>Spec,IP54,With additional Connector\*
- 05 : 9000min<sup>-1</sup>Spec,IP54,Without additional Connector
- 08 : 10000min<sup>-1</sup>Spec,IP66,Without additional Connector
- 09 : 10000min<sup>-1</sup>Spec,IP66,With additional Connector\*

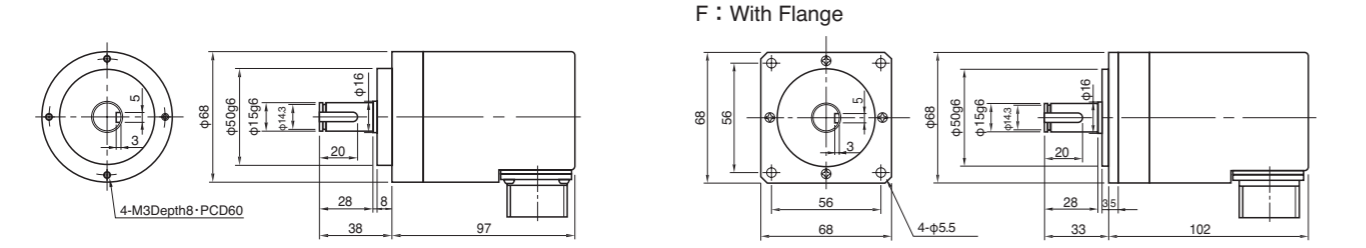
\*With Connector  
 Plug :D/M3106B20-29S(DDK or its equivalent) 1piece  
 Cable Clamp:D/M3057-12A (DDK or its equivalent) 1piece

Flange Style — 0 : No Flange  
 F : With Flange

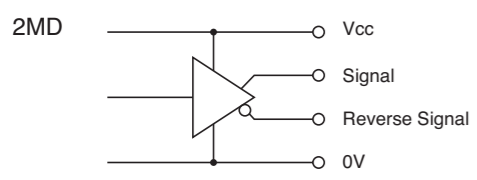
Output Mode — D : Line Driver Output

Signals — 2M : AB90° Phase Difference + Index Signal

### External Dimension



### Output Circuit



### Electrical Spec

TYPE		2MD
Power Supply(Vcc)		DC4.75~5.25V
Current Consumption		150 mA Max
Output Voltage	"H"	2.4 V Min
	"L" *1	0.5 V Max
Maximum Sink Current		40 mA
Rise & Fall Time		200 ns Max
Maximum Frequency Response		200 kHz

\*1) at Maximum Sink Current

### Wave Form

CW → Rotating Toward Clockwise Viewed from an Arrow

Rising point of A-Signal is always at one point while Z-Signal is at H-Level in CW.

Signal A

Signal B

Signal Z

$P = \frac{1}{\text{Resolution}}$

$a, b, c, d = \frac{P}{4} \pm \frac{P}{8} \quad \frac{P}{2} \leq h \leq \frac{3P}{2}$

Wave Ratio (Duty);  $50 \pm 25 (\%)$

\*2MD has reverse signal of Signal A,B,Z.

### Electrical Connections

Receptacle D/MS3102A20-29P( DDK or its equivalent)

Pin#	Signal	Pin#	Signal
A	Signal A	K	0V
B	Signal Z	N	Signal $\bar{A}$
C	Signal B	P	Signal $\bar{Z}$
E	F.G	R	Signal $\bar{B}$
H	Power Supply(Vcc)		

### Mechanical Spec

( ) Option

Starting Torque	9.8x10 <sup>-2</sup> N · m Max	
Angular Acceleration	2x10 <sup>5</sup> rad/s <sup>2</sup>	
Shaft Loading	Thrust	49N
	Radial	98N
Moment of Inertia	1.7x10 <sup>-5</sup> kg · m <sup>2</sup>	
Maximum Permissible Speed	5000min <sup>-1</sup> (9000min <sup>-1</sup> , 10000min <sup>-1</sup> )	
Net Weight	1kg Max(Without Flange)	

### Environmental Spec

( ) Option

Operating Temperature	-5°C~+60°C
Storage Temperature	-30°C~+80°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X, Y, Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP54(IP66) Plug In

# Incremental Hollow Type Encoder

## Hollow Shaft Encoder

38H.....	44
38HG .....	46
HEF .....	48
NOC-H.....	50
NOC-HP .....	52

## Built-in Encoder

SBY .....	54
SBH.....	56

## Modular Encoder

18M .....	58
38M .....	60

**HOLLOW TYPE**

**38H Model**

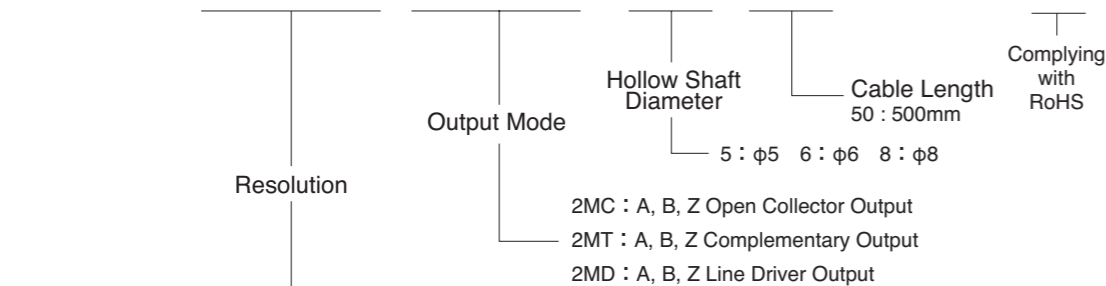


**Small Standard Model**

•Wide Range of Resolution from 100 to 4096 P/R.

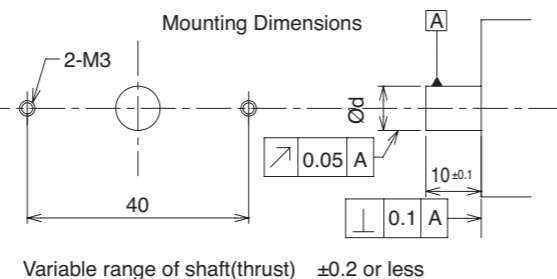
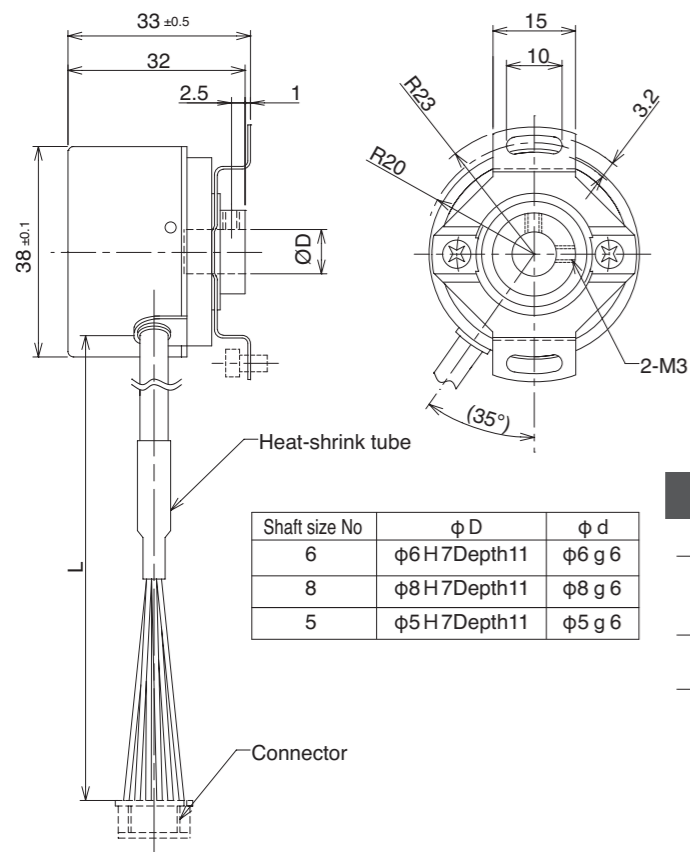


**Model**  
**38H- [ ] - [ ] - [ ] -50-B00E**

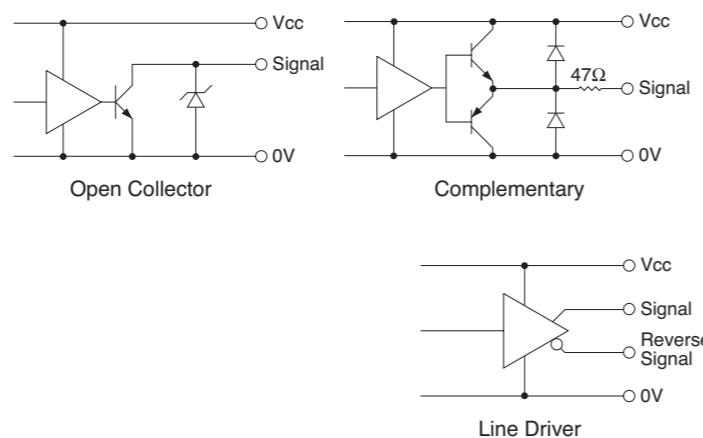


100	100P/R	360	360P/R	600	600 P/R	2000	2000 P/R	4000	4000 P/R
200	200P/R	400	400P/R	800	800 P/R	2048	2048 P/R	4096	4096 P/R
250	250P/R	500	500P/R	1000	1000 P/R	2500	2500 P/R	-	-
300	300P/R	512	512P/R	1024	1024 P/R	3600	3600 P/R	-	-

**External Dimension**



**Output Circuit**

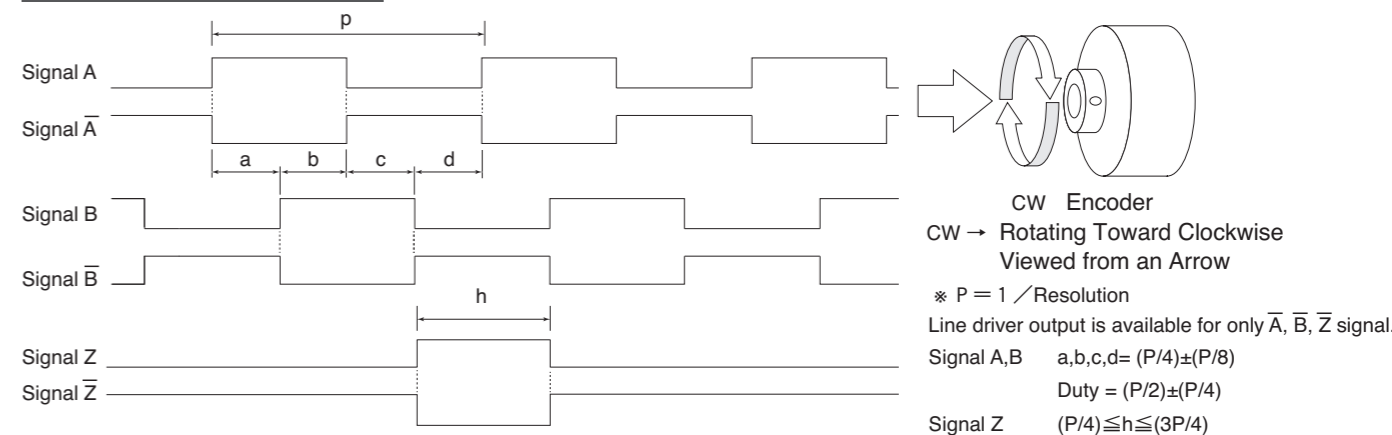


**Electrical Spec**

TYPE	2MC	2MT	2MD
Power Supply(Vcc)	DC 4.5 to 30V (Ripple 3% or less (P-P))		DC 4.5 to 13.2V (Ripple 3% or Less (P-P))
Current Consumption	30mA Max	60mA Max	30mA Max
Output Voltage	"H"	-	Vcc -3V Min
	"L" *1	0.5V Max	3V Max
Maximum Sink Current	40mA		20mA
Maximum Frequency Response	1024P/R or less	120kHz	
	2000P/R or more	240kHz	
Rise & Fall Time	1μs Max	200ns Max	100ns Max

\*1) at Maximum Sink Current

**Wave Form**



**Electrical Connections**

Connector Hirose Electric Co., Ltd. DF3-6S-2C

Open Collector • Complementary		
1	Red	Vcc
2	Black	0 V
3	Blue	Sig A
4	White	Sig B
5	Yellow	Sig Z
6	Shield	N.C

Connector Hirose Electric Co., Ltd. DF3-9S-2C

Line Driver		
1	Red	Vcc
2	Black	0 V
3	Green	Sig A
4	Blue	Sig A-bar
5	White	Sig B
6	Gray	Sig B-bar
7	Yellow	Sig Z
8	Orange	Sig Z-bar
9	Shield	N.C

**Mechanical Spec**

Starting Torque	0.98x10 <sup>-3</sup> N·m Max	
Angular Acceleration	1x10 <sup>5</sup> rad/s <sup>2</sup>	
Shaft Loading	Thrust	9.8N
	Radial	29.4N
Moment of Inertia	8x10 <sup>-7</sup> kg·m <sup>2</sup>	
Maximum Permissible Speed	6000min <sup>-1</sup>	
Net Weight	120g Max (Without Cable)	

**Environmental Spec**

Operating Temperature	-10°C~+85°C
Storage Temperature	-30°C~+85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> ,11ms X, Y, Z Each 3 times
Ingress Protection	IP50



HOLLOW TYPE

Small & Short delivery Model

38HG Model



• Compact Sized Encoder with OD38mm x L33mm.

Model **38HG- [ ] - [ ] - 8 - 50 - N [ ] [ ] E**



Resolution	500	500P/R	1000	1000P/R	1024	1024P/R	1800	1800P/R	2000	2000P/R	2048	2048P/R
Signal A,B,Z	500	500P/R	1000	1000P/R	1024	1024P/R	1800	1800P/R	2000	2000P/R	2048	2048P/R
Signal A,B	100	100P/R	200	200P/R	300	300P/R	360	360P/R	400	400P/R	600	600P/R

Output Mode: V: Voltage Output, C: Open Collector Output, D: Line Driver Output

Signals: 2: Signal A,B, 2M: Signal A,B,Z

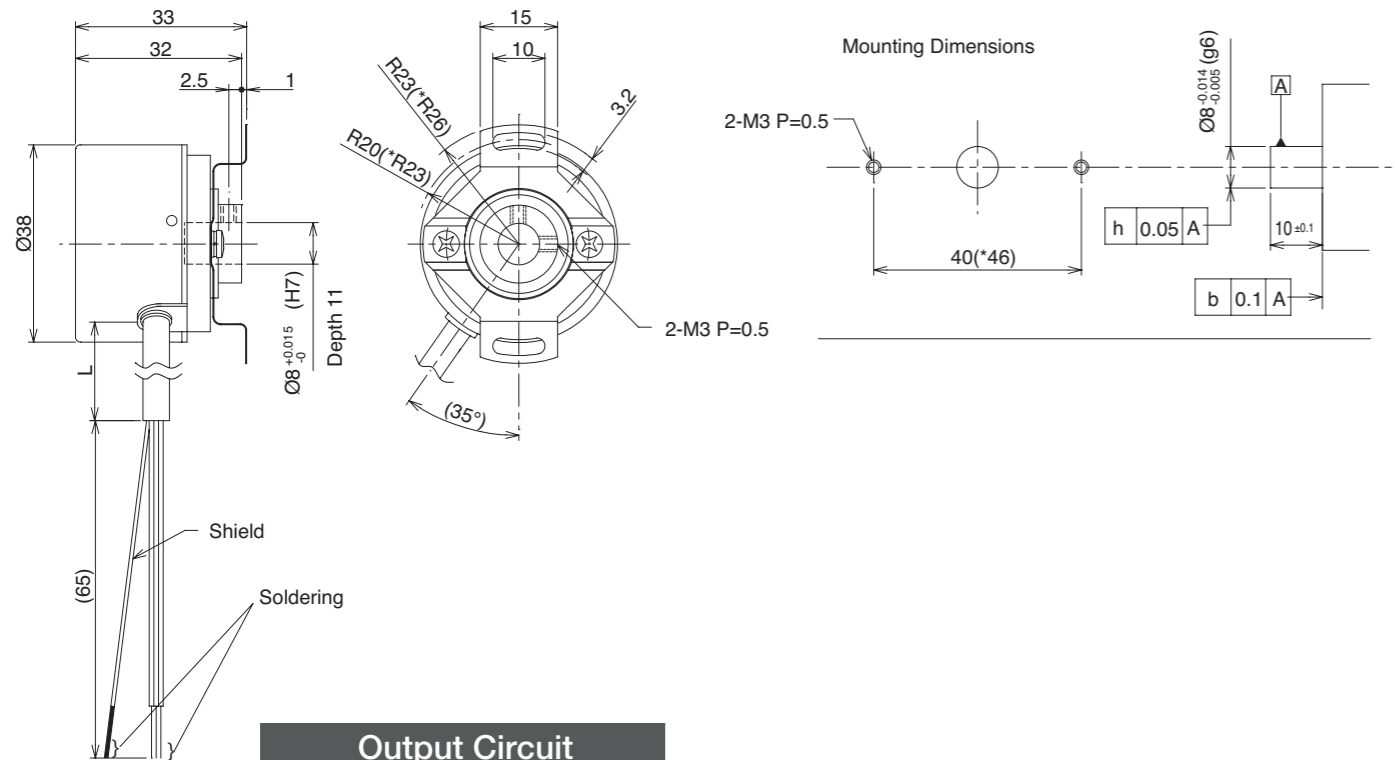
Cable Length: 50: 500mm

Hollow Shaft Diameter: 8: φ8

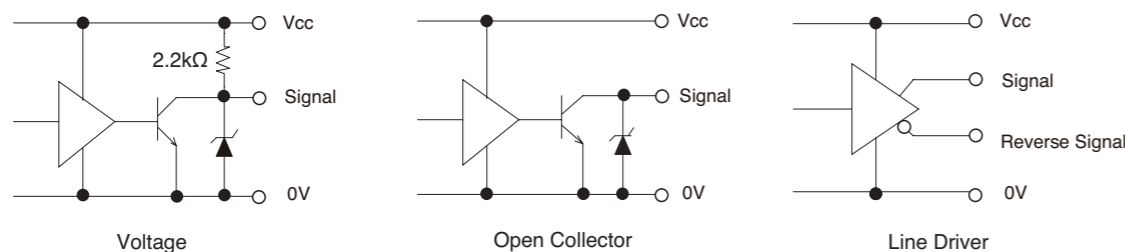
Mounting: 00: PCD40mm, 01: PCD46mm

Complying with RoHS

External Dimension



Output Circuit

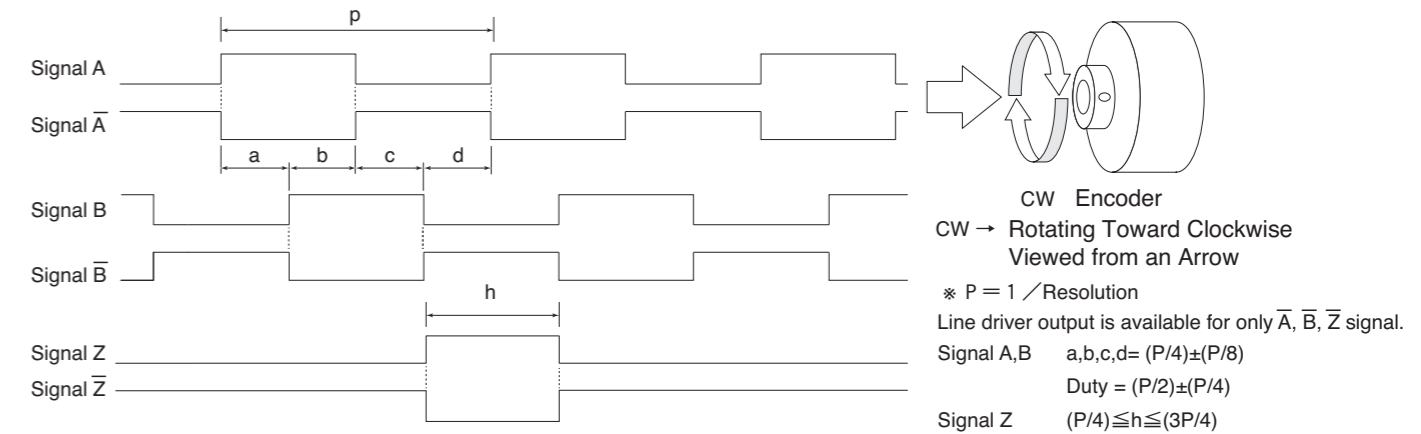


Electrical Spec

TYPE	2V 2MV	2C 2MC	2D 2MD
Power Supply(Vcc)	DC 3.35V to 13.2V (Ripple 3% or less (P-P))	DC 3.35V to 34.5V (Ripple 3% or less (P-P))	DC 3.35V to 5.25V (Ripple 3% or less (P-P))
Current Consumption	400mA Max		
Output Voltage	"H"	Vcc-1V Min	2.5V Min
	"L" *1	0.4V Max	
Maximum Sink Current	20mA	35mA	20mA
Maximum Frequency Response	120kHz		
Rise & Fall Time	1μs Max (sink current 10mA / cable length 2m)	1μs Max (load 1kΩ / cable length 2m)	100ns Max (current ±20mA)

\*1) at Maximum Sink Current

Wave Form



Electrical Connections

Voltage / Open Collector		Line Driver	
Red	Vcc	Red	Vcc
Black	0 V	Black	0 V
Blue	Sig A	Green	Sig A
White	Sig B	Blue	Sig $\bar{A}$
Yellow	Sig Z	White	Sig B
Shield	N.C	Gray	Sig $\bar{B}$
		Yellow	Sig Z
		Orange	Sig $\bar{Z}$
		Shield	N.C

Mechanical Spec

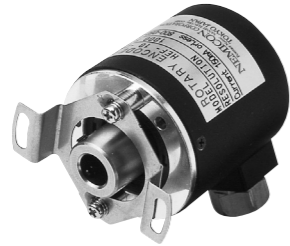
Starting Torque	0.98x10 <sup>-3</sup> N · m Max
Angular Acceleration	1x10 <sup>5</sup> rad/s <sup>2</sup>
Shaft Loading	Thrust 9.8N
	Radial 29.4N
Moment of Inertia	1x10 <sup>-6</sup> kg · m <sup>2</sup>
Maximum Permissible Speed	6000min <sup>-1</sup>
Net Weight	120g Max (Without Cable)

Environmental Spec

Operating Temperature	-10°C ~ +85°C
Storage Temperature	-30°C ~ +85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X, Y, Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

**HOLLOW TYPE**

**HEF Model**



**Heavy Duty 39mm Diameter Encoder**

•Most Advanced IP65 Encoder.



**Model**  
**HEF- [ ] - 2M [ ] - [ ] - [ ] - [ ] - 00E**

Resolution				Hollow Shaft Diameter		Cable Length		Complying with RoHS	
002	20P/R	05	500P/R	500	φ5	050	500mm (Standard)	No Indication	Other than D output
003	30P/R	0512	512P/R	600	φ6	100	1000mm	No Indication	D output with LS
0032	32P/R	06	600P/R	635	φ6.35	300	3000mm	C	D output with C-MOS
004	40P/R	08	800P/R	800	φ8				
005	50P/R	09	900P/R	9525	φ9.525				
006	60P/R	10	1000P/R						
01	100P/R	1024	1024P/R						
0125	125P/R	12	1200P/R						
02	200P/R	15	1500P/R						
025	250P/R	18	1800P/R						
0256	256P/R	20	2000P/R						
03	300P/R	2048	2048P/R						
036	360P/R	25	2500P/R						
04	400P/R	36	3600P/R						

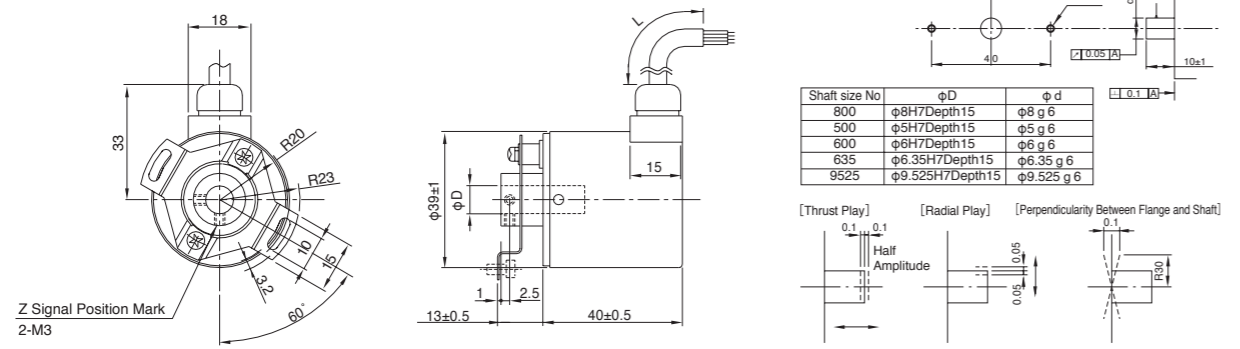
  

Output Mode	Description
No Indication	: Voltage Output
C	: Open Collector Output
HC	: Open Collector Output / High Voltage
HCP	: PNP Mode Open Collector Output / High Voltage
HT	: Push-Pull Output / High Voltage
D	: Line Driver Output

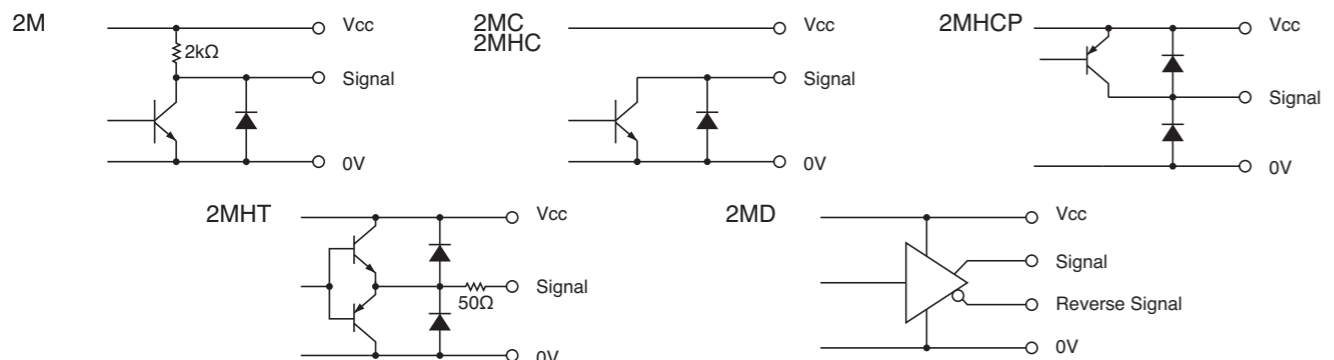
Low Power Consumption C-MOS Output Available

Signals — 2M : AB90° Phase Difference + Index Signal

**External Dimension**



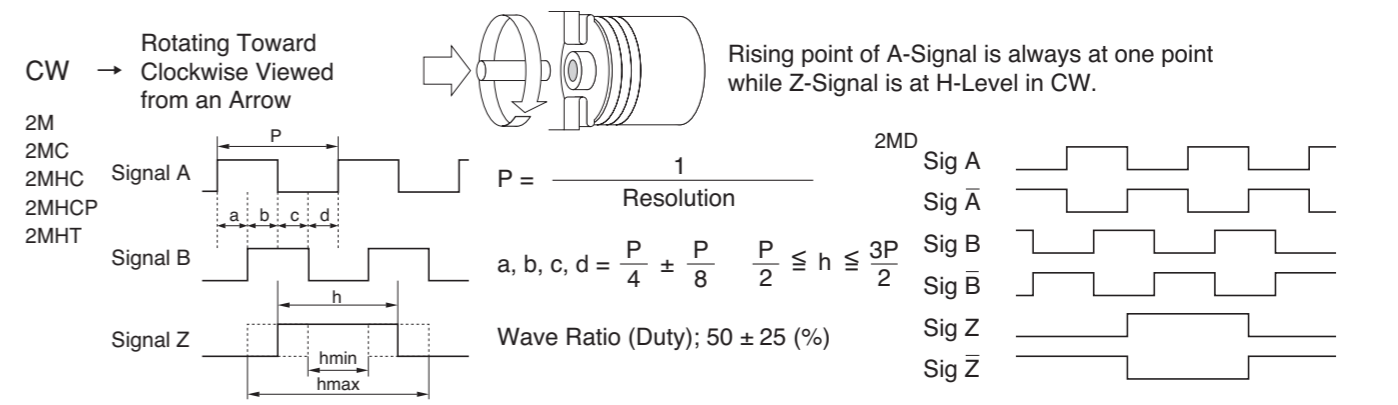
**Output Circuit**



**Electrical Spec**

		※1) at Maximum Sink Current		※2) Maximum Source Current		
TYPE	2M	2MC	2MHC	2MHCP	2MHT	2MD
Power Supply(Vcc)	DC4.5~13.2 V			DC10.8~26.4 V		DC4.75~5.25V
Current Consumption	80 mA Max	60 mA Max		100 mA Max	60 mA Max	150 mA Max
Output Voltage	"H"	Vcc-1V Min	—————		Vcc-1V Min ※2	Vcc-3V Min
	"L" ※1	0.5 V Max			—————	3 V Max
Maximum Sink Current	20 mA			40 mA		20 mA
Rise & Fall Time	1 μs Max					200 ns Max
Maximum Frequency Response	200 kHz			50 kHz	200 kHz	
Withstanding Voltage of Output Tr.	—————		50 V Max.		—————	

**Wave Form**



**Electrical Connections**

Color	Signal	Color	Signal
Red	Power Supply(Vcc)	White	Signal B
Black	0V	Gray	Signal B̄
Green or Blue	Signal A	Yellow	Signal Z
White	Signal B	Orange	Signal Z̄
Yellow	Signal Z		
Shield	NC		

**Mechanical Spec**

Starting Torque	4.9x10 <sup>-3</sup> N · m Max
Angular Acceleration	1x10 <sup>5</sup> rad/s <sup>2</sup>
Shaft Loading	Thrust: 9.8N
	Radial: 19.6N
Moment of Inertia	1.2x10 <sup>-6</sup> kg · m <sup>2</sup>
Maximum Permissible Speed	5000min <sup>-1</sup>
Net Weight	300g Max

**Environmental Spec**

Operating Temperature	-10°C~+70°C
Storage Temperature	-30°C~+80°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	294m/s <sup>2</sup> ,11ms X, Y, Z Each 3 times
Ingress Protection	IP65

HOLLOW TYPE

NOC-H Model



Standard Model of 50mm Diameter Encoder

•Standard Versions of 10~5000 P/R.



Model

NOC-H -2M - 00E

Style Resolution Output Mode Hollow Shaft Diameter Cable Length Complying with RoHS

H : Hollow Shaft

10	10P/R	600	600P/R
20	20P/R	1000	1000P/R
30	30P/R	1024	1024P/R
40	40P/R	1250	1250P/R
50	50P/R	1800	1800P/R
60	60P/R	2000	2000P/R
100	100P/R	2048	2048P/R
200	200P/R	2500	2500P/R
250	250P/R	3600	3600P/R
300	300P/R	4096	4096P/R
360	360P/R	5000	5000P/R
500	500P/R		

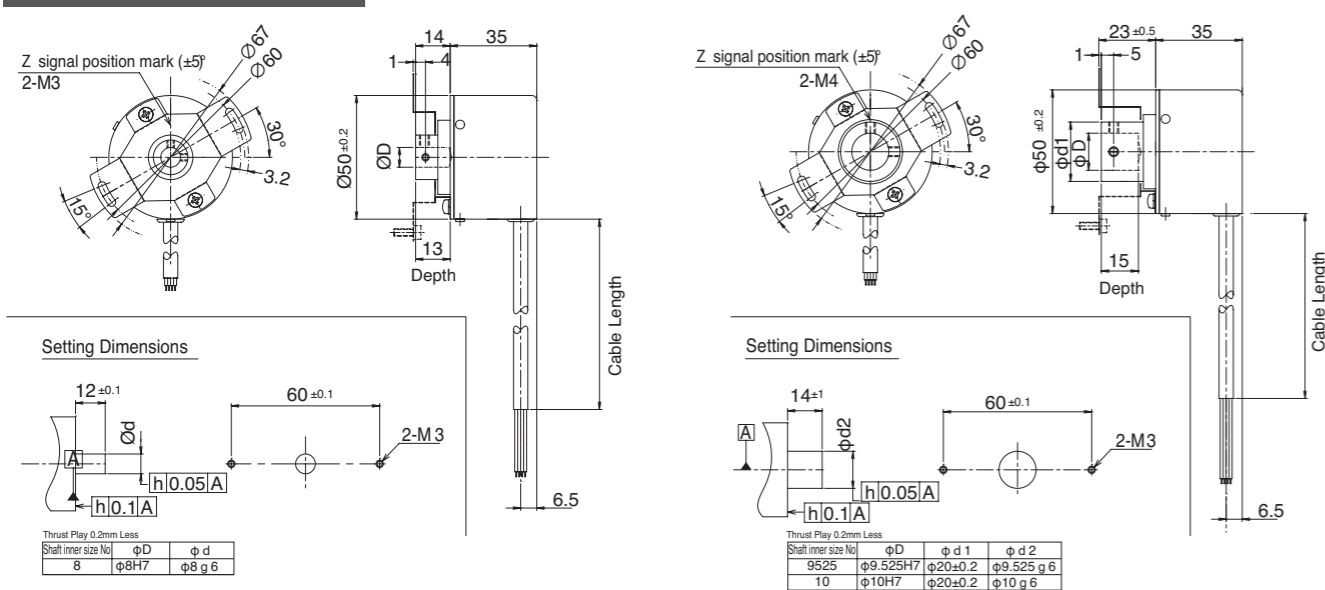
Hollow Shaft Diameter: 8 : φ 8, \*9525 : φ 9.525, 10 : φ 10, \* Option

Cable Length: 050 : 500mm (Standard), 100 : 1000mm, 300 : 3000mm

Output Mode: No Indication : Voltage Output, C : Open Collector Output, HC : Open Collector Output / High Voltage, HCP : PNP Mode Open Collector Output / High Voltage, HT : Push-Pull Output / High Voltage, D : Line Driver Output, WT : Push-Pull Output / Wide Voltage(10~2500P/R)

Signals: 2M : AB90° Phase Difference + Index Signal

External Dimension



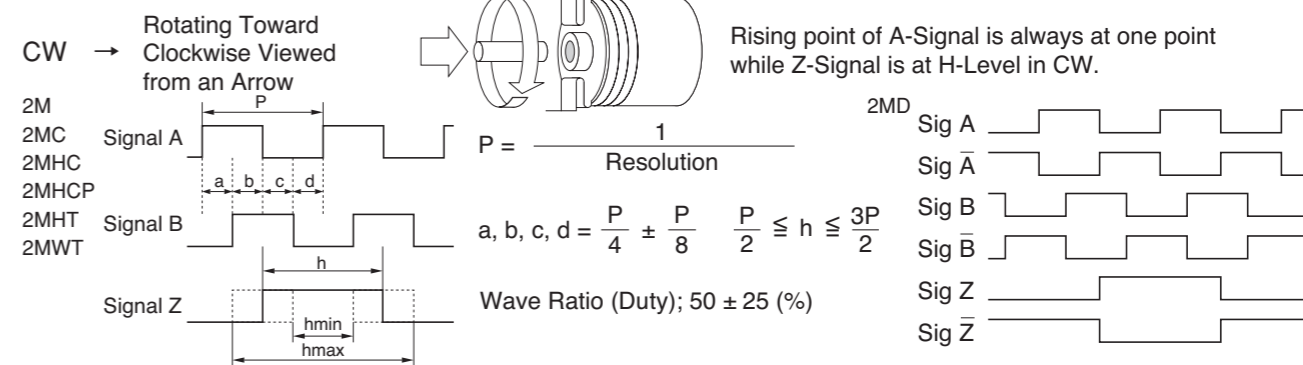
Electrical Connections

2M	Color	Signal	2MD	Color	Signal	Color	Signal
2MC	Red	Power Supply(Vcc)	Red	Red	Power Supply(Vcc)	White	Signal B
2MHC	Black	0V	Black	Black	0V	Gray	Signal B
2MHCP	Green or Blue	Signal A	Green	Green	Signal A	Yellow	Signal Z
2MHT	White	Signal B	Blue	Blue	Signal A	Orange	Signal Z
2MWT	Yellow	Signal Z	Shield	Shield	F·G		
	Shield	F·G					

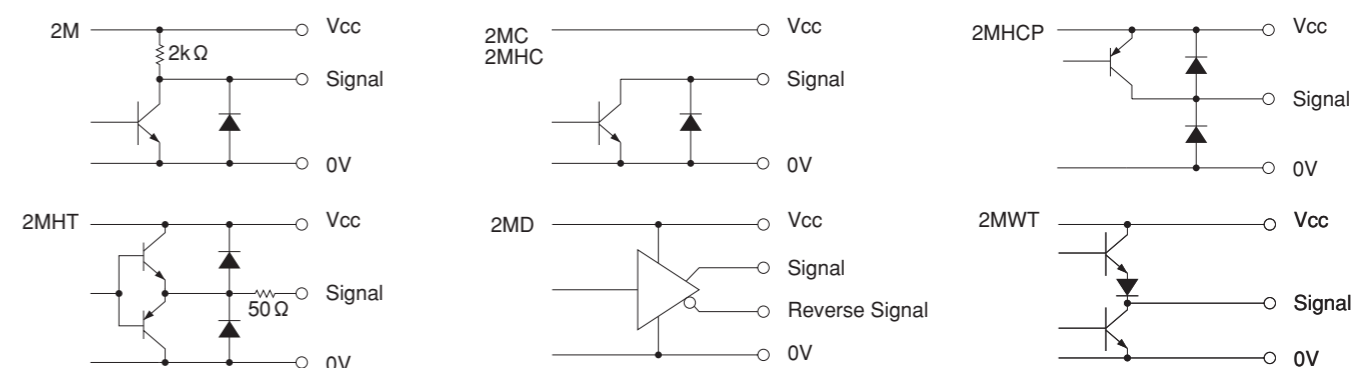
Electrical Spec

TYPE	2M		2MC		2MHC		2MHCP		2MHT		2MD		2MWT	
	DC4.5~13.2 V		DC10.8 ~ 26.4 V		DC4.5~5.5V (C-MOS)		DC 4.75~30V							
Power Supply(Vcc)	90 mA Max		70 mA Max		100 mAMax		90 mA Max		70 mA Max (C-MOS)		60 mA Max			
Current Consumption	Vcc-1V Min		Vcc-1V Min		Vcc-1V Min		Vcc-3V Min		2.5 V Min		Vcc-2.5V Min			
Output Voltage	"H" : Vcc-1V Min		"L" : 0.5 V Max		"H" : Vcc-1V Min		"L" : 3 V Max		2.5 V Min		0.5 V Max		0.4 V Max	
Maximum Sink Current	20 mA		40 mA		20 mA		30 mA							
Rise & Fall Time	1 μs Max		200 ns Max		3 μs Max									
Maximum Frequency Response	200 kHz		50 kHz		200 kHz		100 kHz							
Withstanding Voltage of Output Tr.	50 V Max													

Wave Form



Output Circuit



Mechanical Spec

Starting Torque	9.8x10 <sup>-4</sup> N · m Max
Angular Acceleration	1x10 <sup>5</sup> rad/s <sup>2</sup>
Shaft Loading	Thrust: 49N, Radial: 78.4N
Moment of Inertia	3x10 <sup>-6</sup> kg · m <sup>2</sup>
Maximum Permissible Speed	5000min <sup>-1</sup>
Net Weight	200g Max

Environmental Spec

Operating Temperature	-10°C~+70°C
Storage Temperature	-30°C~+85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	980m/s <sup>2</sup> ,11ms X, Y, Z Each 3 times
Ingress Protection	IP50

HOLLOW TYPE

NOC-HP Model



**Heavy Duty Model 50mm Diameter Encoder (IP65)**  
 -Standard Versions of 10~10000 P/R, for High Accurate Application.



Model **NOC-HP** [ ] - **2M** [ ] - [ ] [ ] [ ] [ ] - **00E**

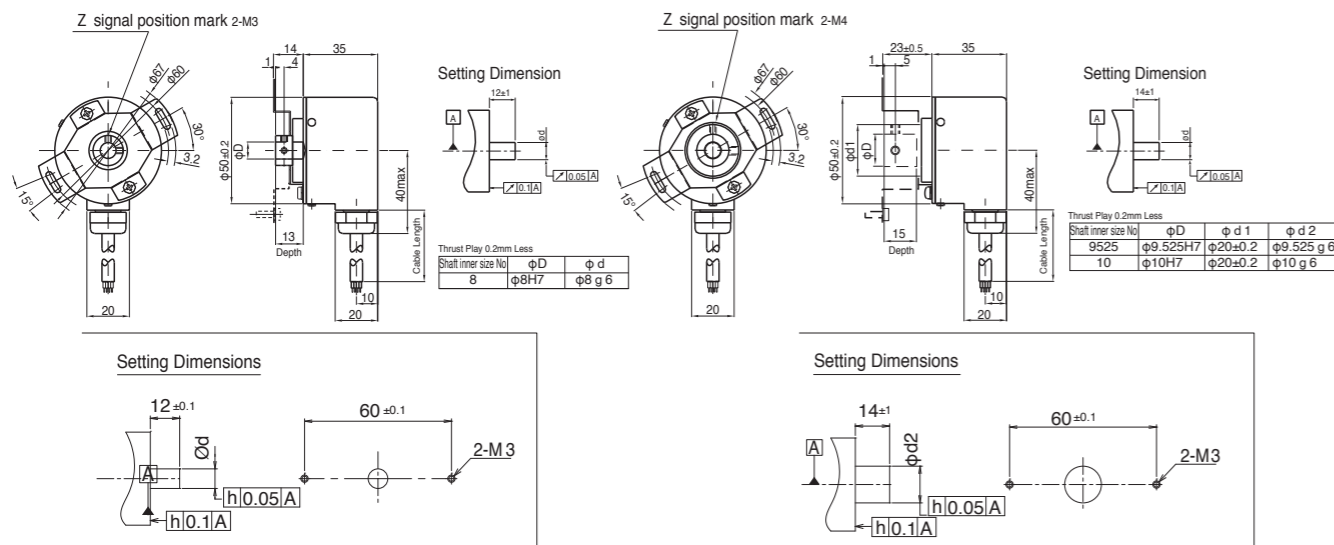
Style	Resolution	Output Mode	Hollow Shaft Diameter	Cable Length	Complying with RoHS		
H: Hollow Shaft P: Dust-Proof & Water-Proof	10 20 30 40 50 60 100 200 250 300 360 500	10P/R 20P/R 30P/R 40P/R 50P/R 60P/R 100P/R 2048P/R 2500P/R 3600P/R 4096P/R 5000P/R 10000P/R	600 1000 1024 1250 1800 2000 2048 2500 3600 4096 5000 10000	600P/R 1000P/R 1024P/R 1250P/R 1800P/R 2000P/R 2048P/R 2500P/R 3600P/R 4096P/R 5000P/R 10000P/R	8 : φ8 * 9525 : φ9.525 10 : φ10 * Option	050 : 500mm (Standard) 100 : 1000mm 300 : 3000mm	No Indication : Other than D output No Indication : D output with LS C : D output with C-MOS

Output Mode	Description
No Indication	Voltage Output
C	: Open Collector Output
HC	: Open Collector Output / High Voltage
HCP	: PNP Mode Open Collector Output / High Voltage
HT	: Push-Pull Output / High Voltage
D	: Line Driver Output
WT	: Push-Pull Output / Wide Voltage(10~2500P/R)

Signals — 2M: AB90° Phase Difference + Index Signal  
 \*10000 P/R (Line Driver Only)

External Dimension



Electrical Connections

Model	Color	Signal
2M	Red	Power Supply(Vcc)
2MC	Black	0V
2MHC	Green or Blue	Signal A
2MHCP	White	Signal B
2MHT	Yellow	Signal Z
2MWT	Shield	F·G

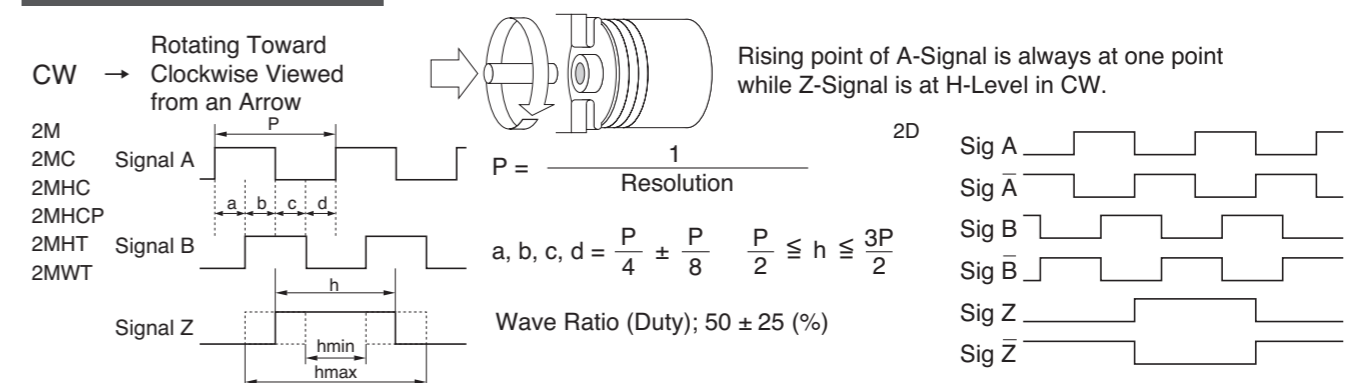
  

Model	Color	Signal	Color	Signal
2M	Red	Power Supply(Vcc)	White	Signal B
2MC	Black	0V	Gray	Signal B
2MHC	Green	Signal A	Yellow	Signal Z
2MHT	Blue	Signal A	Orange	Signal Z
2MWT	Shield	F·G		

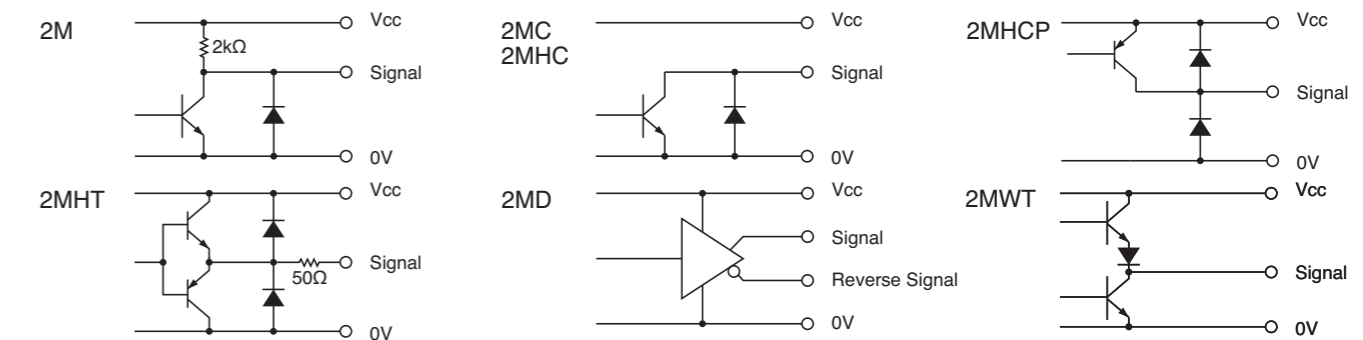
Electrical Spec

TYPE	*1) at Maximum Sink Current				*2) Maximum Source Current		
	2M	2MC	2MHC	2MHCP	2MHT	2MD	2MWT
Power Supply(Vcc)	DC4.5~13.2 V			DC10.8~26.4 V		DC4.5~5.5V (C-MOS)	DC 4.75~30V
Current Consumption	90 mA Max	70 mA Max		100 mA Max	90 mA Max	70 mA Max (C-MOS)	60 mA Max
Output Voltage	"H"	Vcc-1V Min	—————		Vcc-1V Min	Vcc-3V Min	2.5 V Min
	"L" *1	0.5 V Max			—————	3 V Max	0.5 V Max
Maximum Sink Current	20 mA				40 mA	20 mA	30 mA
Rise & Fall Time	1 μs Max					200 ns Max	3 μs Max
Maximum Frequency Response	200 kHz			50 kHz	200 kHz (~5000P/R) 1 MHz (10000P/R)		100 kHz
Withstanding Voltage of Output Tr.	—————			50 V Max		—————	

Wave Form



Output Circuit



Mechanical Spec

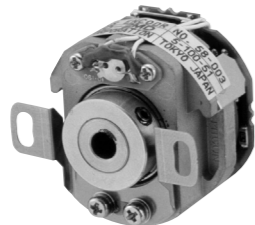
Starting Torque	9.8×10 <sup>-3</sup> N · m Max
Angular Acceleration	1×10 <sup>5</sup> rad/s <sup>2</sup>
Shaft Loading	Thrust 49N
	Radial 78.4N
Moment of Inertia	3×10 <sup>-6</sup> kg · m <sup>2</sup>
Maximum Permissible Speed	Instantaneous : 5000min <sup>-1</sup> Continuous : 3000min <sup>-1</sup>
Net Weight(Without Cable)	250g Max

Environmental Spec

Operating Temperature	-10°C~+70°C
Storage Temperature	-30°C~+85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	980m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65

**BUILT-IN TYPE**

**SBY Model**



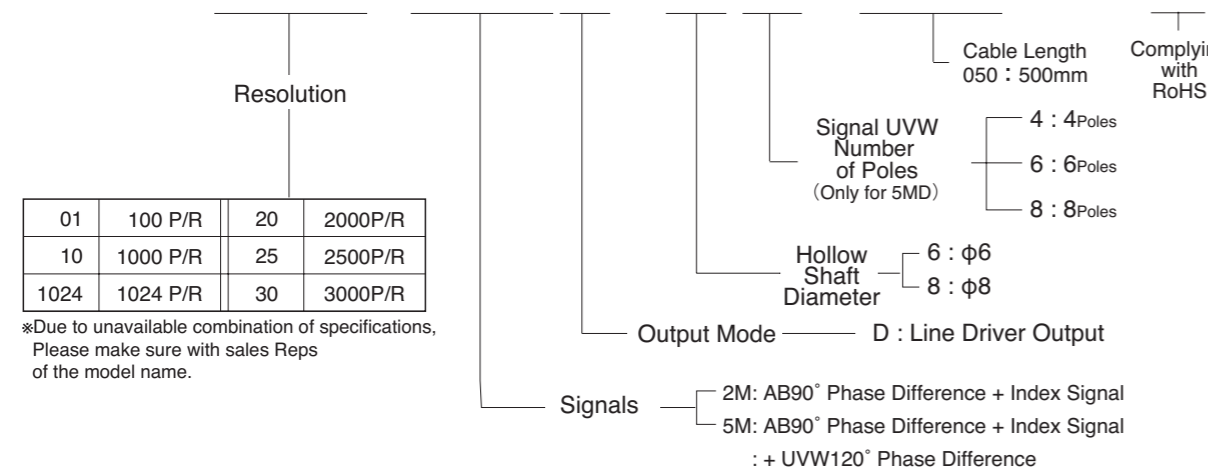
**Standard Built-in Model**

- General Application Built-in Model.
- Suitable for Small Servo-motor.

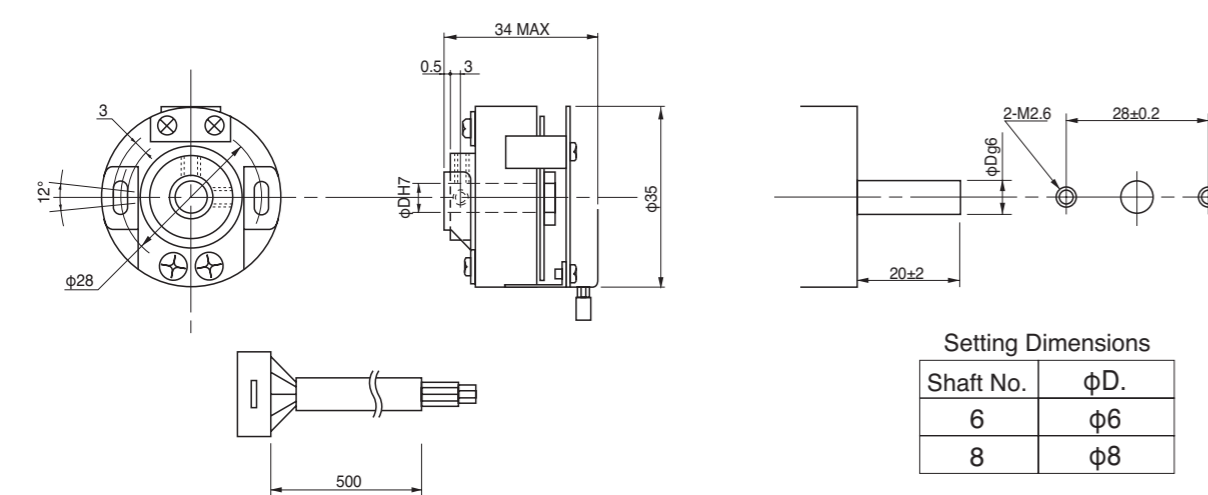


**Model**

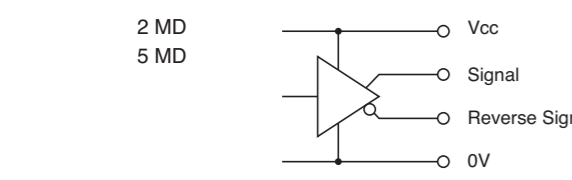
**SBY- [ ] - [ ] D - [ ] - 050 - 00E**



**External Dimension**



**Output Circuit**



**Electrical Spec**

TYPE	2MD	5MD
Power Supply(Vcc)	DC4.75~5.25V	
Current Consumption	160 mA Max	250 mA Max
Output Voltage	"H"	2.5 V Min
	"L" *1	0.5 VMax
Maximum Sink Current	20 mA	
Rise & Fall Time	200 ns Max	
Maximum Frequency Response	200 kHz	

\*1) at Maximum Sink Current

**Electrical Connections**

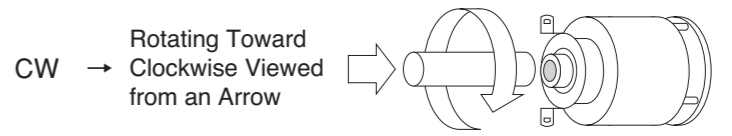
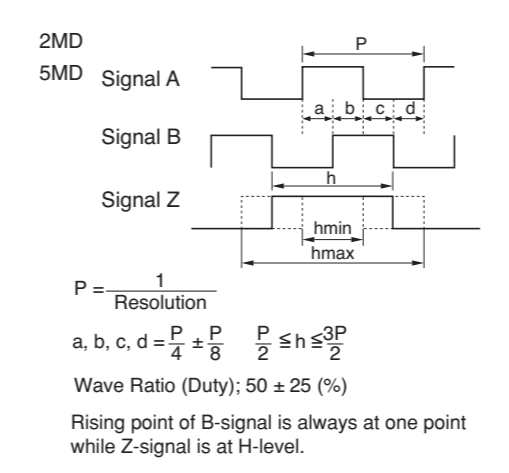
2MD

Color	Signal	Color	Signal
Red	Power Supply(Vcc)	White	Signal B
Black	0V	Gray	Signal B
Green	Signal A	Yellow	Signal Z
Blue	Signal A	Orange	Signal Z
Shield	F, G		

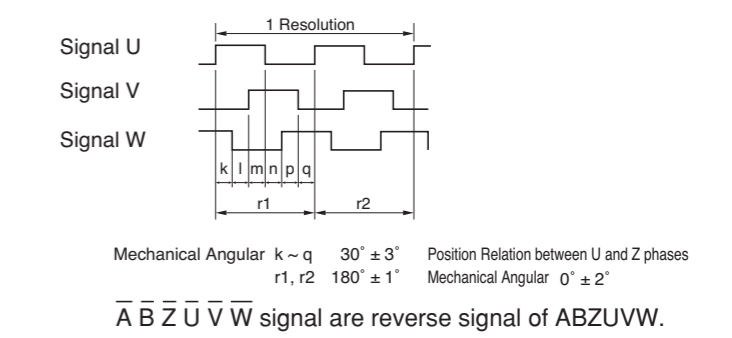
5MD

Color	Signal	Color	Signal
Red	Power Supply(Vcc)	Yellow	Signal Z
Black	0V	Yellow - White	Signal Z
Green	Signal A	Brown	Signal U
Green - White	Signal A	Brown - White	Signal U
Gray	Signal B	Blue	Signal V
Gray - White	Signal B	Blue - White	Signal V
Shield	F, G	Orange	Signal W
		Orange - White	Signal W

**Wave Form**



Only for 5MD  
●When UVW phases output are 4 poles at 120°.



**Mechanical Spec**

Starting Torque	2.94x10 <sup>-3</sup> N · m Max
Angular Acceleration	1x10 <sup>5</sup> rad/s <sup>2</sup>
Shaft Loading	Thrust 9.8N
	Radial 19.6N
Moment of Inertia	1x10 <sup>-6</sup> kg · m <sup>2</sup>
Maximum Permissible Speed	6000min <sup>-1</sup>
Net Weight(Without Cable)	150g Max

**Environmental Spec**

Operating Temperature	-10°C~+85°C
Storage Temperature	-20°C~+85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> ,11ms X, Y, Z Each 3 times

**BUILT-IN TYPE**

**SBH Model**



**Large Size Model**

- The Largest Shaft Diameter 30mm.
- High Resolution up to 10000 P/R.

**Model**  
**SBH- [ ] - [ ] -30- [ ] -00E**

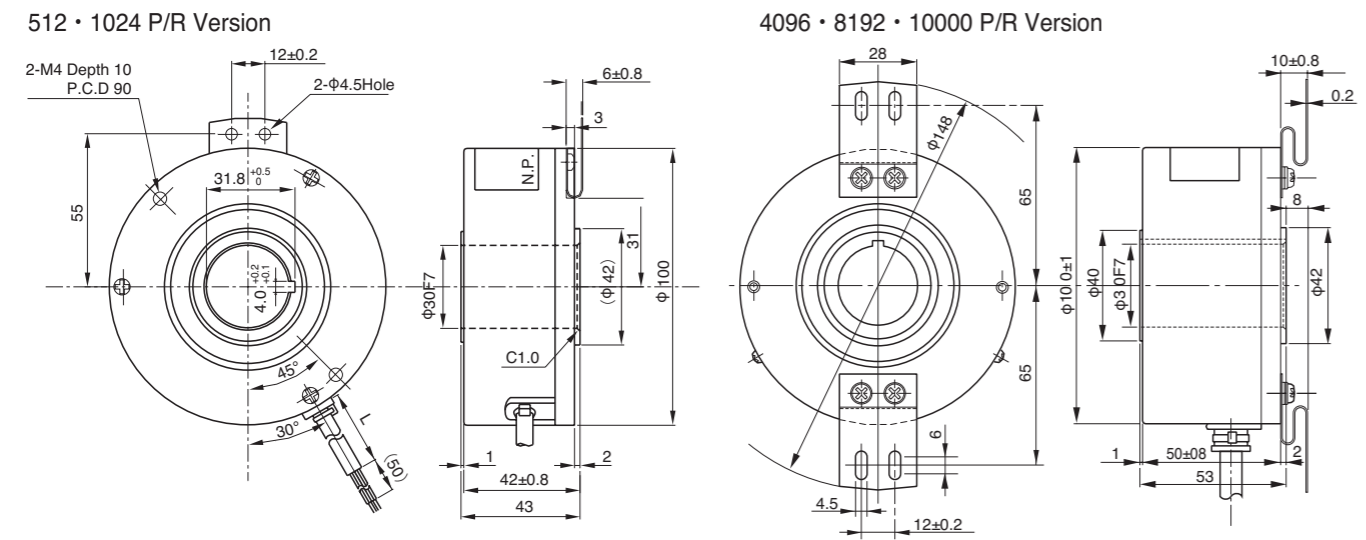
Resolution

0512	512 P/R
1024	1024 P/R
4096	4096 P/R *
8192	8192 P/R *
100	10000 P/R *

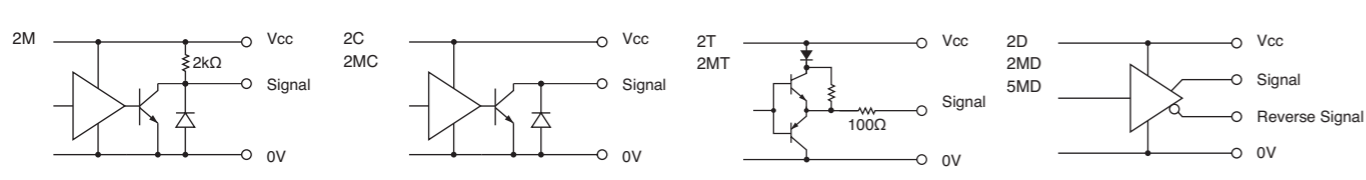
\*Line Driver Only

- Cable Length
- 050 : 500mm
  - 100 : 1000mm
  - 300 : 3000mm
- Complying with RoHS
- Hollow Shaft Diameter 30 : φ30
- Output Mode
- No Indication : Voltage Output
  - C : Open Collector Output
  - D : Line Driver Output
  - T : Push-Pull Output
- Signals
- 2 : AB90° Phase Difference
  - 2M : AB90° Phase Difference + Index Signal
  - 5M : AB90° Phase Difference + Index Signal
  - +UVW120° Phase Difference
- Due to angled signal, Please make sure to our sales about combination of Pole number and Electrical angle.

**External Dimension**



**Output Circuit**



**Electrical Spec**

TYPE	2M	2C·2MC	2T·2MT	2D·2MD	2MD(4096P/R)	5MD
Power Supply(Vcc)	DC5V±10%		DC 10.8~13.2 V	DC 4.75~5.25 V	DC 12V±10%	DC 5V±10%
Current Consumption	45 mA Max		60 mA Max	150 mA Max	270 mA Max	210 mA Max
Output Voltage	"H"	Vcc -1V Min	-	Vcc -2.5V Min	2.5 V Min	
	"L" *1	0.5V Max		3 V Max	0.5 V Max	
Maximum Sink Current	20mA		40mA	20 mA		
Rise & Fall Time	1 μs Max			200 ns Max		
Maximum Frequency Response	200kHz	150kHz		200kHz	35kHz	68.27 kHz

\*1) at Maximum Sink Current

**Electrical Connections**

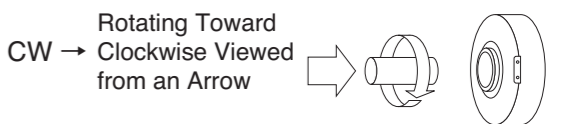
Model	Color	Signal
2M	Red	Power Supply(Vcc)
2C	Black	0V
2MC	Blue or Green	Signal A
2T	White	Signal B
2MT	Yellow	Signal Z
	Shield	F. G

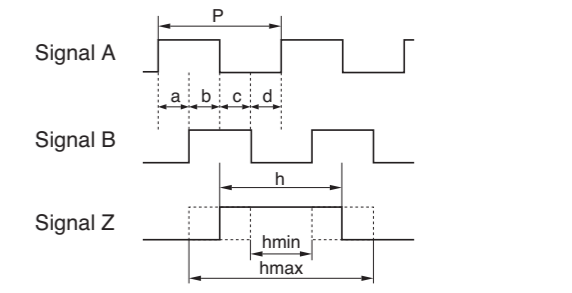
Model	Color	Signal
2D	Red	Power Supply(Vcc)
2MD	Black	0V
	*	Signal A
	*	Signal A
	*	Signal B
	*	Signal B
	*	Signal Z
	*	Signal Z
	Shield	F. G

\*Contact us.

**Wave Form**



Rising point of A-Signal is always at one point while Z-Signal is at H-Level in CW.

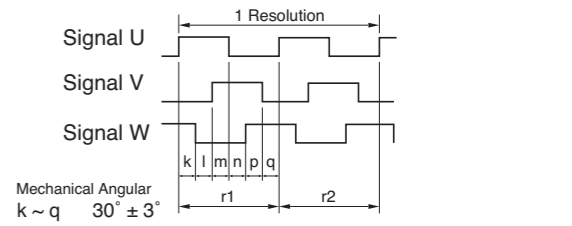


$$P = \frac{1}{\text{Resolution}}$$

$$a, b, c, d = \frac{P}{4} \pm \frac{P}{8} \quad \frac{P}{2} \leq h \leq \frac{3P}{2}$$

Wave Ratio (Duty); 50 ± 25 (%)

Only for 5M  
•When UVW phases output are 4 poles at 120°.



Mechanical Angular k ~ q 30° ± 3°  
r1, r2 180° ± 1°  
Position Relation between U and Z phases  
Mechanical Angular 0° ± 2°  
\* A B Z U V W signal are reverse signal of ABZUVW.

**Environmental Spec**

	512 • 1024 P/R	4096•8192•10000 P/R
Starting Torque	7.35x10 <sup>-2</sup> N · m Max	49x10 <sup>-3</sup> N · m Max
Angular Acceleration	1x10 <sup>4</sup> rad/s <sup>2</sup>	
Shaft Loading	Thrust	19.6N / 9.8N
	Radial	39.2N / 19.6N
Moment of Inertia	1.5x10 <sup>-4</sup> kg · m <sup>2</sup>	1.8x10 <sup>-4</sup> kg · m <sup>2</sup>
Maximum Permissible Speed	Continuous : 500min <sup>-1</sup> Instantaneous : 2500min <sup>-1</sup>	500min <sup>-1</sup>
Net Weight(Without Cable)	1kg Max	

**Environmental Spec**

	512•1024 P/R	4096•8192•10000 P/R
Operating Temperature	-10°C~+70°C	
Storage Temperature	-20°C~+80°C	-20°C~+85°C
Humidity	RH 85% Max No Condensation	
Vibration	50 Hz / 1.5mm X,Y,Z Each 2h	
Shock	490m/s <sup>2</sup> ,11ms X, Y, Z Each 3 times	

# Modular Encoder

# Miniature Model

•Small-size Encoder with OD 18mm.

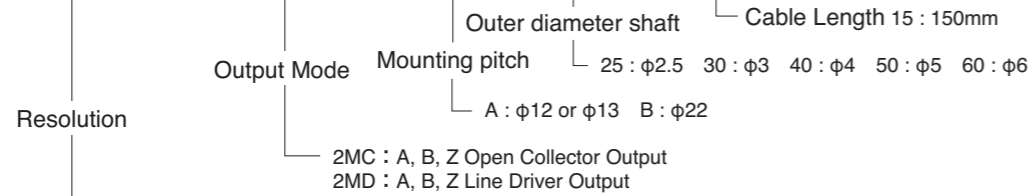
# 18M Model



## Model

# 18M- [ ] - [ ] - [ ] - [ ] - [ ] -15-00E

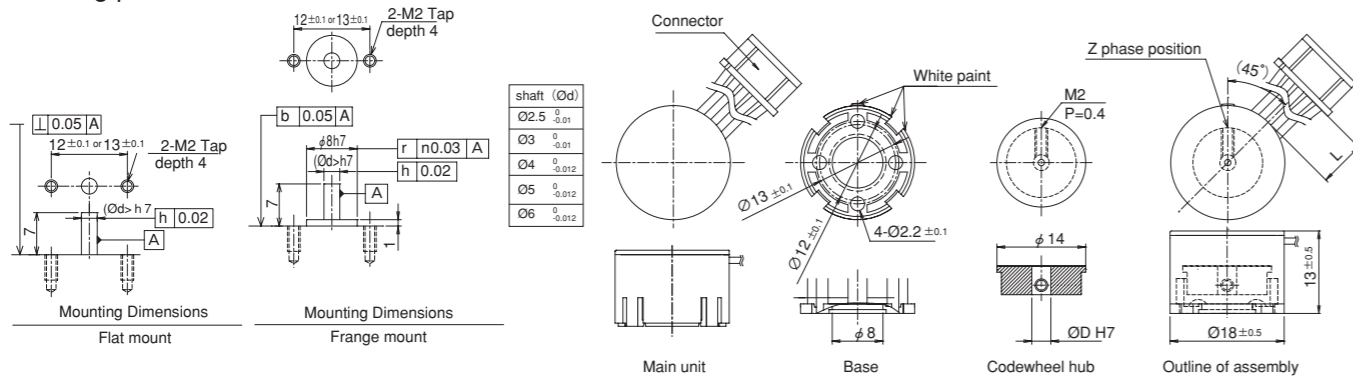
Complying with RoHS



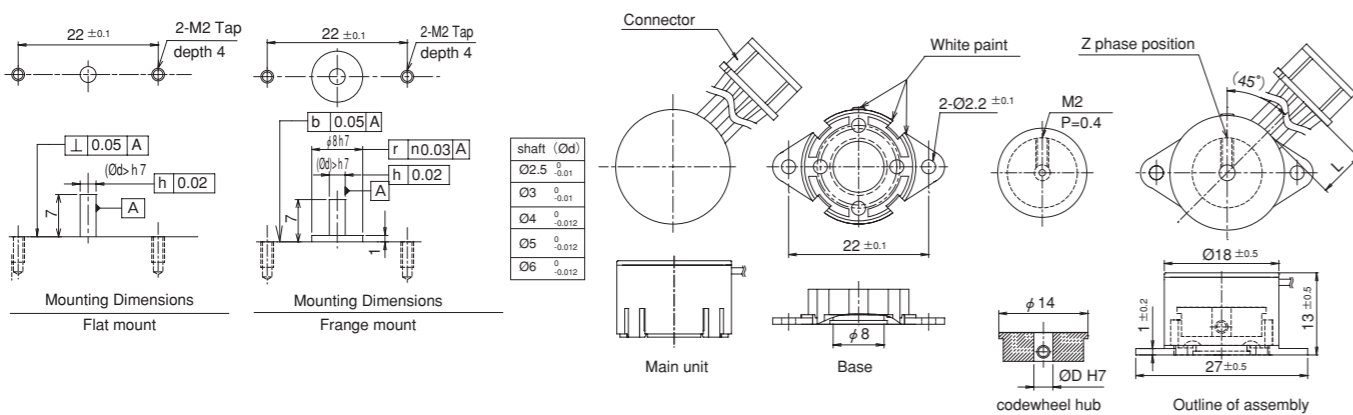
200	200 P/R	400	400 P/R	1000	1000 P/R
300	300 P/R	500	500 P/R	1024	1024 P/R
360	360 P/R	800	800 P/R	1600	1600 P/R

## External Dimension

Mounting pitch 12,13



Mounting pitch 22



## Electrical Spec

TYPE	2MC	2MD
Power Supply(Vcc)	DC 4.5 to 13.2V (Ripple 100mV (P-P))	DC 4.5 to 5.5V (Ripple 100mV (P-P))
Current Consumption	30mA Max	
Output Voltage	"H"	2.5V Min
	"L" *1	0.5V Max
Maximum Sink Current	20mA	
Maximum Frequency Response	400P/R or less	120kHz
	500P/R or more	240kHz
Rise & Fall Time	1μs Max	100ns Max

\*1) at Maximum Sink Current

## Electrical Connections

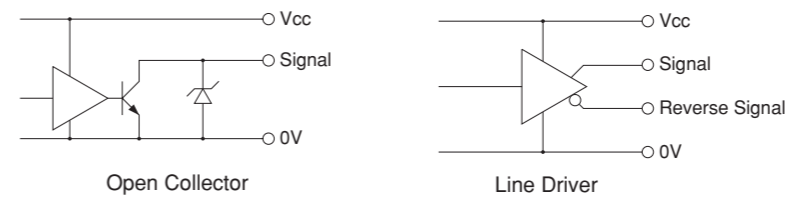
Connector Hirose Electric Co., Ltd. DF3-5S-2C

Open Collector		
1	Brown	Vcc
2	Red	0V
3	Orange	Sig A
4	Yellow	Sig B
5	Green	Sig Z

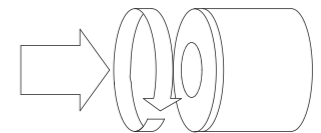
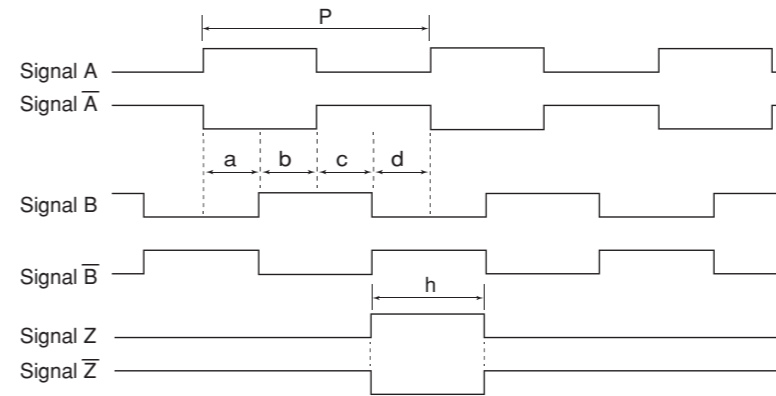
Connector Hirose Electric Co., Ltd. DF3-9S-2C

Line Driver		
1	Brown	Vcc
2	Red	0V
3	Orange	Sig A
4	Yellow	Sig A
5	Green	Sig B
6	Blue	Sig B
7	Purple	Sig Z
8	Gray	Sig Z
9	N.C	N.C

## Output Circuit



## Wave Form



$P = 1 / \text{Resolution}$   
Line driver output is available for only A, B, Z signal.  
Signal A,B  $a, b, c, d = (P/4) \pm (P/8)$   
Duty =  $(P/2) \pm (P/4)$   
Signal Z  $(P/4) \leq h \leq (3P/4)$

An option fixture is needed to mount the modular encoder.  
For positioning the mounting base: Misumi DCLB-D8-V\*-H10-T1-L12  
For securing specified clearance between sensor and code disc : Misumi CIMWS12-1.0

## Mechanical Spec

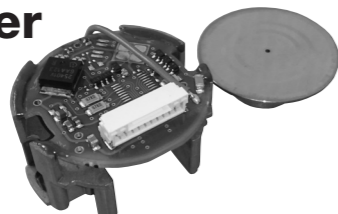
Moment of Inertia	$8 \times 10^{-8} \text{kg} \cdot \text{m}^2$
Allowable Value of shaft play	Thrust : $\pm 0.3 \text{mm}$
Angular Acceleration	$1 \times 10^5 \text{rad/s}^2$
Maximum Permissible Speed	$18000 \text{min}^{-1}$
Net Weight	10g Max (Without Cable)

## Environmental Spec

Operating Temperature	$-10^\circ\text{C} \sim +85^\circ\text{C}$
Storage Temperature	$-30^\circ\text{C} \sim +85^\circ\text{C}$
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X, Y, Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times

# Modular Encoder

# 38M Model



## Small Modular Model

- Wide Range of Resolution from 200 to 4096 P/R.
- Rotating Speed of 10000min<sup>-1</sup> is Available for High Speed Motor.



### Model

# 38M- [ ] - [ ] - A [ ] - 00E

Resolution: 50 : φ5 60 : φ6

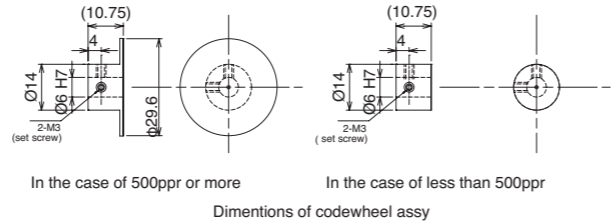
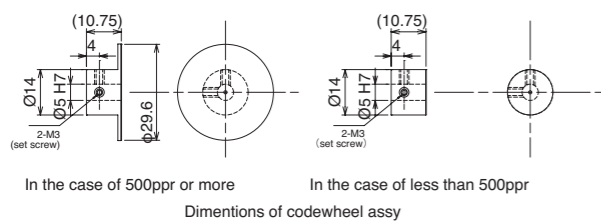
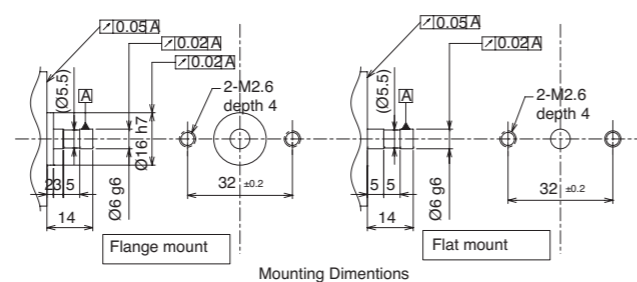
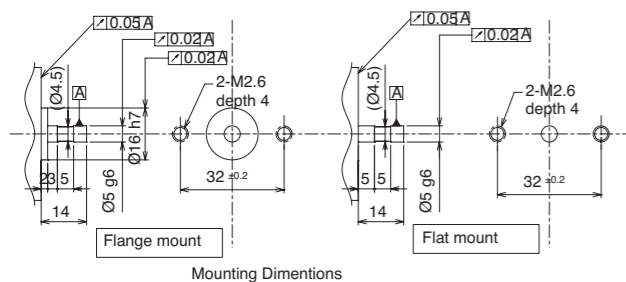
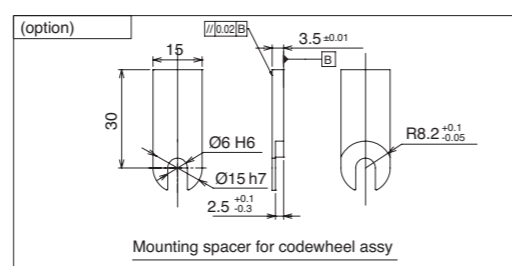
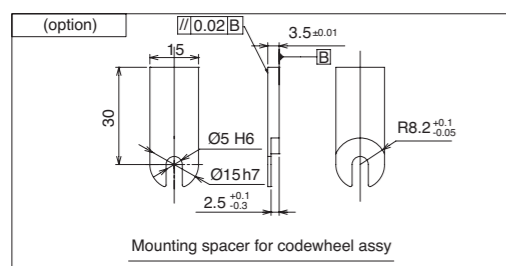
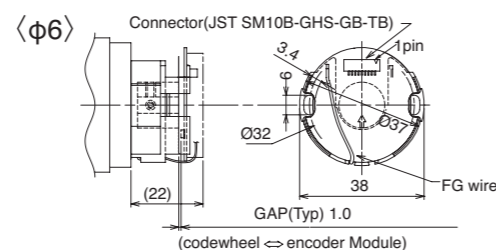
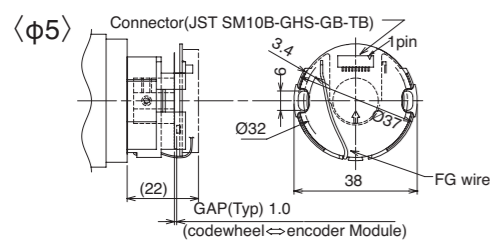
Output Mode: 2MC : A, B, Z Open Collector Output  
2MT : A, B, Z Complementary Output  
2MD : A, B, Z Line Driver Output

Outer diameter motor shaft: 50 : φ5 60 : φ6

Complying with RoHS

200	200P/R	360	360P/R	1000	1000P/R	2048	2048P/R	4000	4000P/R
250	250P/R	500	500P/R	1024	1024P/R	2500	2500P/R	4096	4096P/R
300	300P/R	512	512P/R	2000	2000P/R	3600	3600P/R	-	-

### External Dimension

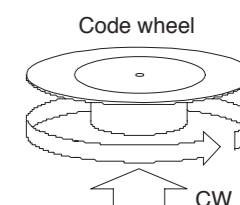
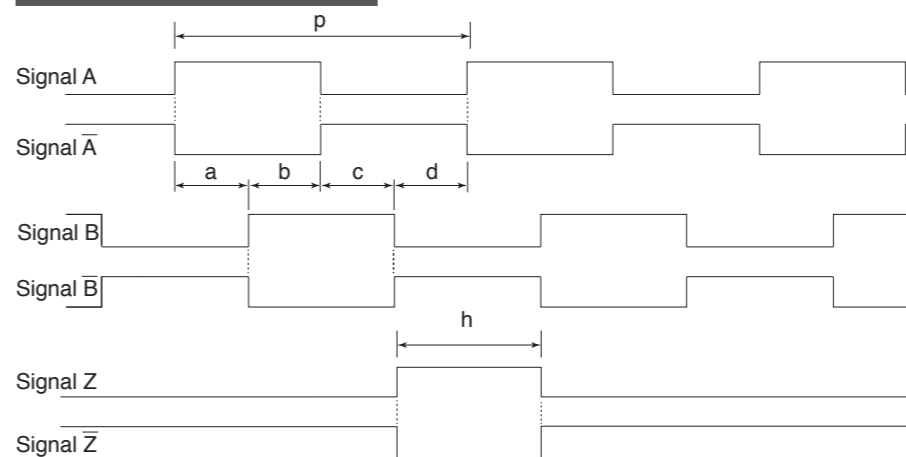


### Electrical Spec

TYPE		2MC	2MT	2MD
Power Supply(Vcc)		DC 4.5 to 30V (Ripple 3% or less (P-P))		DC 4.5 to 13.2V (Ripple 3% or less (P-P))
Current Consumption		30mA Max	60mA Max	30mA Max
Output Voltage	"H"	-	Vcc -3V Min	2.5V Min
	"L" *1	0.5V Max	3V Max	0.5V Max
Maximum Sink Current		40mA		20mA
Maximum Frequency Response	1024P/R or less	120kHz		
	2000P/R or more	240kHz		
Rise & Fall Time		1μs Max	200ns Max	100ns Max

\*1) at Maximum Sink Current

### Wave Form



CW → Rotating Toward Clockwise Viewed from an Arrow

\* P = 1 / Resolution

\* Line driver output is available for only A-bar, B-bar, Z-bar signal.

Signal A,B a,b,c,d= (P/4)±(P/8)  
Duty = (P/2)±(P/4)

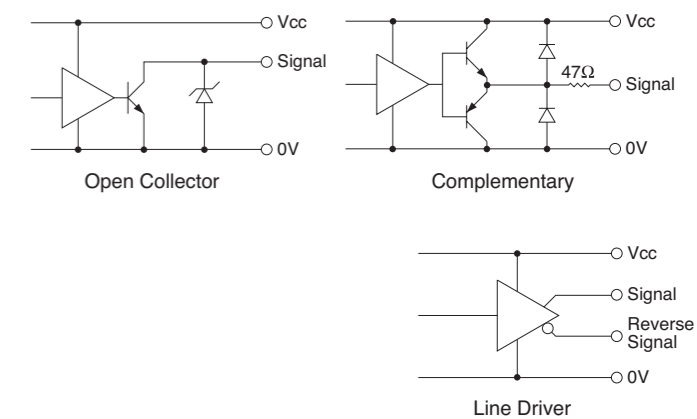
Signal Z (P/4) ≤ h ≤ (3P/4)

### Electrical Connections

Connector JST SM10B-GHS-GB-TB

Open Collector · Complementary		Line Driver	
1	Vcc	1	Vcc
2	0V	2	0V
3	Sig A	3	Sig A
4	-	4	Sig A-bar
5	Sig B	5	Sig B
6	-	6	Sig B-bar
7	Sig Z	7	Sig Z
8	-	8	Sig Z-bar
9	-	9	-
10	FG	10	FG

### Output Circuit



### Mechanical Spec

Angular Acceleration	1×10 <sup>5</sup> rad/s <sup>2</sup>
Moment of Inertia	9.3×10 <sup>-7</sup> kg·m <sup>2</sup> Max
Allowable Value of shaft play	Thrust : ±0.25mm Max
Maximum Permissible Speed	10000min <sup>-1</sup>

### Environmental Spec

Operating Temperature	-10°C~+85°C
Storage Temperature	-30°C~+85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times



# Absolute Encoder

## Multi Turn

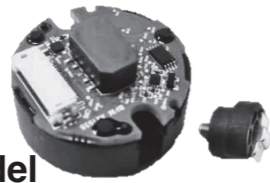
N33MA .....	64
N35MA .....	66
37HA-MB.....	68
38HA-MS.....	70

## Single Turn

N35ST .....	72
AEW2 .....	74
ASC-SP .....	76
AHS2.....	78
ASC-HP.....	80

**ABSOLUTE TYPE**

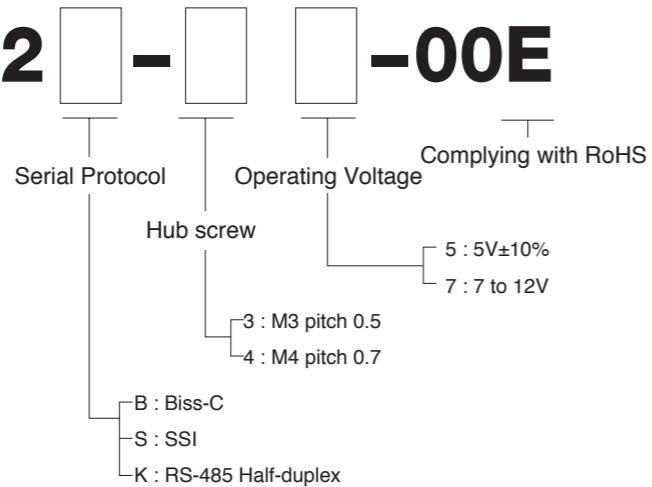
**N33MA Model**



**Battery less 42bit Multi turn**

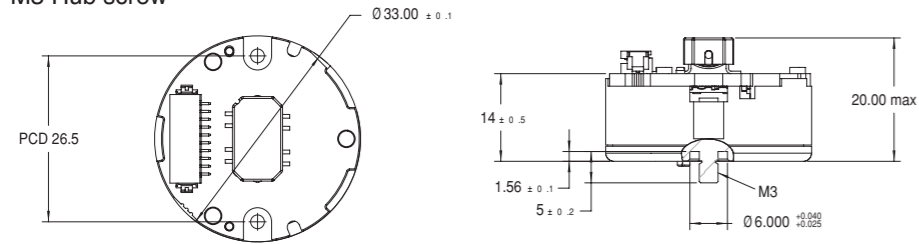
- Module type
- Full Magnetic

**Model**  
**N33MA-M42 - -00E**

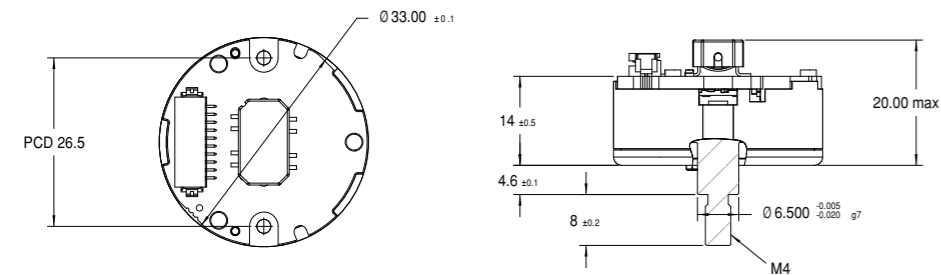


**Dimension**

M3 Hub screw

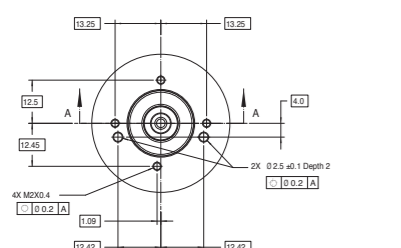


M4 Hub screw

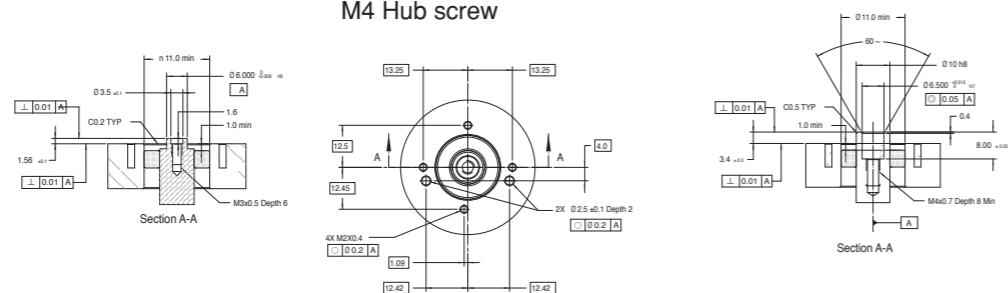


**Mounting**

M3 Hub screw



M4 Hub screw



**Electrical Spec**

Resolution	Multi turn	24bits
	Single turn	18bits
Current Consumption(No load)	65mA Max (5v) 55mA Max (7v)	
Supply Voltage	5V ± 10% or 7 to 12V	
Electrically Permissible Speed	< 12000 min <sup>-1</sup>	
Initialization Time	< 1s	

**Mechanical Spec.**

System Accuracy (With electrical correction)	± 313 Arc-sec	
Mechanical Permissible Speed	< 12000 min <sup>-1</sup>	
Shaft Play	Axial	≤ ±0.2mm
	Radial	≤ ±0.05 mm

**Connection**

Pin No	SSI	BiSS-C	RS-485
1	GND	GND	GND
2	VDD	VDD	VDD
3	SCLK-	MA-	NC
4	SCLK+	MA+	NC
5	DAT-	SLO-	DATA-
6	DAT+	SLO+	DATA+
7	SPI CLK	NC(1)	NC(1)
8	SPI DO	NC(1)	NC(1)
9	SPI DIN	NC(1)	NC(1)
10	GND	GND	GND

Note (1): Do not connect during operation

※Recommended mating connector:

Hirose Part No: DF13-10S-1.25C (CL No.536-0006-8)

Hirose (Terminal Pin for Wire 26~30AWG):

DF13-2630SCF (CL No.536-0300-5)

**Environmental Spec.**

Storage Temperature	- 40 ~ + 115°C
Operating Temperature	- 40 ~ + 115°C
Relative Air Humidity (Non-Condensing)	90%RH (T <sub>amb</sub> = 60°C)
Vibration	10G; 10 to 2000Hz
Shock	6ms; Half Sine; 200G
Electrostatic Discharge (Module level)	± 4kV

**Data communication**

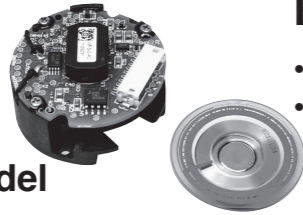
SSI		BiSS-C		RS-485	
Interface	Circuit	Interface	Circuit	Interface	Circuit
Shift Clock (SCLK)	Receiver (P/N:ISL3283E)	Serial Clock(MA)	Receiver (P/N:ISL3283E)	Serial Data (DAT)	Receiver (P/N:ISL3283E)
Data Output (DAT)	Transmitter (P/N:ISL3295E)	Serial Data(SLO)	Transmitter (P/N:ISL3295E)	Serial Data (DAT)	Transmitter (P/N:ISL3295E)

[Note]

There are an Alignment Fixture and an Accuracy calibration station (SSI, Biss-C or RS-485) available separately. Please contact our Sales for inquiries about this product of details.

**ABSOLUTE TYPE**

**N35MA Model**

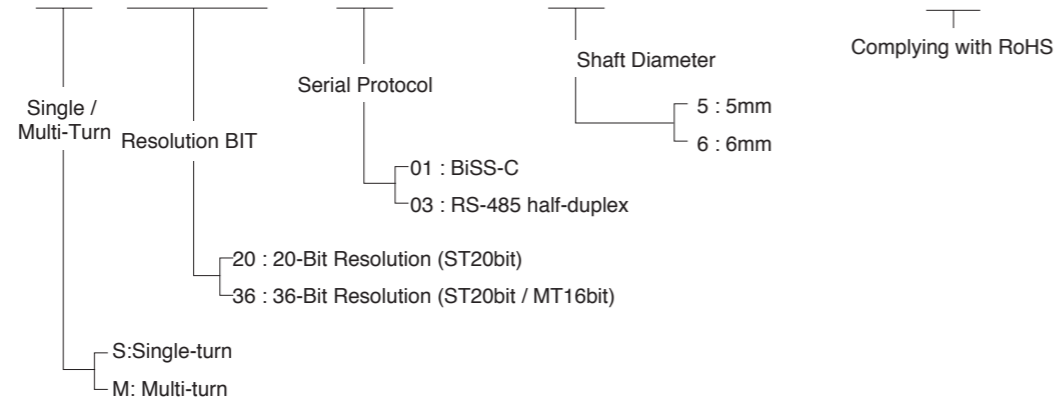


**Battery less Multi turn**

- Module type
- Compact ( $\phi 35$ )

**Model**

**N35MA- [ ] [ ] [ ] - [ ] [ ] - [ ] -000-00E**



**Electrical Spec.**

Current Consumption	200mA Max(No load)
Supply Voltage	5V $\pm$ 0.5V
Electrically Permissible Speed	< 10000 min <sup>-1</sup>
Initialization Time	< 500 ms

**Mechanical Spec.**

System Accuracy (With electrical correction)	$\pm 120$ Arc-sec ( $T_{amb} = 25^{\circ}C$ )
Mechanical Permissible Speed	< 10000 min <sup>-1</sup>

**Connection**

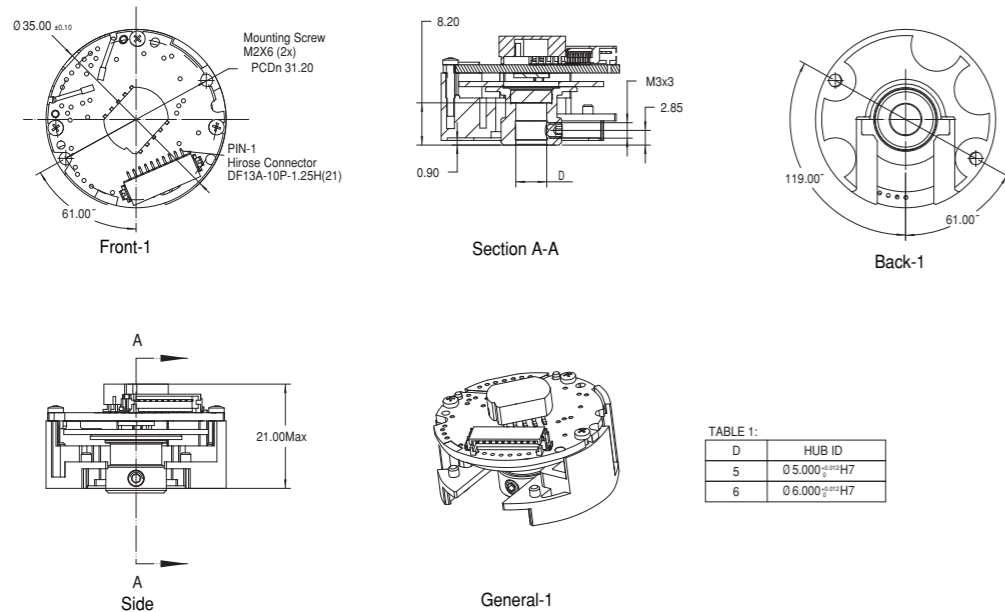
Pin No	BiSS-C	RS-485
1	VCC, Encoder Supply	VCC, Encoder Supply
2	GND, Ground	GND, Ground
3	MA+	DATA+
4	MA-	DATA-
5	SLO+	Phase Calibration Signal 1
6	SLO-	Phase Calibration Signal 2
7	Phase Calibration Signal 1	Phase Calibration Signal 3
8	Phase Calibration Signal 2	Phase Calibration Signal 4
9	Phase Calibration Signal 3	N/A
10	Phase Calibration Signal 4	N/A

\*Recommended mating connector:

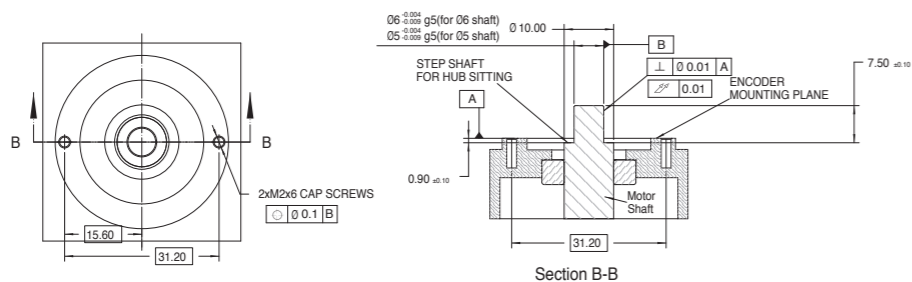
Hirose Part No: DF13-10S-1.25C (CL No.536-0006-8)

Hirose (Terminal Pin for Wire 26~30AWG): DF13-2630SCF (CL No.536-0300-5)

**Dimension**



**Mounting**



**Environmental Spec.**

Storage Temperature	- 20 to + 105°C
Operating Temperature	- 20 to + 105°C
Relative Air Humidity (Non-Condensing)	90%RH ( $T_{amb} = 60^{\circ}C$ )
Vibration	10G; 10 to 2000Hz
Shock	6ms; Half Sine; 200G
Electrostatic Discharge (Module level)	2kV

**Data communication**

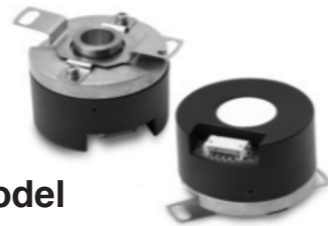
BiSS-C		RS-485	
Interface	Circuit	Interface	Circuit
Serial Clock(MA)	Transceiver(P/N:SN65LBC179Q)	Serial Data(DATA+)	Transceiver(P/N:ISL8485SE)
Serial Data(SLO)	Transceiver(P/N:SN65LBC179Q)	Serial Data(DATA-)	Transceiver(P/N:ISL8485SE)

[Note]

There are an Alignment Fixture and a Phase calibration kit (Biss-C or RS-485) available separately. Please contact our Sales for inquiries about this product of details.

**ABSOLUTE TYPE**

**37HA-MB** Model

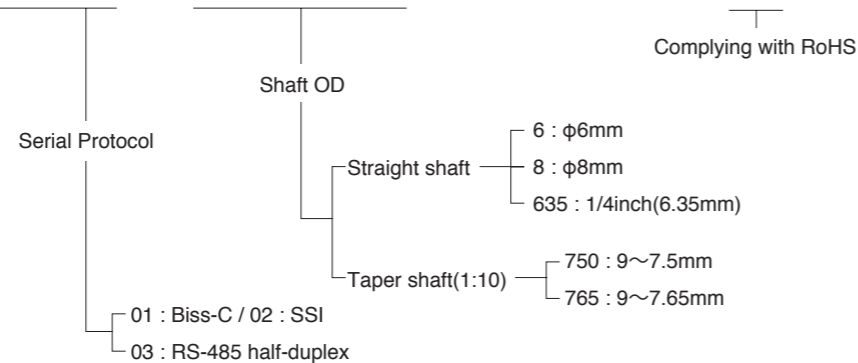


**39bit Multi turn**

- Housed encoder
- Hollow and Taper shaft

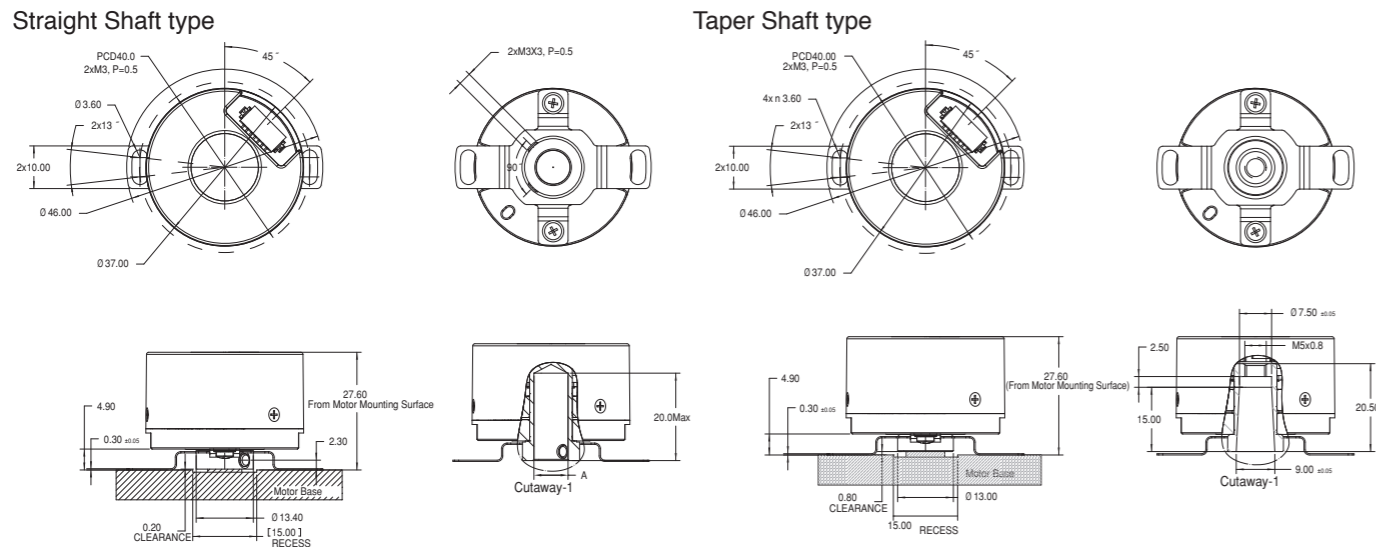
**Model**

**37HA-MB-** [ ] [ ] **-** [ ] [ ] [ ] **-000-00E**

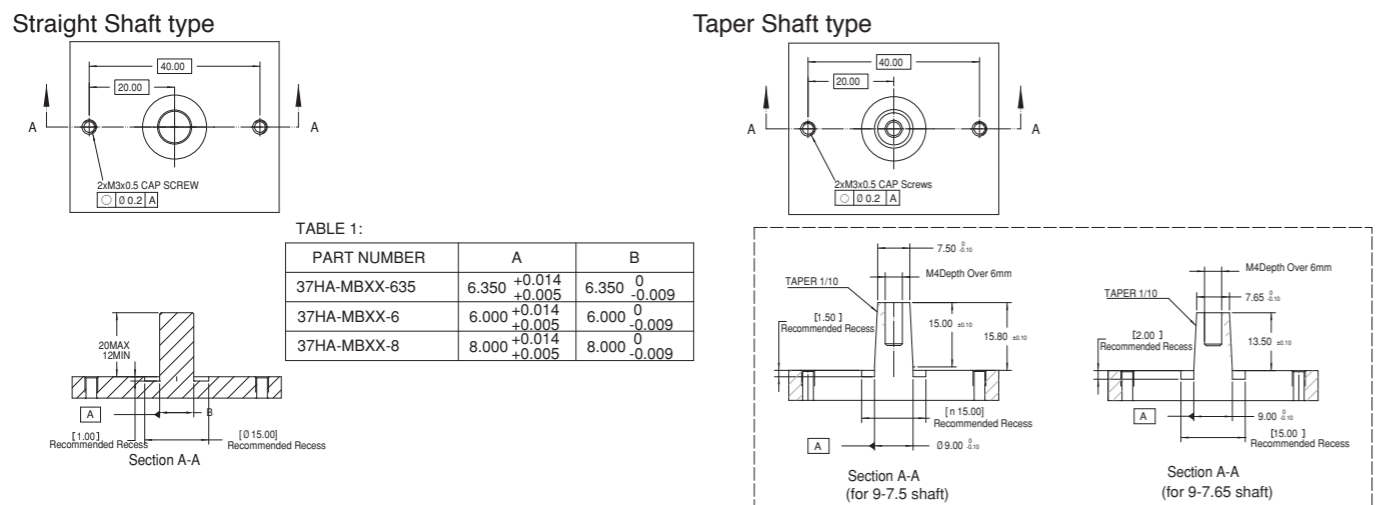


Complying with RoHS

**Dimension**



**Mounting**



**Electrical Spec.**

Resolution	Mult turn	16bits
	Single turn	23bits
Current Consumption	115mA Typ. (No load)	
Supply Voltage	5V ± 0.5V	
Electrically Permissible Speed	< 6000 min <sup>-1</sup>	
Initialization Time	< 500 ms	
Recommended external Battery	3.60V/ 2,000mAh Lithium battery	

**Connection**

Pin No	BiSS-C (10 pins connector)	SSI (10 pins connector)	RS-485 (7 pins connector)
1	VCC, Encoder Supply	VCC, Encoder Supply	VCC, Encoder Supply
2	GND, Ground	GND, Ground	GND, Ground
3	GND (External Battery)	GND (External Battery)	GND (External Battery)
4	BATPWR (External Battery)	BATPWR (External Battery)	BATPWR (External Battery)
5	MA+	SCL+	DATA+
6	MA-	SCL-	DATA-
7	SLO+	DOUT+	N/C
8	SLO-	DOUT-	N/A
9	N/C	N/C	N/A
10	N/C	N/C	N/A

\*Recommended mating connector:

Hirose Part No : DF13-7S-1.25C (7pins) or DF13-10S-1.25C (10 pins) connector (CL No.536-0006-8)

Hirose (Terminal Pin for Wire 26~30AWG): DF13-2630SCF (CL No.536-0300-5)

**Mechanical Spec.**

System Accuracy (With electrical correction)	±80 Arc-sec(T <sub>amb</sub> = 25°C)	
Mechanical Permissible Speed	< 6000 min <sup>-1</sup>	
Shaft Play	Axial	≤ ±0.1 mm
	Radial	≤ ±0.05 mm
Starting torque	≤ 9.8x10 <sup>-3</sup> N · m T <sub>amb</sub> = 25°C	
Weight	0.047kg (±10%)	

**Environmental Spec.**

Storage Temperature	- 20 to + 105°C
Operating Temperature	- 20 to + 105°C
Relative Air Humidity (Non-Condensing)	90%RH (T <sub>amb</sub> = 40°C)
Shock	10G; 10 to 2000Hz
Protection	6ms; Half Sine; 200G
Vibration	IP40

**Data communication**

BiSS-C / SSI		RS-485	
Interface	Circuit	Interface	Circuit
Serial Clock(MA)	Transceiver(P/N:SN65LBC179Q)	Serial Data(DATA+)	Transceiver(P/N:ISL8485E)
Serial Data(SLO)	Transceiver(P/N:SN65LBC179Q)	Serial Data(DATA-)	Transceiver(P/N:ISL8485E)

[Note]

Please contact our Sales for inquiries about this product of details.

**ABSOLUTE TYPE**

**38HA-MS** Model

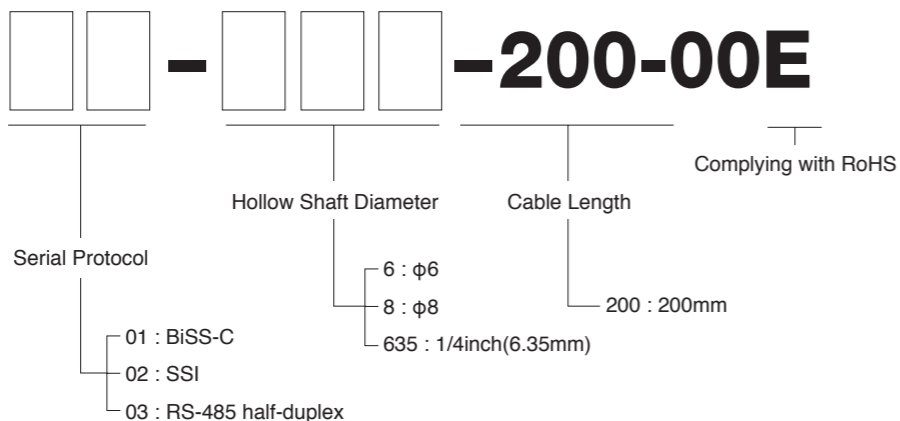


**Battery less Multi turn**

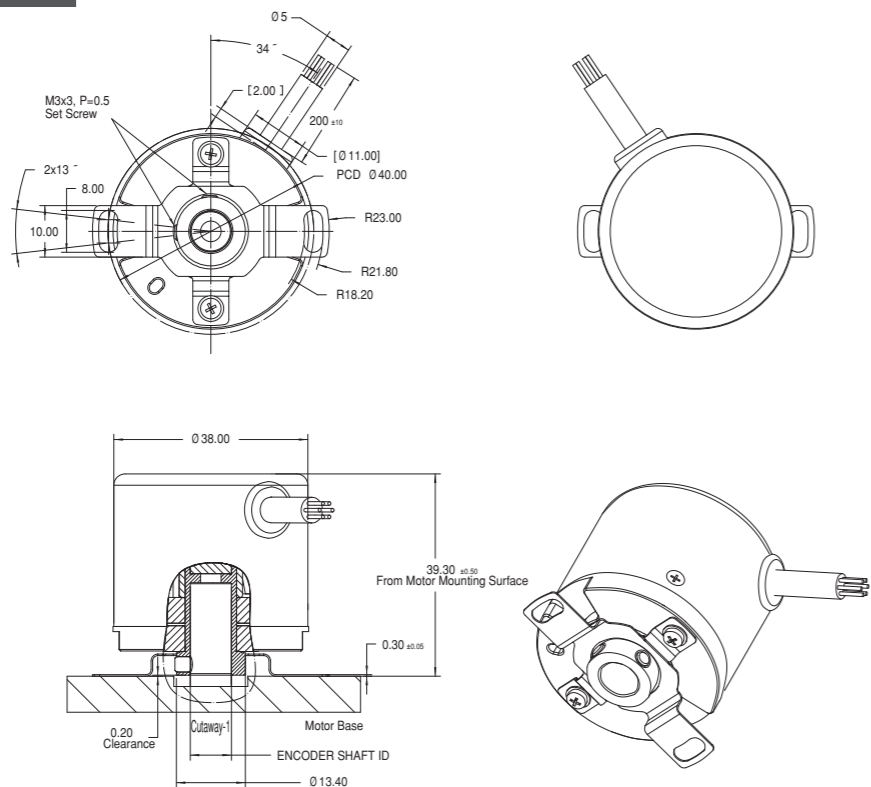
- Module type
- Compact (φ35)

**Model**

**38HA-MS-** [ ] [ ] - [ ] [ ] [ ] - **200-00E**



**Dimension**



**Mounting**

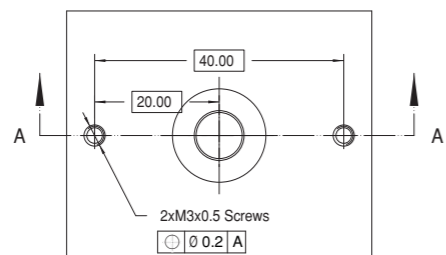
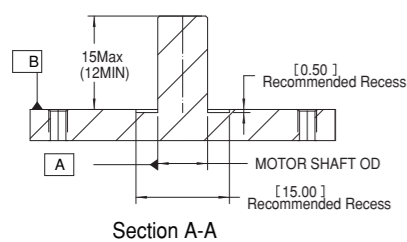


TABLE 1 : SHAFT OPTION

OPTION	SHAFT SIZE	ENCODE SHAFT ID DIMENSIONS(mm)	MOTOR SHAFT OD DIMENSIONS(mm)
635	1/4 INCH	6.355/6.364	6.341/6.350
6	6mm	6.005/6.014	5.991/6.000
8	8mm	8.005/8.014	7.991/8.000

**Electrical Spec.**

Resolution	Multi turn	16bit
	Single turn	23bit
Current Consumption		115mA Typ. (No load)
Supply Voltage		5V ± 0.5V
Electrically Permissible Speed		< 6000 min <sup>-1</sup>
Initialization Time		< 500 ms

**Connection**

Pin No	Cable Color	BiSS-C (7 core cable)	SSI (7 core cable)	RS-485 (5 core cable)
1	RED	VCC, Encoder Supply	VCC, Encoder Supply	VCC, Encoder Supply
2	BLACK	GND, Ground	GND, Ground	GND, Ground
3	BROWN	MA+	SCL+	DATA+
4	WHITE	MA-	SCL-	DATA-
5	ORANGE	SLO+	DOUT+	N/A
6	BLUE	SLO-	DOUT-	N/A
7	Cable Shield	Cable Shield	Cable Shield	Cable Shield

[Note]

Cable provided is 200mm +/- 10mm (included pigtail length) with AWG28.

**Mechanical Spec.**

System Accuracy (With electrical correction)	±80 Arc-sec ( T <sub>amb</sub> = 25°C)	
Mechanical Permissible Speed	< 6000 min <sup>-1</sup>	
Shaft Play	Axial	≤±0.1 mm
	Radial	≤±0.05 mm
Starting torque	≤9.8x10 <sup>-3</sup> N · m T <sub>amb</sub> = 25°C	
Weight	0.091kg	

**Environmental Spec.**

Storage Temperature	- 20 to + 105°C
Operating Temperature	- 20 to + 105°C
Relative Air Humidity (Non-Condensing)	90%RH ( T <sub>amb</sub> = 40°C)
Vibration	10G; 10 to 2000Hz
Shock	6ms; Half Sine; 200G
Protection	IP50

**Data communication**

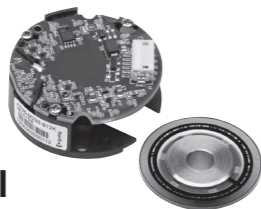
Interface	BiSS-C / SSI		RS-485	
	Circuit		Interface	Circuit
Serial Clock(MA)	Transceiver(P/N:SN65LBC179Q)		Serial Data(DATA+)	Transceiver(P/N:ISL8485E)
Serial Data(SLO)	Transceiver(P/N:SN65LBC179Q)		Serial Data(DATA-)	Transceiver(P/N:ISL8485E)

[Note]

Please contact our Sales for inquiries about this product of details.

**ABSOLUTE TYPE**

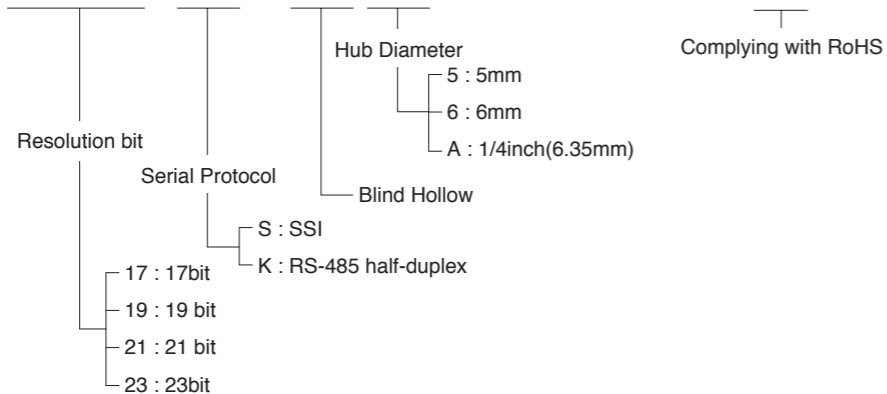
**N35ST** Model



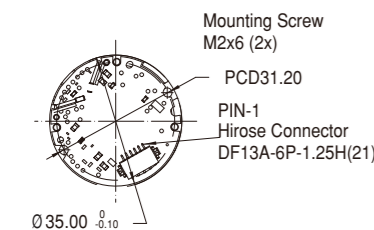
**23 bit Single turn**

- Module type
- Compact (φ35)

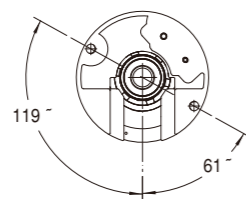
**Model**  
**N35ST- [ ] [ ] [ ] -B [ ] -000-00E**



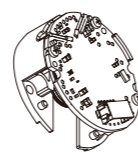
**Dimension**



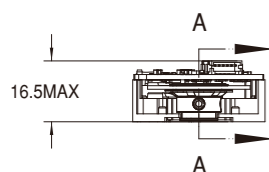
Front-1



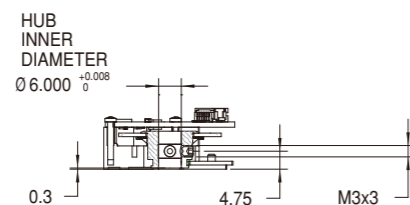
Back-1



Iso-1

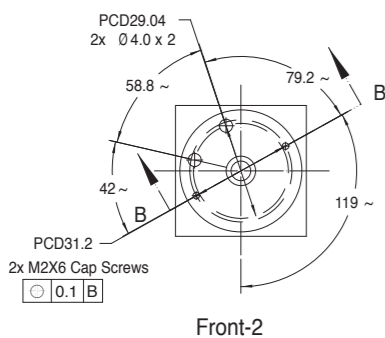


Side-1

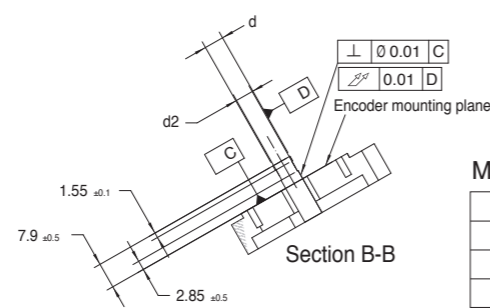


Section A-A

**Mounting**



Front-2



**Motor Shaft Spec.**

d (mm)	d2 (mm)
5 <sup>+0.004</sup> / <sub>-0.014</sub>	4.5±0.2
6 <sup>+0.004</sup> / <sub>-0.014</sub>	5.5±0.2
7 <sup>+0.004</sup> / <sub>-0.014</sub>	5.85±0.2

**Electrical Spec.**

Current Consumption	120mA Max (No load)
Supply Voltage	5V ± 0.5V
Electrically Permissible Speed	< 12000 min <sup>-1</sup>
Initialization Time	< 500 ms

**Mechanical Spec.**

System Accuracy (With electrical correction)	±300 Arc-sec (T <sub>amb</sub> = 25°C)	
Mechanical Permissible Speed	< 12000 min <sup>-1</sup>	
Shaft Play	Axial	≤ ±0.15 mm
	Radial	≤ ±0.05 mm

**Connection**

Pin No	SSI	RS-485
1	GND, Ground	GND, Ground
2	VCC, Encoder Supply	VCC, Encoder Supply
3	DOUT-	Data-
4	DOUT+	Data+
5	SCL-	NA
6	SCL+	NA

\*Recommended mating connector:

Hirose Part No : DF13-6S-1.25C (CL0536-0005-5-00)

Hirose (Terminal Pin for Wire 26~30AWG) : DF13-2630SCF (CL No.536-0300-5)

**Environmental Spec.**

Storage Temperature	- 40 to + 105°C
Operating Temperature	- 40 to + 105°C
Relative Air Humidity (Non-Condensing)	90%RH (T <sub>amb</sub> = 40°C)
Vibration	10G; 10 to 2000Hz
Shock	6ms; Half Sine; 200G
Electrostatic Discharge (Module level)	± 8kV (contact) ± 12kV (air)

**Data communication**

Interface	SSI		RS-485	
	Interface	Circuit	Interface	Circuit
Serial Clock(MA)	Transceiver(P/N:SN65LBC179Q)	Serial Data(DATA+)	Transceiver(P/N:ISL8485E)	
Serial Data(SLO)	Transceiver(P/N:SN65LBC179Q)	Serial Data(DATA-)	Transceiver(P/N:ISL8485E)	

[Note]

There are an Alignment Fixture and a Phase calibration kit (Biss-C or RS-485) available separately.

Please contact our Sales for inquiries about this product of details.

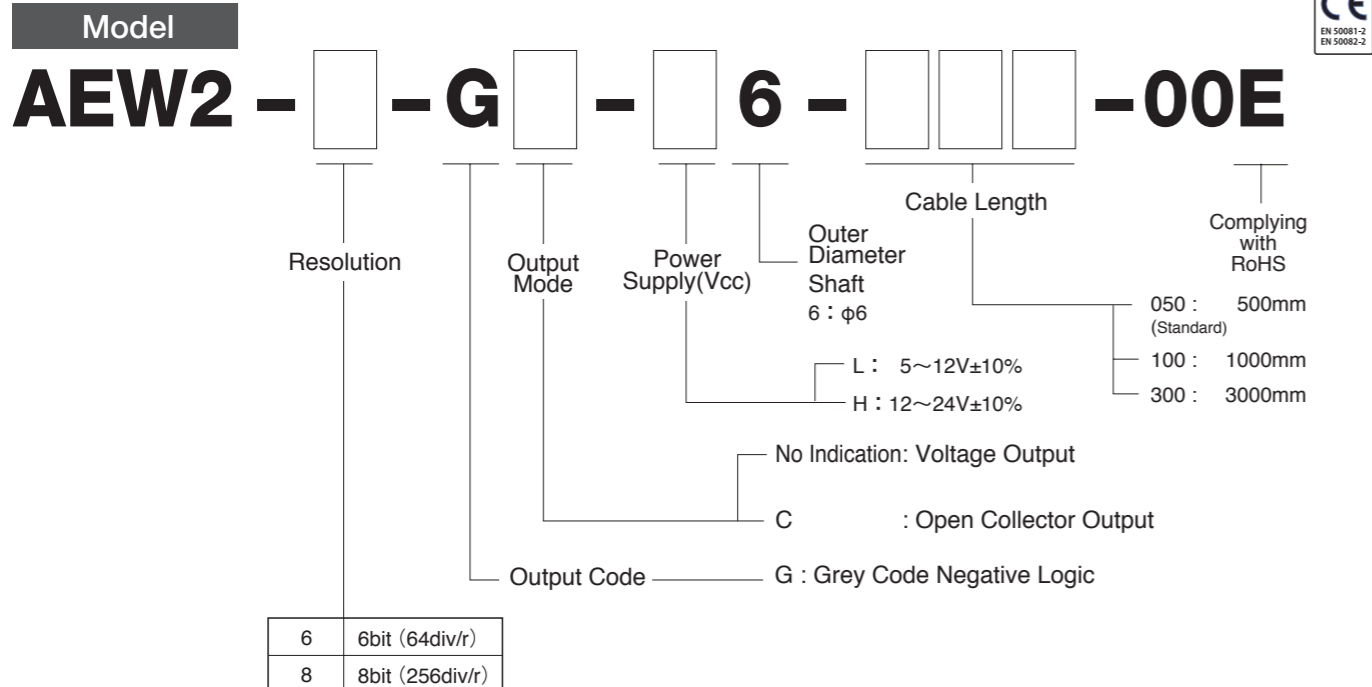
**ABSOLUTE TYPE**



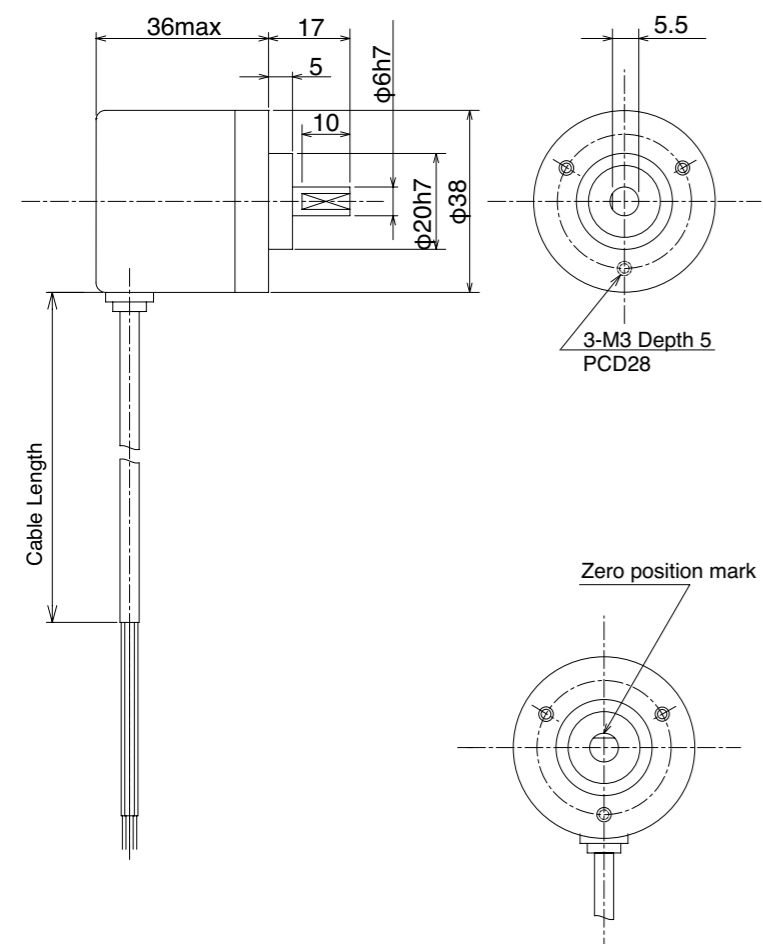
**38mm Diameter Compact Shaft Type Absolute Encoder**

•8bit (256div/r) is available with OD 38mm.

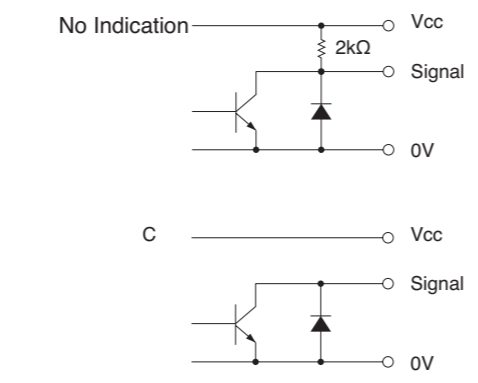
**AEW2 Model**



**External Dimension**



**Output Circuit**



**Electrical Spec**

Power Supply(Vcc)	L : DC 4.5 ~13.2 V H : DC 10.8 ~26.4 V	
Current Consumption	Voltage Output 160mA Max Open Collector Output 100mA Max	
Output Voltage	"H"	Vcc-1V Min (Exclude C Mode)
	"L" <sup>*1</sup>	0.5 VMax
Maximum Sink Current	20 mA	
Rise & Fall Time	1 μs Max	
Maximum Frequency Response <sup>*2</sup>	5 kHz	

\*1) at Maximum Sink Current \*2) When The Loading is 5V 1KΩ

**Electrical Connections**

Color	Signal
Red	Power Supply(Vcc)
Black	0V
Brown	Signal 2 <sup>0</sup>
Orange	Signal 2 <sup>1</sup>
Yellow	Signal 2 <sup>2</sup>
Green	Signal 2 <sup>3</sup>
Blue	Signal 2 <sup>4</sup>
Purple	Signal 2 <sup>5</sup>
Gray	Signal 2 <sup>6</sup> Only available for 8bit output
White	Signal 2 <sup>7</sup> Only available for 8bit output
Shield	F.G

**Wave Form**



**Mechanical Spec**

Starting Torque	9.8x10 <sup>-4</sup> N · m Max	
Angular Acceleration	1x10 <sup>5</sup> rad/s <sup>2</sup>	
Shaft Loading	Thrust	19.6N
	Radial	29.4N
Moment of Inertia	8x10 <sup>-7</sup> kg · m <sup>2</sup>	
Maximum Permissible Speed	6000min <sup>-1</sup>	
Net Weight(Without Cable)	120g Max	

**Environmental Spec**

Operating Temperature	-10°C~+55°C
Storage Temperature	-25°C~+80°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

**ABSOLUTE TYPE**

**ASC-SP Model**



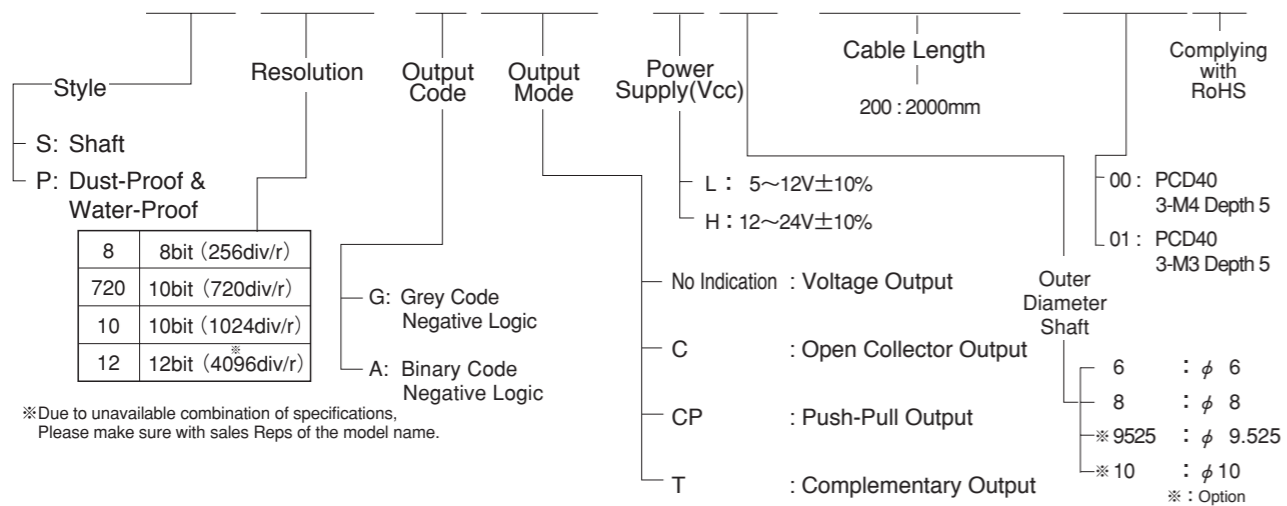
**Heavy Duty 50mm Diameter Encoder**

• Large Size Bearings. The Highest Shaft Load in The Class Radial 78.4N Thrust 49N.

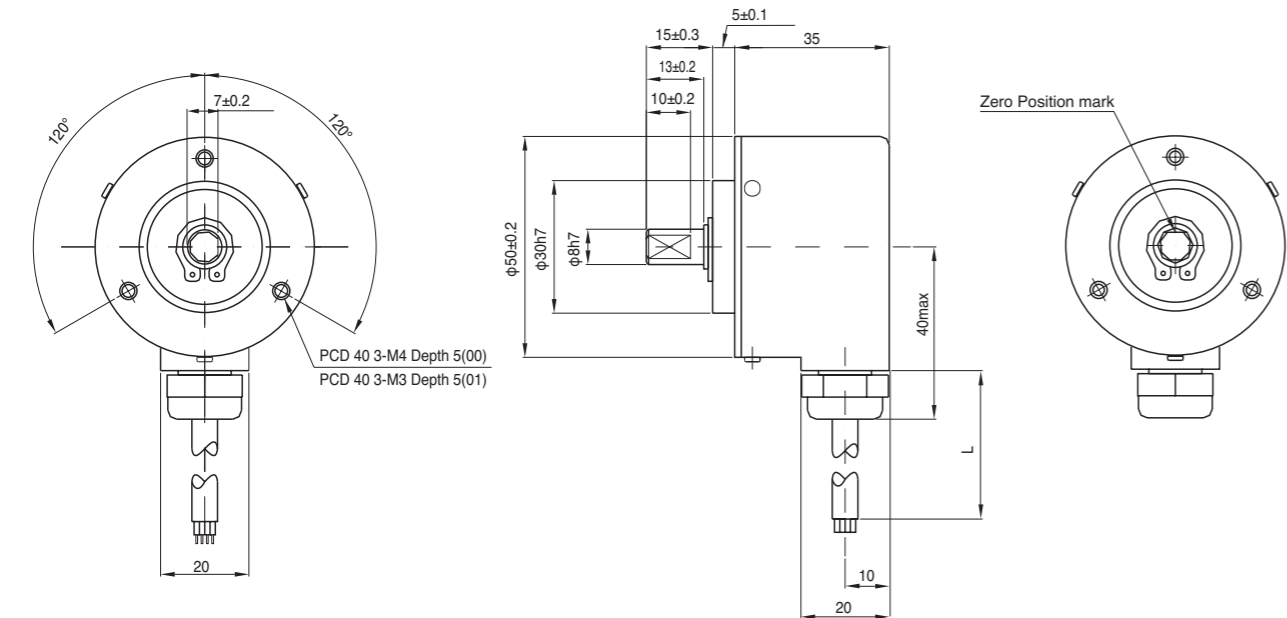


**Model**

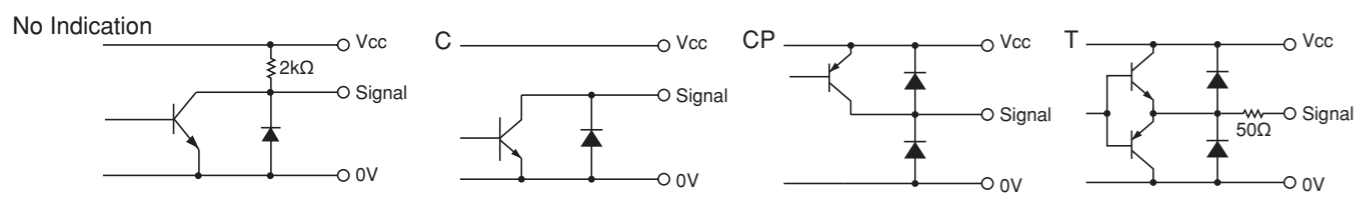
**ASC-SP** [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] **E**



**External Dimension**



**Output Circuit**

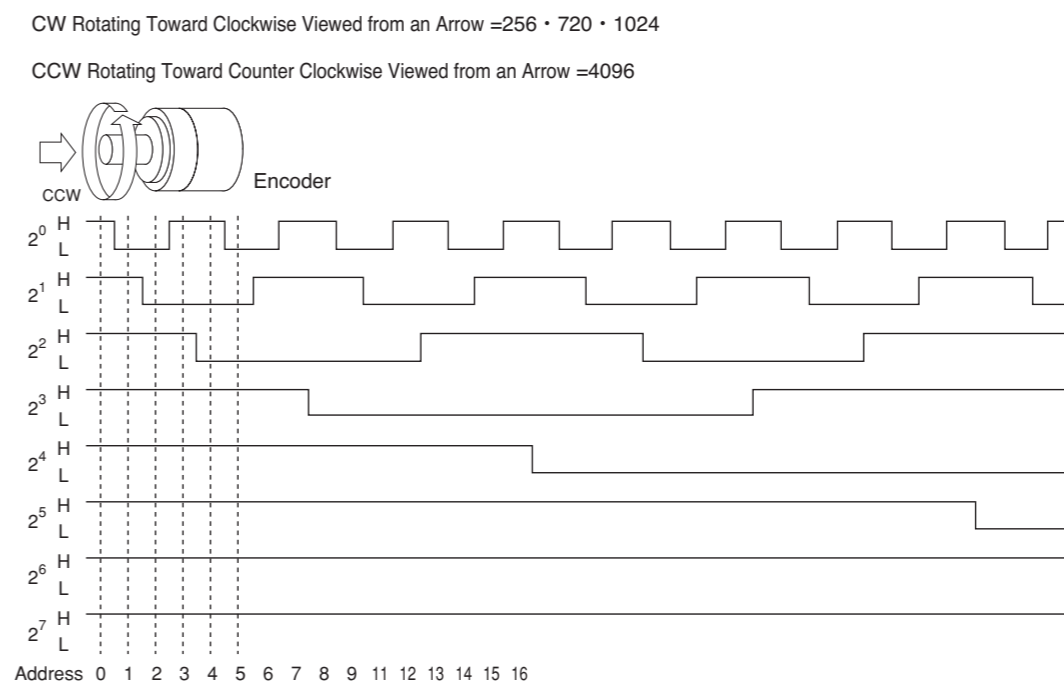


**Electrical Spec**

	TYPE	No Indication	C	CP	T
Power Supply(Vcc)		L : DC 4.5~13.2 V H : DC 10.8~26.4 V			
Current Consumption		100 mA Max			
Output Voltage	"H"	Vcc-1V Min	—	Vcc-1V Min	Vcc-3V Min
	"L" *1	0.5 VMax		—	3 V Max
Maximum Sink Current		20 mA			
Rise & Fall Time		2 μs Max			
Maximum Frequency Response*2		10kHz (256) 、20kHz (720、1024、4096)			

\*1) at Maximum Sink Current \*2) When The Loading is 5V 1KΩ

**Wave Form**



**Electrical Connections**

Color	Signal
Red	Power Supply(Vcc)
Black	0V
Brown	Signal 2 <sup>0</sup>
Brown-White	Signal 2 <sup>1</sup>
Orange	Signal 2 <sup>2</sup>
Orange-White	Signal 2 <sup>3</sup>
Yellow	Signal 2 <sup>4</sup>
Yellow-White	Signal 2 <sup>5</sup>
Green	Signal 2 <sup>6</sup>
Green-White	Signal 2 <sup>7</sup>
Blue	Signal 2 <sup>8</sup>
Blue-White	Signal 2 <sup>9</sup>
Gray	Signal 2 <sup>10</sup>
Gray-White	Signal 2 <sup>11</sup>
Shield	FG

Color	Signal
Red	Power Supply(Vcc)
Black	0V
Brown	Signal 2 <sup>0</sup>
Orange	Signal 2 <sup>1</sup>
Yellow	Signal 2 <sup>2</sup>
Green	Signal 2 <sup>3</sup>
Blue	Signal 2 <sup>4</sup>
Purple	Signal 2 <sup>5</sup>
Gray	Signal 2 <sup>6</sup>
White	Signal 2 <sup>7</sup>
Pink	Signal 2 <sup>8</sup> Only available for 10bit output
Sky Blue	Signal 2 <sup>9</sup> Only available for 10bit output
Shield	F.G

**Mechanical Spec**

Starting Torque	9.8×10 <sup>-3</sup> N · m Max
Angular Acceleration	1×10 <sup>5</sup> rad/s <sup>2</sup>
Shaft Loading	Thrust 49N
	Radial 78.4N
Moment of Inertia	3×10 <sup>-6</sup> kg · m <sup>2</sup>
Maximum Permissible Speed	Instantaneous : 5000min <sup>-1</sup> Continuous : 3000min <sup>-1</sup>
Net Weight(Without Cable)	250g Max

**Environmental Spec**

Operating Temperature	-10°C~+60°C
Storage Temperature	-30°C~+85°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	980m/s <sup>2</sup> ,11ms X, Y, Z Each 3 times
Ingress Protection	IP65



**ABSOLUTE TYPE**

**AHS2** Model

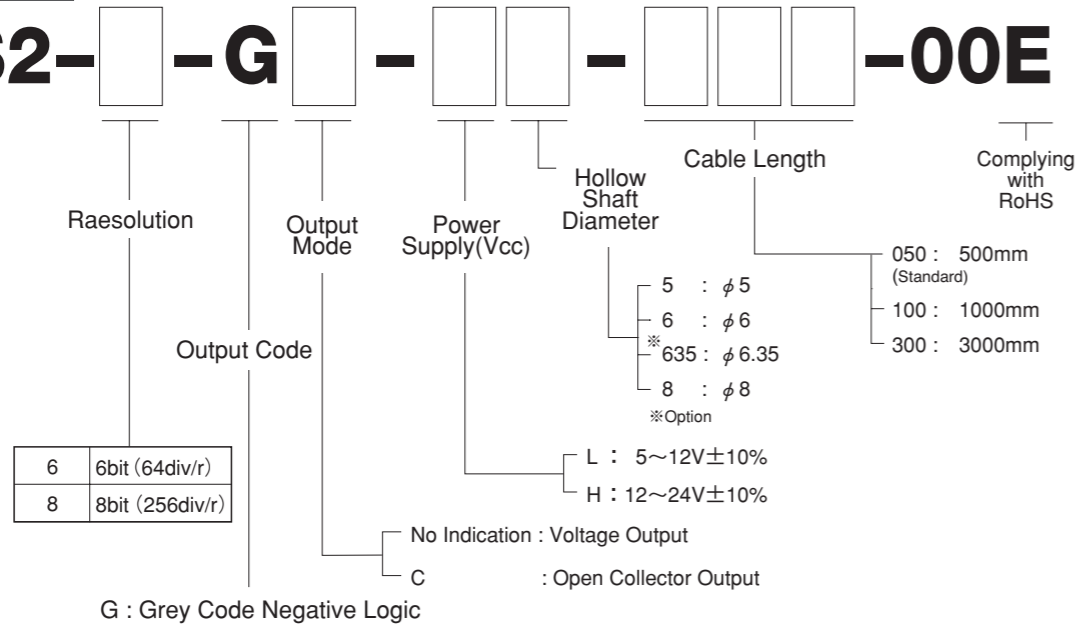


**38 Series Hollow Shaft and Absolute Models**

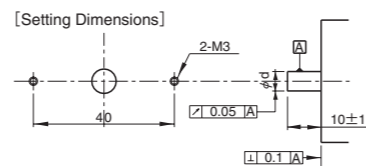
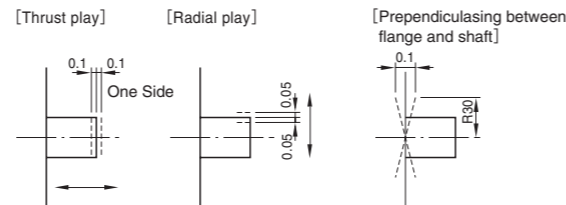
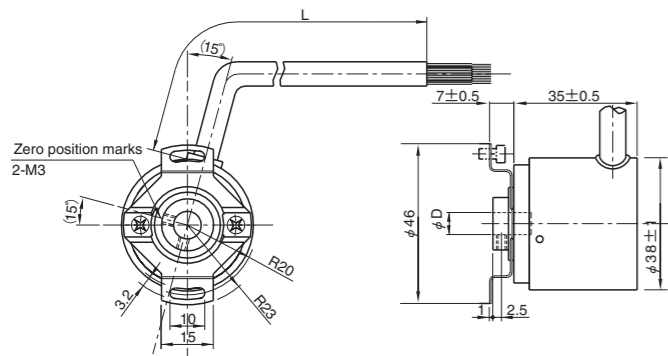
•8bit (256div/r) is Available with OD 38mm.



**Model**  
**AHS2- -G - - - -00E**

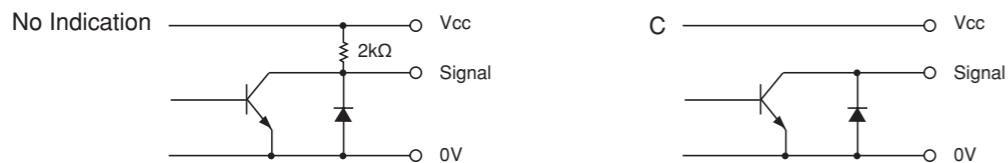


**External Dimension**



Shaft ring no.	φ D	φ d
800	φ 8H7Depth11	φ 8 g 6
500	φ 5H7Depth11	φ 5 g 6
600	φ 6H7Depth11	φ 6 g 6
635	φ 6.35H7Depth11	φ 6.35 g 6

**Output Circuit**



**Electrical Spec**

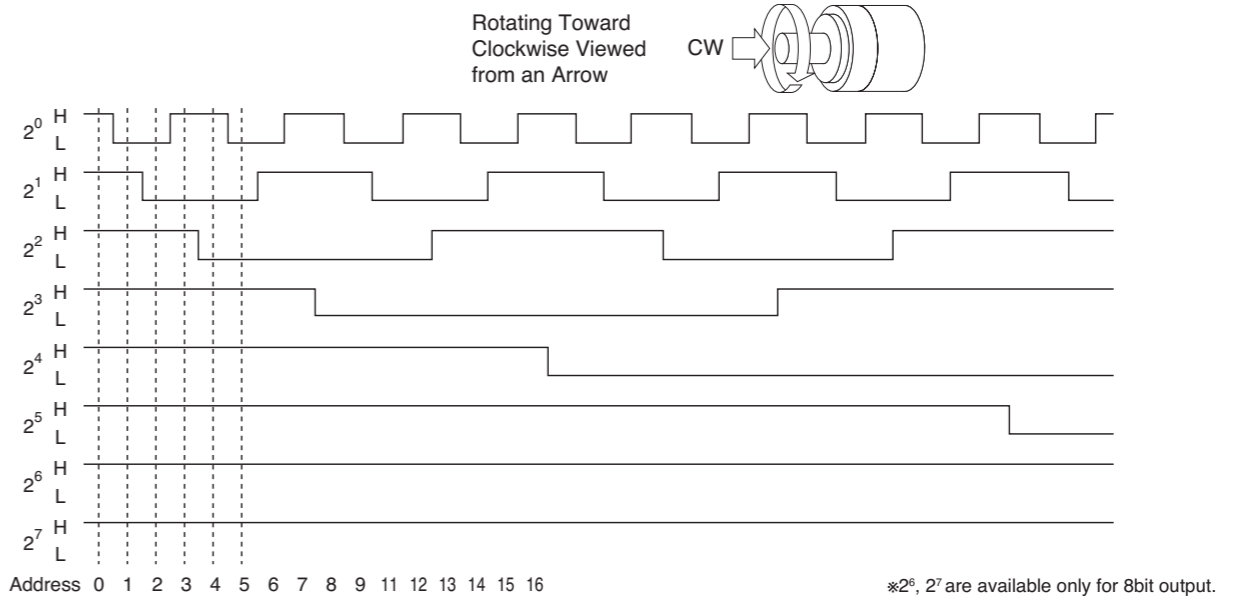
Power Supply(Vcc)	L : DC 4.5 ~13.2 V H : DC 10.8 ~26.4 V	
Current Consumption	100mA Max	
Output Voltage	"H"	Vcc-1V Min (Exclude C Mode)
	"L" <sup>*1</sup>	0.5 VMax
Maximum Sink Current	20 mA	
Rise & Fall Time	1 μs Max	
Maximum Frequency Response <sup>*2</sup>	5 kHz	

\*1) at Maximum Sink Current \*2) When The Loading is 5V 1KΩ

**Electrical Connections**

Color	Signal
Red	Power Supply(Vcc)
Black	0V
Brown	Signal 2 <sup>0</sup>
Orange	Signal 2 <sup>1</sup>
Yellow	Signal 2 <sup>2</sup>
Green	Signal 2 <sup>3</sup>
Blue	Signal 2 <sup>4</sup>
Purple	Signal 2 <sup>5</sup>
Gray	Signal 2 <sup>6</sup> Only available for 8bit output
White	Signal 2 <sup>7</sup> Only available for 8bit output
Shield	F.G

**Wave Form**



**Mechanical Spec**

Starting Torque	9.8x10 <sup>-4</sup> N · m Max	
Angular Acceleration	1x10 <sup>5</sup> rad/s <sup>2</sup>	
Shaft Loading	Thrust	9.8N
	Radial	29.4N
Moment of Inertia	8x10 <sup>-7</sup> kg·m <sup>2</sup>	
Maximum Permissible Speed	6000min <sup>-1</sup>	
Net Weight(Without Cable)	120g Max	

**Environmental Spec**

Operating Temperature	-10°C~+55°C
Storage Temperature	-25°C~+80°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50



# Manual Encoder

## Manual Pulse Generator

35PG .....	84
UFO.....	86
UFO-M2.....	88

## Handy Pendant

HP-U.....	90
HP-V.....	92
HP-M.....	94

MANUAL TYPE

35PG Model

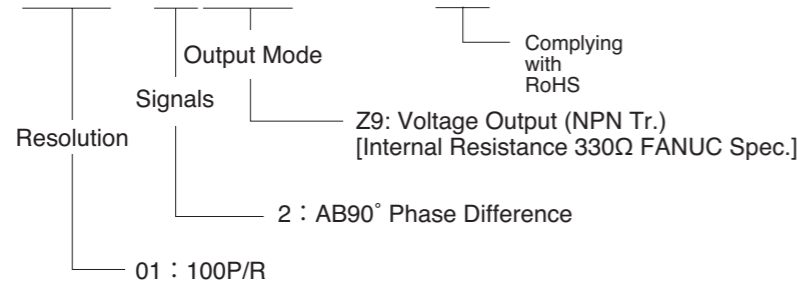


Small Size Model

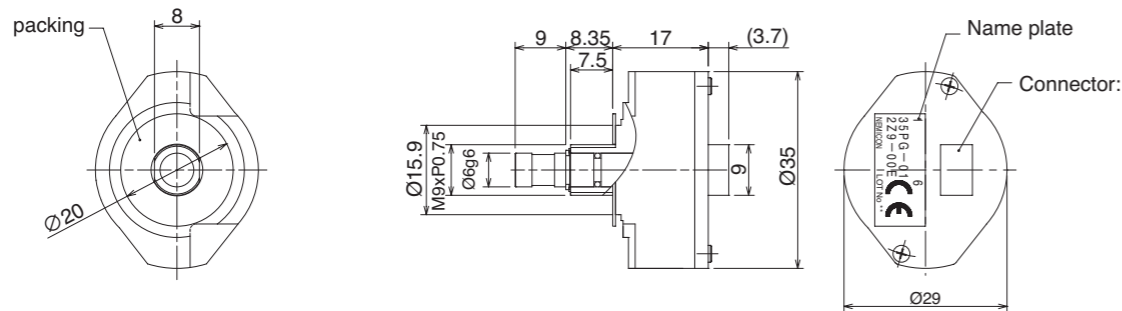
- Ideal for Measuring Equipment.
- Build-in Click Mechanism.



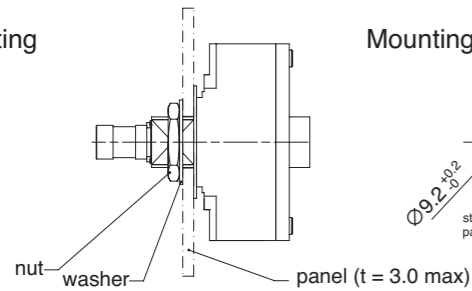
Model  
**35PG-01-2Z9-00E**



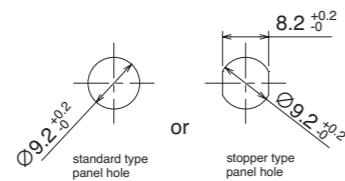
External Dimension



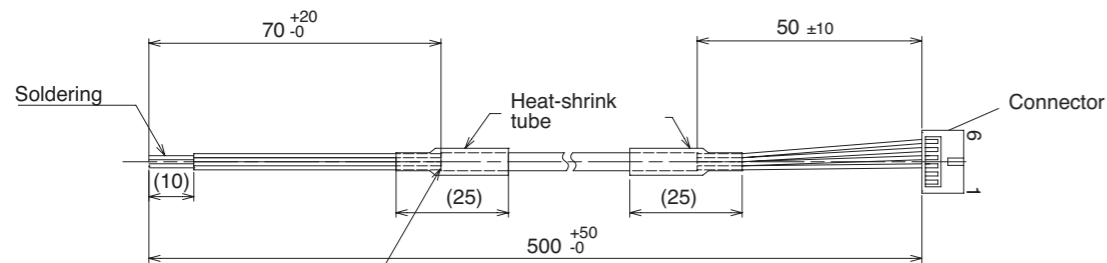
Mounting



Mounting hole



Option Cable(sold separately)

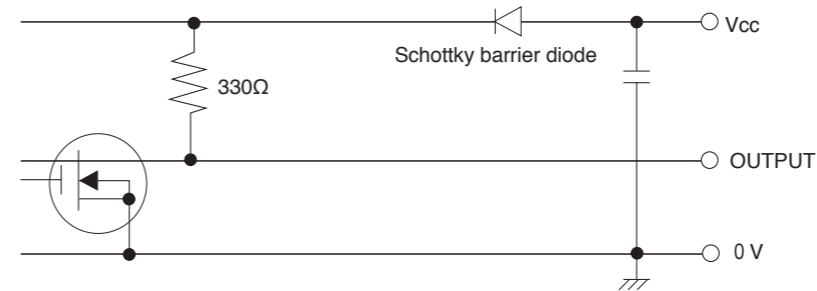


The shield is cut on the edge of the sheath.

Electrical Spec

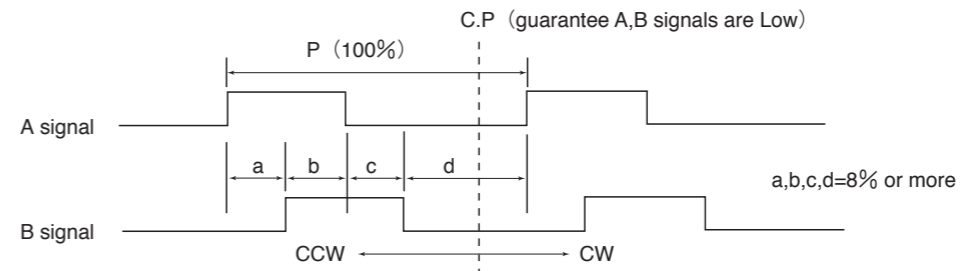
Power Supply(Vcc)	DC+5V ± 10%	Maximum Sink Current	20mA
Current Consumption	70mA Max	Maximum Frequency Response	1kHz
Resolution	100P/R	Rise & Fall Time	1µs Max
Output Signal	AB90° Phase Difference Voltage Output	Insulation Resistance	50MΩ Min DC 500V (0V ⇔ case)
Output Voltage	[H] : VCC-1V Min [L] : 0.5V Max		

Output Circuit



Wave Form

CW→Rotating Toward Clockwise Viewed from Shaft Side.  
100 click · 100 pulse/resolution (C.P=Click Point)



Electrical Connections

Connector Hirose Electric Co., Ltd.  
DF50A-6P-1V (51)

Pin No.	Signal
1	N.C
2	N.C
3	Sig, B
4	Sig, A
5	0V
6	5V

Mechanical Spec

Starting Torque	1.2x10 <sup>-2</sup> N·m Max
Shaft Loading	Nominal : 9.8N、Instantaneous : 19.6 N(Thrust) Nominal : 19.6N、Instantaneous : 19.6 N(Radial)
Rotation Life	> 1 million rotations (200min <sup>-1</sup> )
Maximum Permissible Speed	600min <sup>-1</sup> Max (Instantaneous)、200min <sup>-1</sup> (Nominal)
Net Weight	100g Max

Environmental Spec

Operating Temperature	-10°C~+60°C
Storage Temperature	-30°C~+80°C
Humidity	RH 90% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65 (Panel Mounting)

MANUAL TYPE

UFO-M2 Model

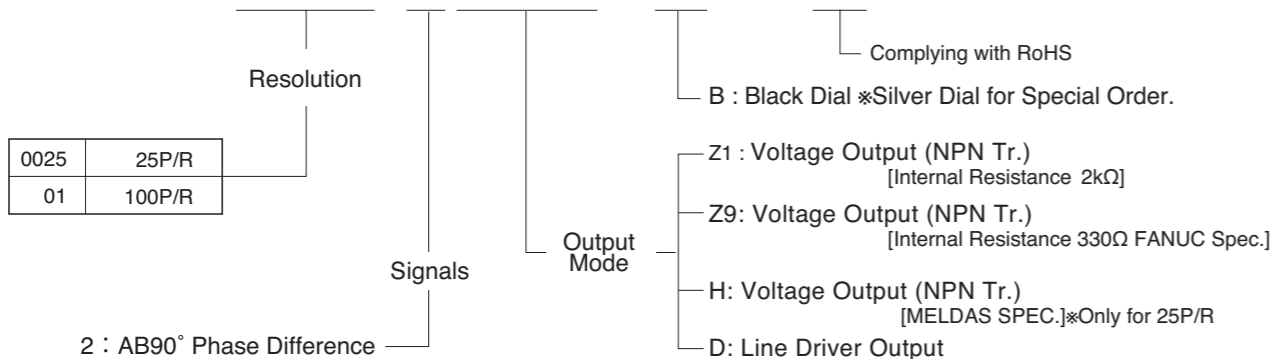


Compact & Very Thin

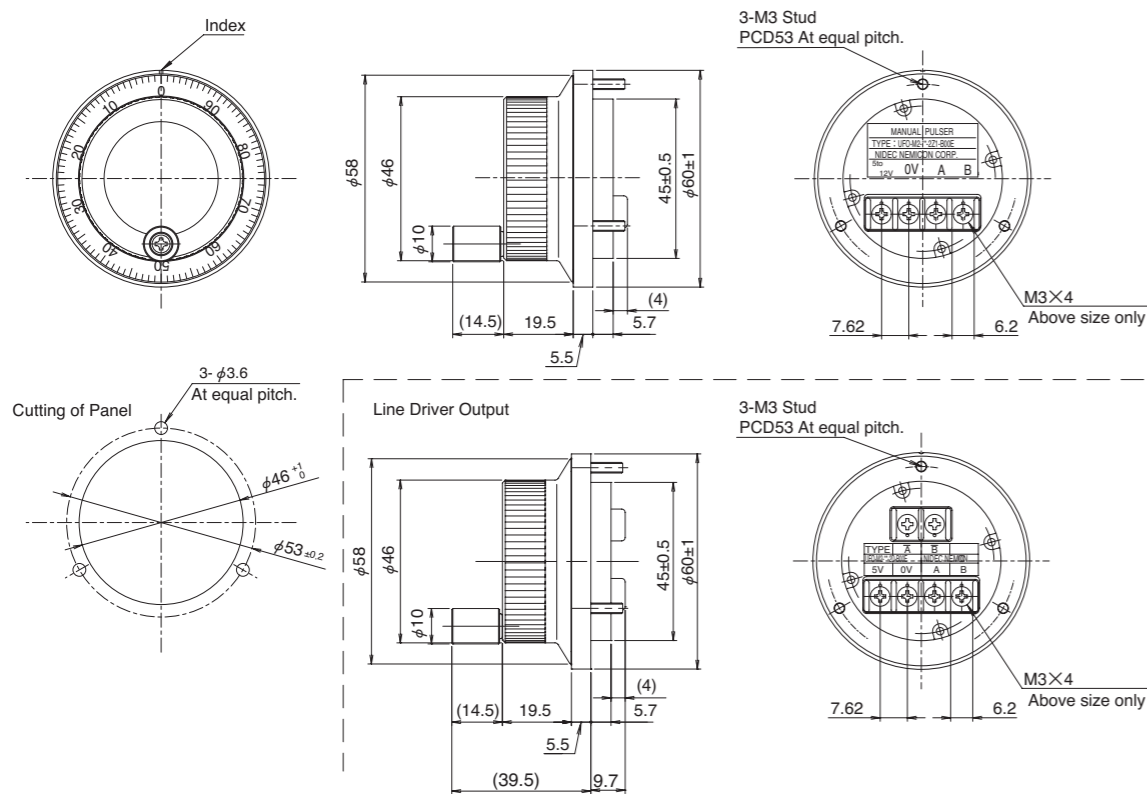
- Optical Slot Mode.
- Click Mechanism.



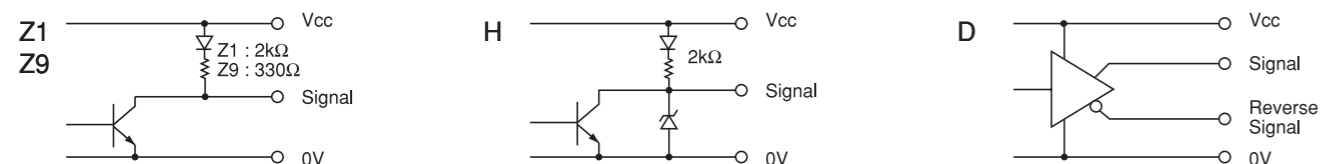
Model UFO-M2- [ ] -2 [ ] -B00E



External Dimension



Output Circuit



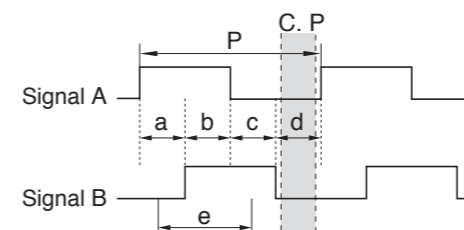
Electrical Spec

TYPE	Z1	Z9	H	D
Power Supply(Vcc)	DC+4.5V~+13.2V	DC+5V±10%	DC+12V±10%	DC+5V±5%
Current Consumption	50 mA Max	70 mA Max	50 mA Max	100 mA Max
Resolution	100P/R · 25P/R		25P/R	100P/R · 25P/R
Output Voltage	"H"	Vcc-1V Min	+5V±10%	2.5 V Min
	"L" ※1	0.5 V Max		
Maximum Frequency Response	5 kHz			
Rise & Fall Time	1 μs Max		1.5 μs Max	200 ns Max
Maximum Sink Current	20 mA Max			

※1) at Maximum Sink Current

Wave Form

2Z1 · 2Z9 · 2H

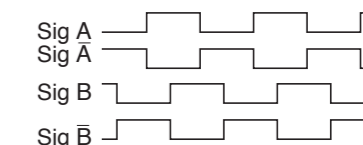


$$P = \frac{1}{\text{Resolution}}$$

$$a, b, c, d = \frac{P}{4} \pm \frac{P}{6}$$

Wave Ratio (Duty); 50 ± 25 (%)

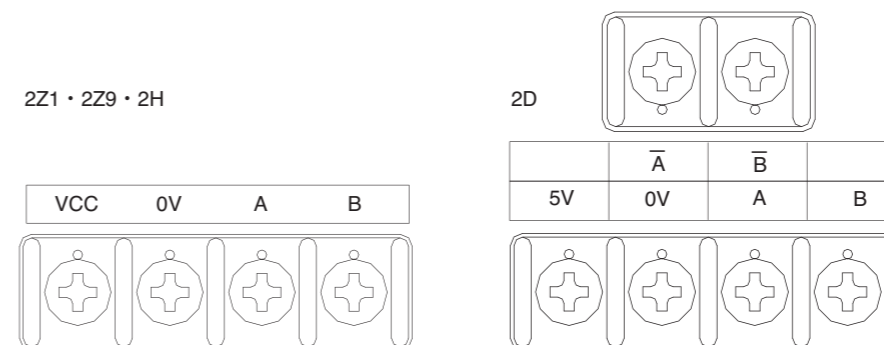
2D



C.P=Click points

For mode 25P/R click point is at each position of a,b,c,d.  
\*Point "e" is recommended as the system switching timing.

Electrical Connections



Mechanical Spec

Starting Torque	6.8×10 <sup>-3</sup> N·m~2.9×10 <sup>-2</sup> N·m	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Maximum Permissible Speed	600min <sup>-1</sup> (Instantaneous) 200min <sup>-1</sup> (Continuous)	
Rotational Life	> 1 million rotations (200min <sup>-1</sup> )	
Net Weight	200g Max	

Environmental Spec

Operating Temperature	-10°C~+60°C
Storage Temperature	-30°C~+70°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> ,11ms X, Y, Z Each 3 times
Ingress Protection	IP64(Panel Mounting)

MANUAL TYPE

UFO Model

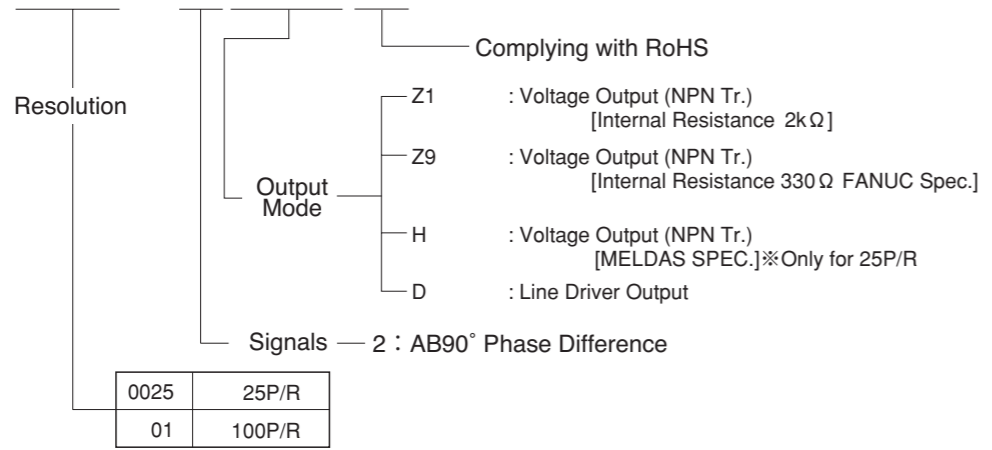


Compact & Very Thin

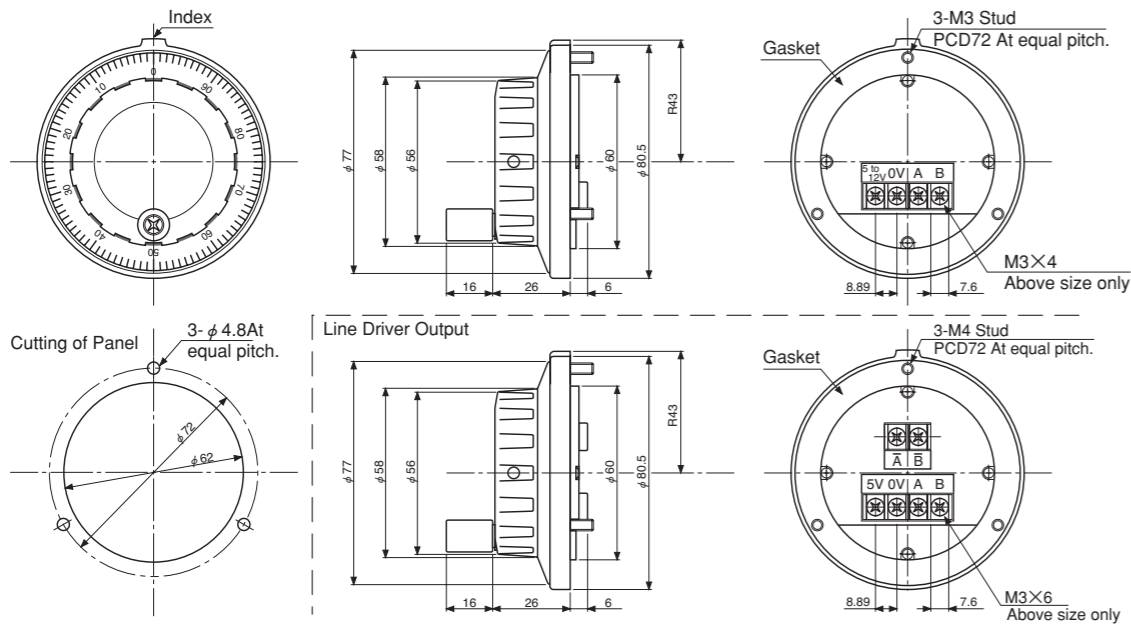
- Suitable for Thin Type Operator Panel.
- Click Mechanism.



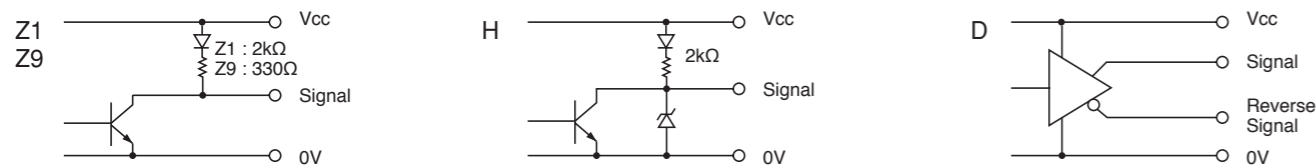
Model UFO-□□-2□□E



External Dimension



Output Circuit



Electrical Spec

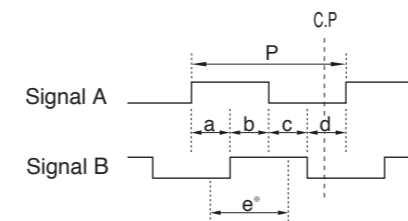
TYPE		Z1	Z9	H	D
Power Supply(Vcc)		DC+4.5V~+13.2V	DC+5V±10%	DC+12V±10%	DC+5V±5%
Current Consumption		50 mA Max	70 mA Max	50 mA Max	150 mA Max
Resolution		100P/R · 25P/R		25P/R	100P/R · 25P/R
Output Voltage	“H”	Vcc-1V Min		+5V±10%	2.5 V Min
	“L”※1	0.5 V Max			
Maximum Frequency Response		5 kHz			
Rise & Fall Time		1 μs Max		1.5 μs Max	200 ns Max
Maximum Sink Current		20 mA			

※1) at Maximum Sink Current

Wave Form

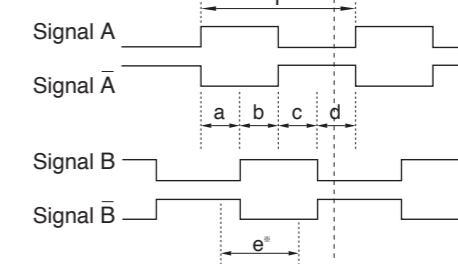
CW → Rotating Toward Clockwise Viewed from Front Side

2Z1 · 2Z9 · 2H



P=1/Resolution a,b,c,d=P/4±P/6

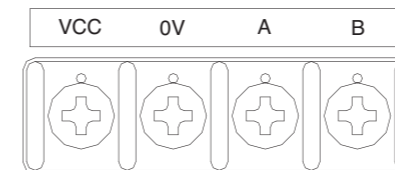
2D



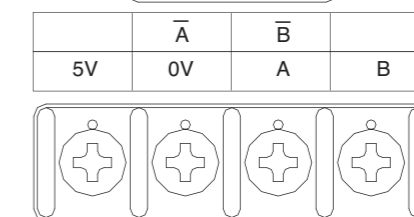
C.P=Click points  
For mode 25P/R click point is at each position of a,b,c,d.  
※Point “e” is recommended as the system switching timing.

Electrical Connections

2Z1 · 2Z9 · 2H



2D



Mechanical Spec

Starting Torque	1.96X10 <sup>-2</sup> N·m~5.88X10 <sup>-2</sup> N·m	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Maximum Permissible Speed	600min <sup>-1</sup> (Instantaneous) 200min <sup>-1</sup> (Continuous)	
Rotational Life	> 1 million rotations (200min <sup>-1</sup> )	
Net Weight	200g Max	

Environmental Spec

Operating Temperature	-10°C~+60°C
Storage Temperature	-20°C~+70°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP64(Panel Mounting)

# HANDY PENDANT

# HP-U Model



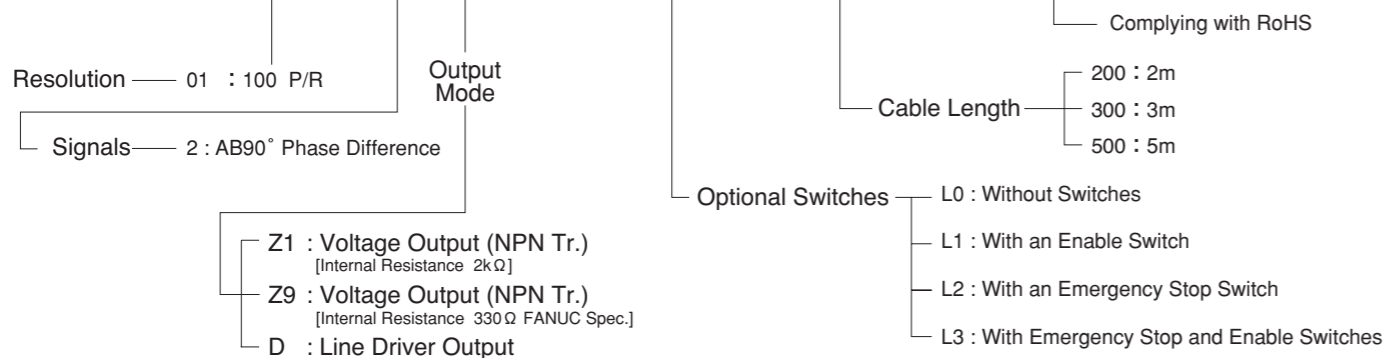
## Economical Palm Size Model

- Low Cost Plastic Box Type.
- Comfortable Size for Hand.

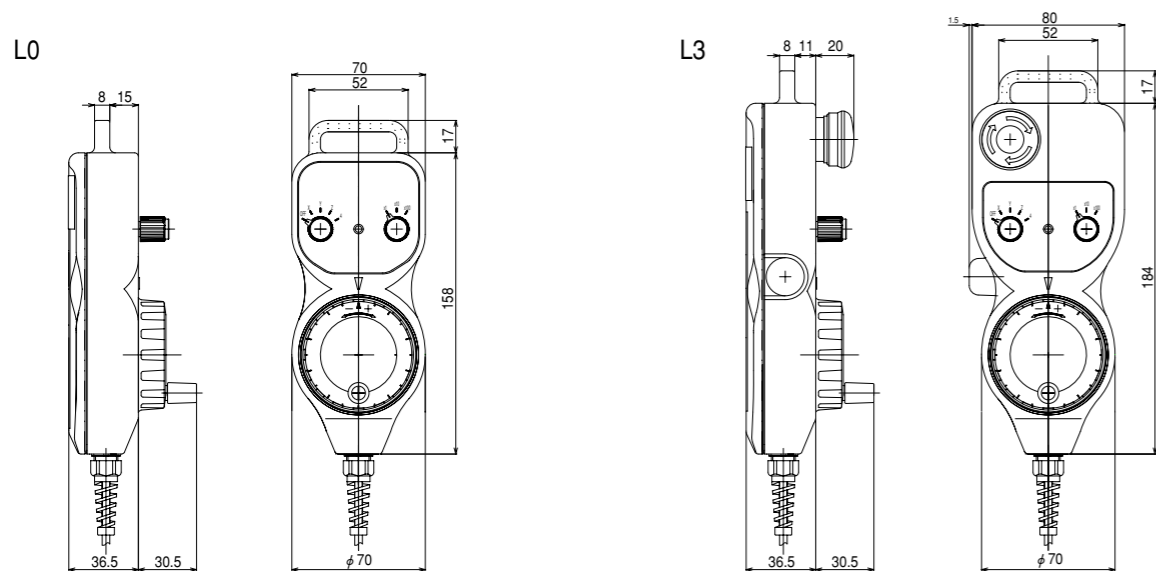


### Model

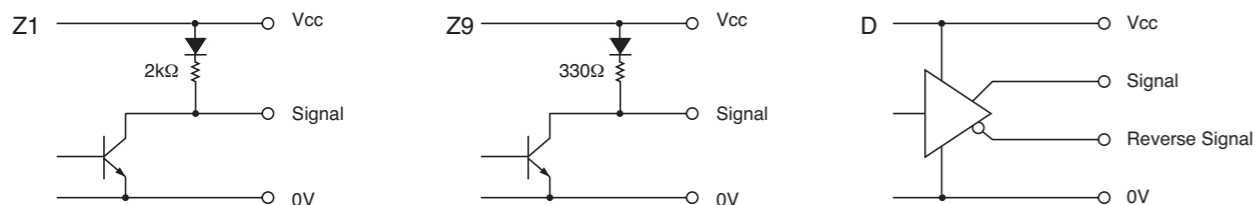
**HP - U01 - 2 - P - - - - - 00E**



### External Dimension



### Output Circuit



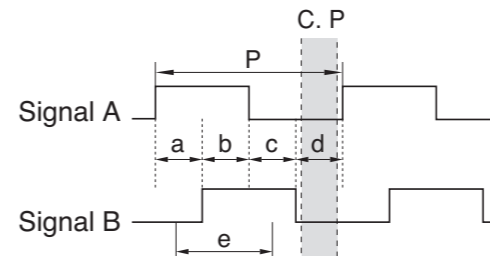
### Electrical Spec

Manual Pulse Generator

TYPE	Z1	Z9	D
Power Supply(Vcc)	DC4.5~13.2V	DC5V±10%	DC5V±5%
Current Consumption	60mA Max	80mA Max	150mA Max
Resolution	100P/R		
Output Voltage	"H"	Vcc-1V Min	2.5V Min
	"L" *1	0.5V Max	
Maximum Frequency Response	5kHz		
Rise & Fall Time	1 μs Max		200ns Max
Maximum Sink Current	20 mA Max (As L level)		

\*1) at Maximum Sink Current

### Wave Form



$$P = \frac{1}{\text{Resolution}}$$

$$a, b, c, d = \frac{P}{4} \pm \frac{P}{6}$$

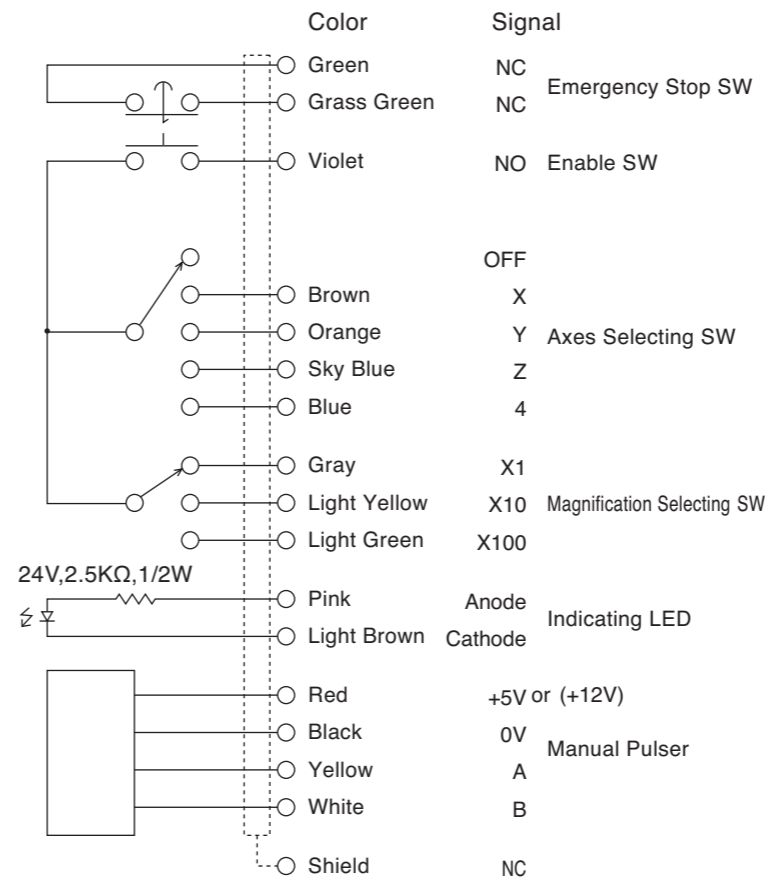
Wave Ratio (Duty): 50 ± 25(%)

C. P = Click Point

\*1) Inverted Output is available for 2D type.

\*2) Point "e" is recommended as the system switching timing.

### Electrical Connections



### Mechanical Spec

Starting Torque	1.96X10 <sup>-2</sup> N·m~5.88X10 <sup>-2</sup> N·m (at 20°C)	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Maximum Permissible Speed	200min <sup>-1</sup>	
Net Weight(Without Cable)	450g Max	

### Environmental Spec

Operating Temperature	-10°C~+60°C
Storage Temperature	-20°C~+70°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65(for Box)

# HANDY PENDANT

# HP-V Model



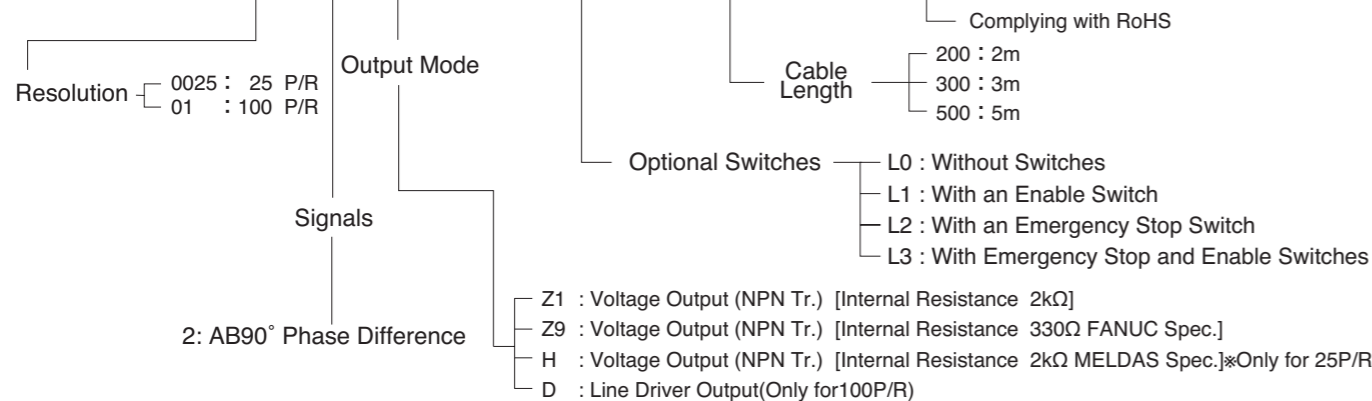
## Handy Model

- Reasonable Cost vs. Performance.
- Fit To Hand Holding.

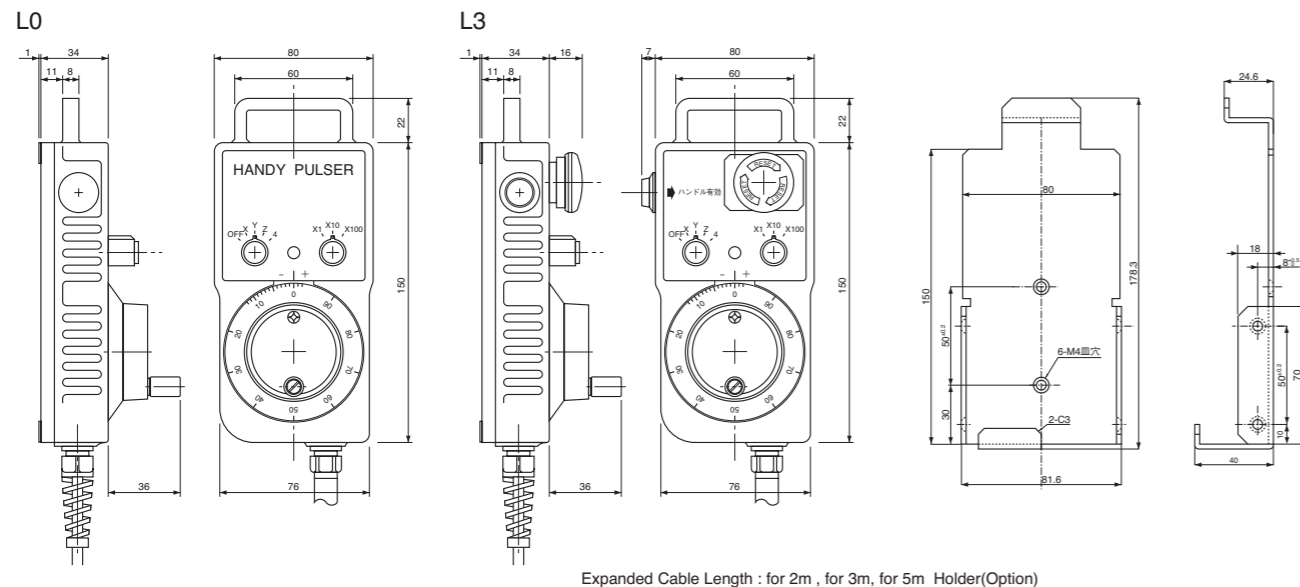


### Model

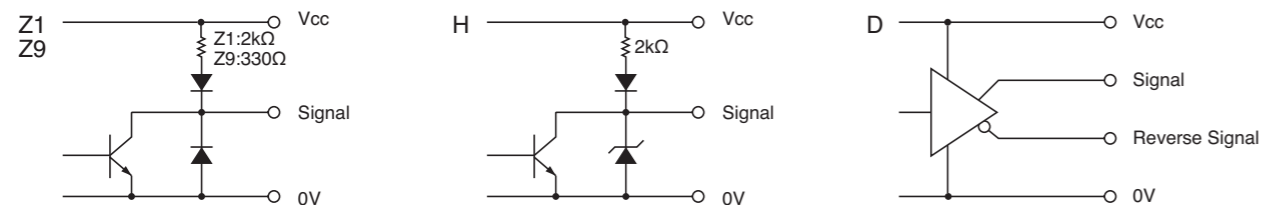
HP-V   -2   -P   -   -00E



### External Dimension



### Output Circuit



### Electrical Spec

#### Manual Pulse Generator

TYPE	Z1	Z9	H	D
Power Supply(Vcc)	DC+4.5V~13.2V	DC5V±10%	DC12V±10%	DC5V±5%
Current Consumption	60mA Max	80mA Max	60mA Max	150mA Max
Resolution	100P/R · 25P/R			100P/R
Output Voltage	"H"	Vcc-1V Min	+5V±10%	2.5V Min
	"L" *1	0.5V Max		
Maximum Frequency Response	5kHz			
Rise & Fall Time	1 μs Max		1.5 μs Max	200ns Max
Maximum Sink Current	20 mA			

\*1) at Maximum Sink Current

### Switches

#### Rotary Switches

Contact Rating	0.4 VA	Maximum Voltage	25 V
Current	0.1~50 mA		

#### Enable Switch

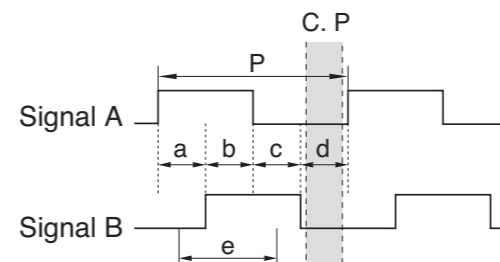
*1 Contact Rating	With AC Load Resistance	AC220V 0.5A , AC110V 1.0A
	With DC Load Resistance	DC 24V 1.0A

#### Emergency Stop Switch

*1 Contact Rating	With AC Load Resistance	AC250V 0.5A , AC125V 1.0A
	With DC Load Resistance	DC 30V 1.0A

\*1Min. Load DC 5V 1mA

### Wave Form



$$P = \frac{1}{\text{Resolution}}$$

$$a, b, c, d = \frac{P}{4} \pm \frac{P}{6}$$

Wave Ratio (Duty): 50 ± 25(%)

C. P = Click Point

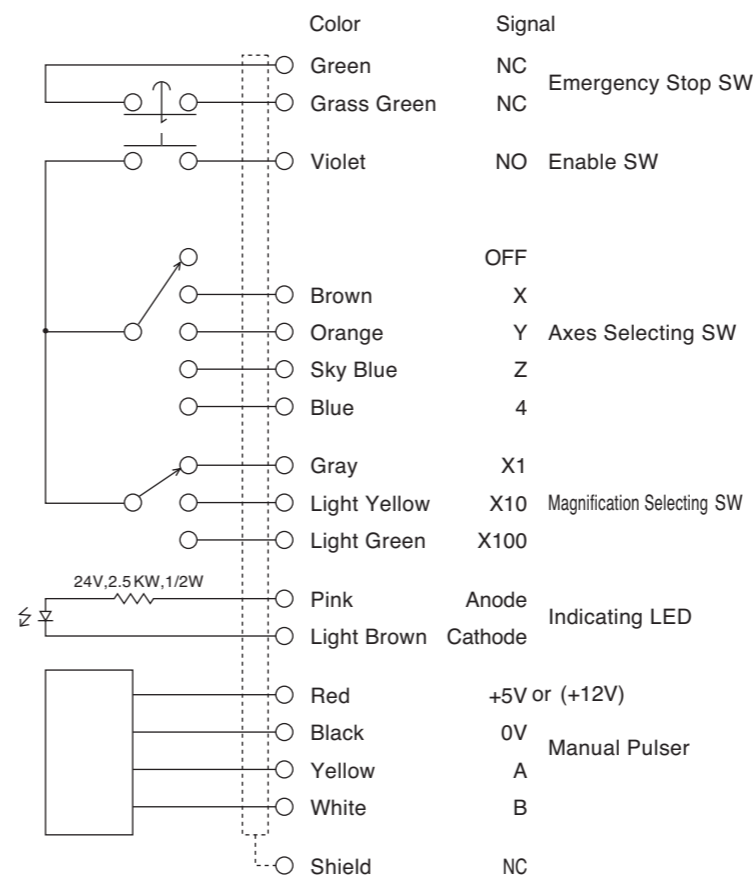
For mode 25P/R click point is at each position of a,b,c,d.

\*1) Inverted Output is available for 2D type.

\*2) Point "e" is recommended as the system switching timing.

### Electrical Connections

#### L3 Spec.



### Mechanical Spec

Starting Torque	1.96×10 <sup>-2</sup> N·m~5.88×10 <sup>-2</sup> N·m	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Maximum Permissible Speed	200min <sup>-1</sup>	
Net Weight(Without Cable)	500g Max	

### Environmental Spec

Operating Temperature	-10°C~+60°C
Storage Temperature	-20°C~+70°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X,Y,Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65(for Box)



# HANDY PENDANT



## Handy Model

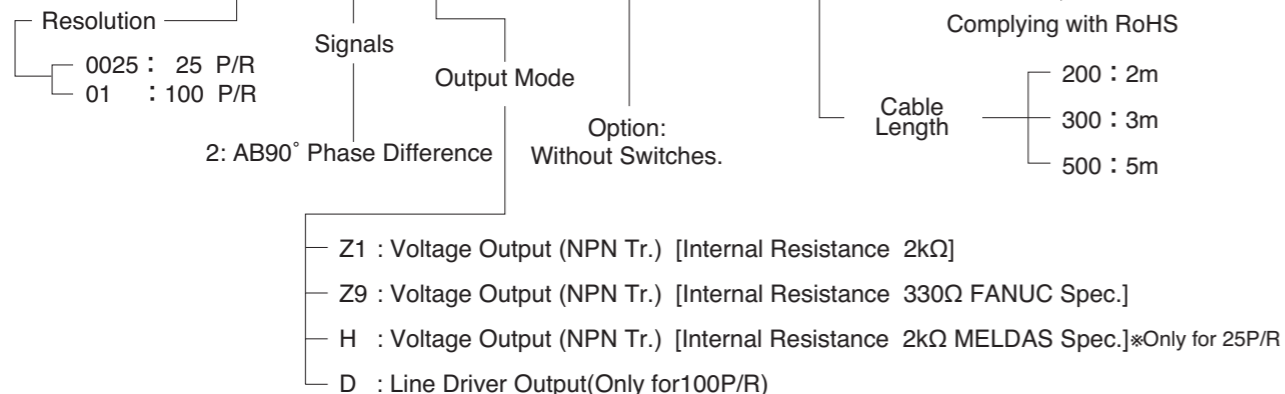
- Reasonable Cost vs. Performance.
- Fit To Hand Holding.

# HP-M Model

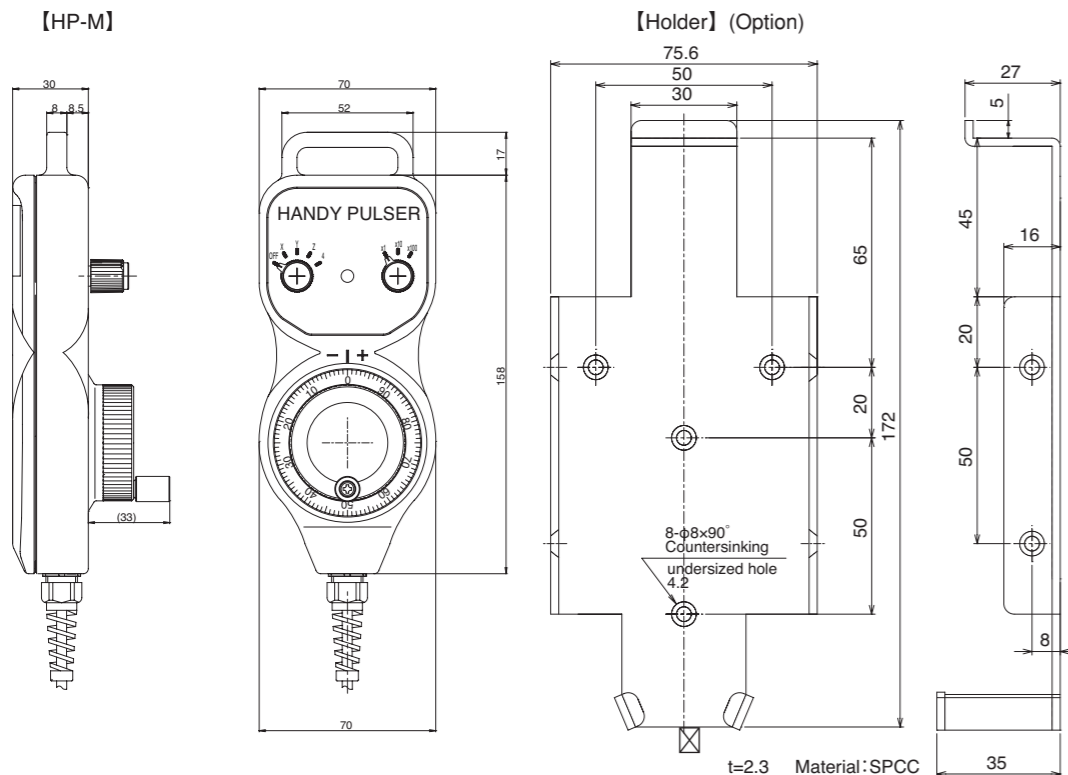


### Model

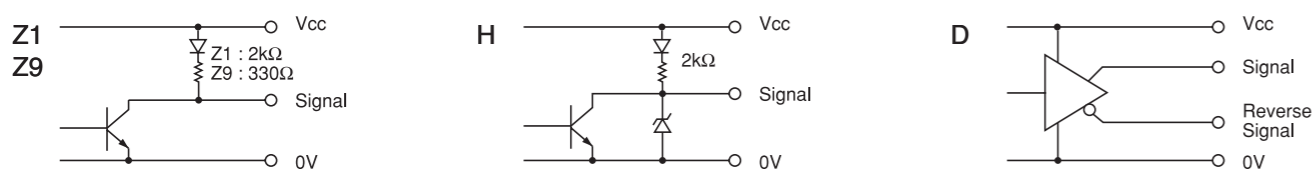
## HP-M [ ] [ ] -2 [ ] [ ] -P L 0 - [ ] [ ] [ ] -00E



### External Dimension



### Output Circuit



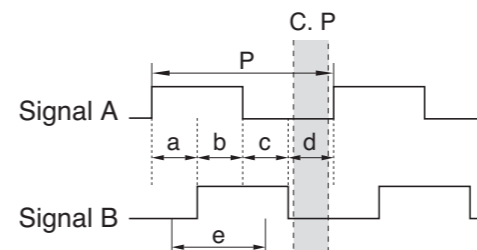
### Electrical Spec

#### Manual Pulse Generator

TYPE		Z1	Z9	H	D
Power Supply(Vcc)		DC+4.5V ~13.2V	DC5V±10%	DC12V±10%	DC5V±5%
Current Consumption		60mA Max	80mA Max	60mA Max	150mA Max
Resolution		100P/R		25P/R	100P/R
Output Voltage	"H"	Vcc-1V Min		+5V±10%	2.5V Min
	"L" ※1	0.5V Max			
Maximum Frequency Response		5kHz			
Rise & Fall Time		1 μs Max		1.5 μs Max	200ns Max
Maximum Sink Current		20 mA Max (As L level)			

※1) at Maximum Sink Current

### Wave Form



$$P = \frac{1}{\text{Resolution}}$$

$$a, b, c, d = \frac{P}{4} \pm \frac{P}{6}$$

Wave Ratio (Duty): 50 ± 25(%)

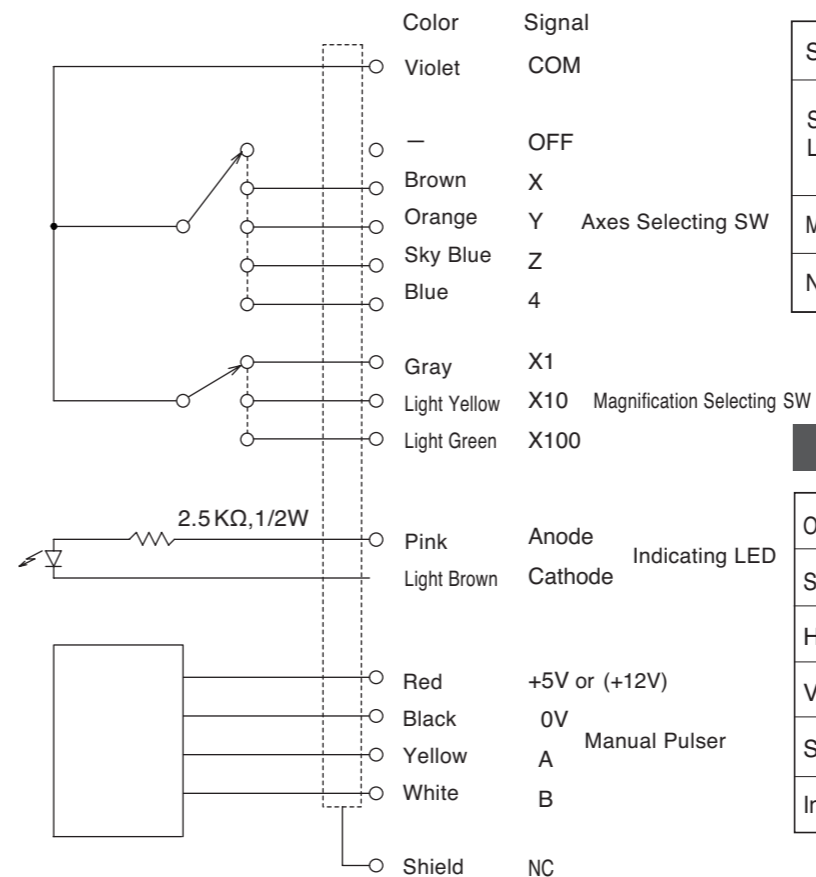
C. P = Click Point

For mode 25P/R click point is at each position of a,b,c,d.

※1) Inverted Output is available for 2D type.

※2) Point "e" is recommended as the system switching timing.

### Electrical Connections



### Mechanical Spec

Starting Torque	6.9x10 <sup>-3</sup> N·m~2.9x10 <sup>-2</sup> N·m	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Maximum Permissible Speed	200min <sup>-1</sup>	
Net Weight(Without Cable)	450g Max	

### Environmental Spec

Operating Temperature	-10°C~+60°C
Storage Temperature	-20°C~+70°C
Humidity	RH 85% Max No Condensation
Vibration	10~55 Hz / 1.5mm X, Y, Z Each 2h
Shock	490m/s <sup>2</sup> , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65(for Box)

## Accessories · Sensors · Custom made

### Accessories

Coupling (BC · GJ) .....	98
Extension cable for OD18mm type and OD38mm type .....	100

### Sensors

PA-M12.....	101
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Development of Customized Encoder .....	102
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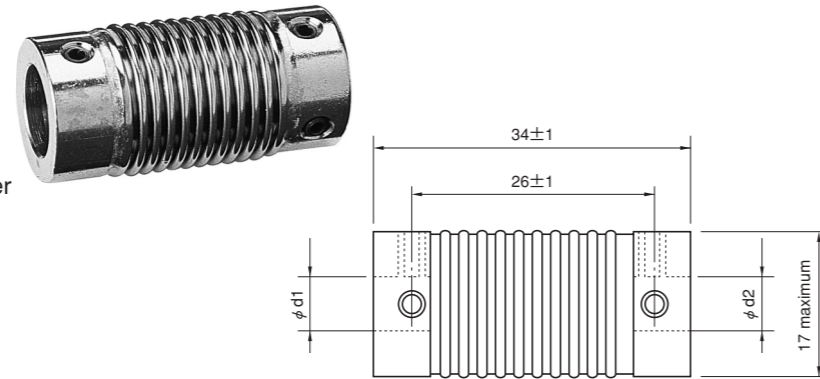
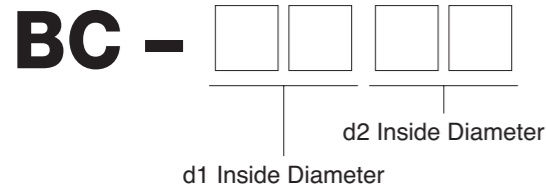
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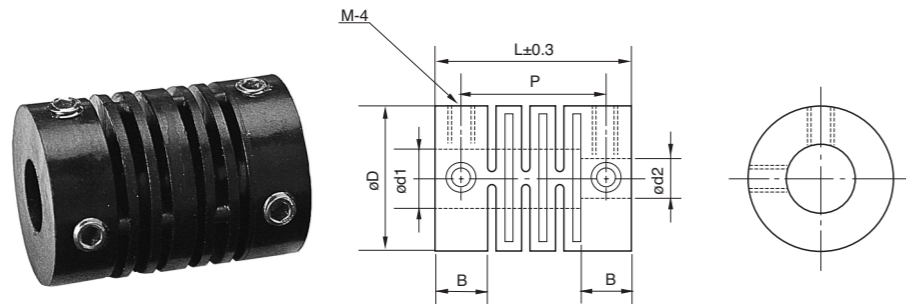
# Coupling (Accessories)

## BC TYPE



MODEL		0503	0505	0510	1010
Coupling Each Part Measure	φd1, d2	φ3 / φ5	φ5	φ5 / φ10	φ10
Coupling Spec.	Tolerance Transfer Torque	0.06 N · m			
	Mounting Tolerance (Clearance to shaft)	0.1 mm Max			
	Mounting Tolerance (Falling angle to shaft)	1° Max			
	Material	Shaft Joints: Brass		Bellows: Phosphor Bronze	

## GJ TYPE



The following are to be cared when a plastic made coupling is used.

- Fastening torque of set screw is to be cared not to exceed the specified torque in the figure. Otherwise the screw tap could be damaged resulting is shaft slippage.
- The shaft must be inserted less than "B" dimension, not to be engaged to deep.
- Do not apply over torque to encoder shaft.
- High speed rotating use for encoder over 3000min<sup>-1</sup> must be carefully designed securing safety factor over 2.0.

## GJ TYPE

### Specifications

Type	Dimensions								Specifications									
	d1	d2	D	L	P	B	Set screw		Rated Torque (N·m)	Max. Speed (min <sup>-1</sup> )	Spring Constant (N·m/rad)	Eccentricity (mm)	Deviation angle (deg)	Allowable extension (mm)	Moment of inertia (kg·m <sup>2</sup> )	Weight (g)	Materials	
							M	Torque (N·m)										
GJ	1.5-1.5	1.5	1.5	9	11	8.2	3.2	2	0.08	0.16	4,000	4	0.2	3	±0.3	1.0×10 <sup>-8</sup>	0.9	Glass-fiber reinforced resin
	1.5-2.5	1.5	2.5	10	12	8.4	3.2	2	0.08	0.22	4,000	5	0.2	3	±0.3	1.4×10 <sup>-8</sup>	1.1	
	2-2	2	2	9	13	10	3.2	2	0.08	0.18	4,000	3.5	0.3	4	±0.3	1.0×10 <sup>-8</sup>	1	
	3-3	3	3	12	20	15	5.1	3	0.15	0.35	4,000	8	0.4	5	±0.3	4.5×10 <sup>-8</sup>	2.5	
	4-4	4	4	13	21	15	5.3	3	0.2	0.5	4,000	8	0.4	5	±0.4	7.0×10 <sup>-8</sup>	3.1	
	5-5	5	5	14	21	15	5.2	3	0.2	0.55	5,000	10	0.5	5	±0.4	9.0×10 <sup>-8</sup>	3.3	
	6-6	6	6	15	22	16	5.2	3	0.25	0.8	6,000	16	0.5	5	±0.4	1.2×10 <sup>-7</sup>	3.9	
	8-8	8	8	19	24	17	7	4	0.4	1.2	8,000	40	0.5	5	±0.4	3.9×10 <sup>-7</sup>	7.3	
G2J	10-10	10	10	22	26	18.8	7.2	4	0.5	1.7	10,000	60	0.5	5	±0.4	7.0×10 <sup>-7</sup>	10	Glass-fiber reinforced resin
	4-2.5	4	2.5	14	21	16	5.3	3	0.25	0.5	5,000	6	0.4	5	±0.4	8.0×10 <sup>-8</sup>	3.4	
	4-3	4	3															
	4-3.2	4	3.2															
	4-4	4	4															
	5-3	5	3	15	20.5	15	5.3	3	0.25	0.6	6,000	12	0.4	5	±0.4	1.0×10 <sup>-7</sup>	4	
	5-3.2	5	3.2															
	5-4	5	4															
	5-5	5	5															
	6-3	6	3	16	21	16	5.5	3	0.3	0.8	6,000	18	0.5	5	±0.4	1.3×10 <sup>-7</sup>	4.5	
	6-3.2	6	3.2															
	6-4	6	4															
6-5	6	5																
6-6	6	6	20	24	16	6.8	4	0.45	1.4	8,000	50	0.5	5	±0.4	4.0×10 <sup>-7</sup>	7.5		
8-4	8	4																
8-5	8	5																
8-6	8	6																
8-8	8	8																
GJK	9.53-9.53	9.53	9.53	25	32	25	7.3	4	0.65	2.2	10,000	100	0.4	4	±0.4	1.3×10 <sup>-8</sup>	15	
	10-10	10	10	25	32	25	7.3	4	0.65									
	12-12	12	12	28	34	27	7.5	4	0.8									3

Heat resistance (ambient temperature) glass fiber reinforced PBT: -30°C ~ 85°C. However 1/2 torque is at a maximum temperature.

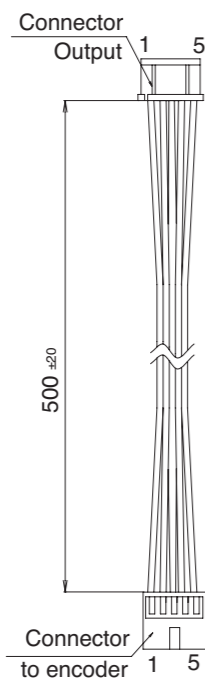
# Extension cable for OD18mm type and OD38mm type

## R-G41581-02

Model  
**18S,18M  
(2MC)**

1. Wire  
UL2651 5x28AWG (7/0.13)
2. Connector to encoder  
DF3-5EP-2C [hirose]
3. Output Connector  
DF3-5S-2C [hirose]
4. Wiring specifications

Pin No.	Color	Signal
1	Brown	VCC
2	Red	0V
3	Orange	Sig. A
4	Yellow	Sig. B
5	Green	Sig. Z

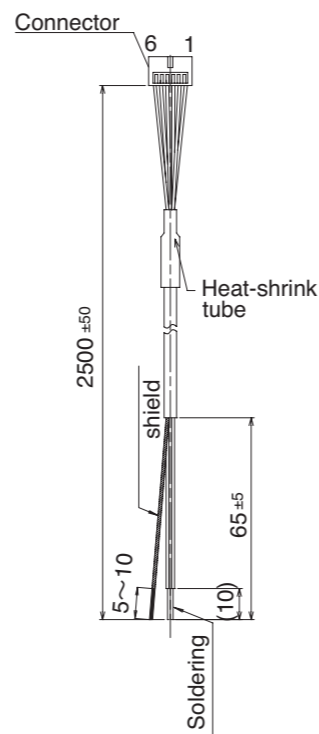


## R-G41584-02

Model  
**38S,38H  
(2MC·2MT)**

1. Cable  
UL2103 5CxAWG28 (7/0.127)
2. Connector  
DF3-6EP-2C [hirose]
3. Wiring specifications

Pin No.	Color	Signal
1	Red	VCC
2	Black	0V
3	Blue	Sig. A
4	White	Sig. B
5	Yellow	Sig. Z
6	Shield	Shield

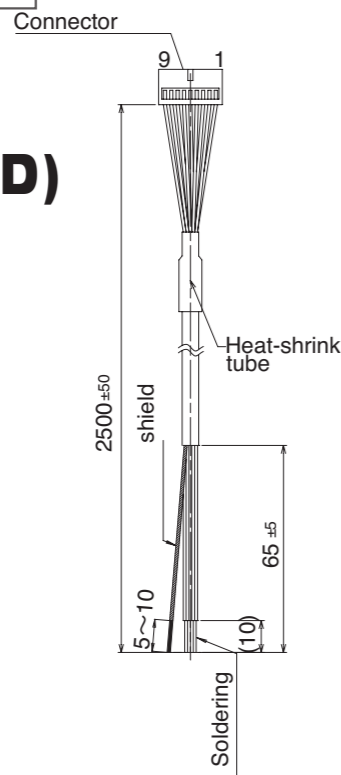


## R-G41584-03

Model  
**18S,18M,  
38S,38H(2MD)**

1. Cable  
UL2103 4PxAWG28 (7/0.127)
2. Connector  
DF3-9EP-2C [hirose]
3. Wiring specifications

Pin No.	Color	Signal
1	Red	VCC
2	Black	0V
3	Green	Sig. A
4	Blue	Sig. A
5	White	Sig. B
6	Gray	Sig. B
7	Yellow	Sig. Z
8	Orange	Sig. Z
9	Shield	Shield



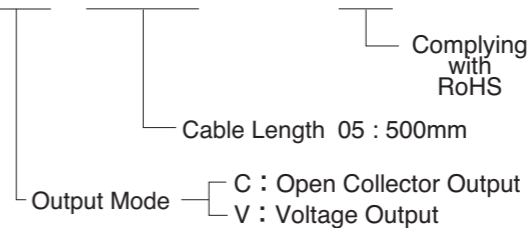
# Gear Sensor

# PA-M12



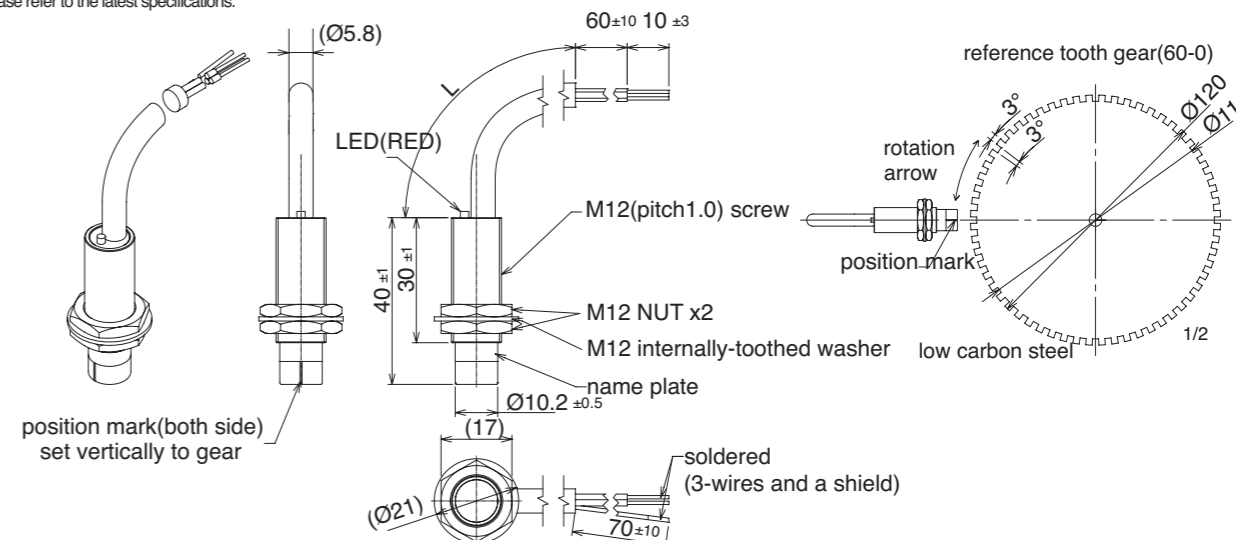
Model

## PA-M12-□-05-00E



Mechanical and Electrical characteristics		Outline and Environmental characteristics					
Sensing method	Differential magnetic sensor	Wiring characteristics	Wire color	Red	White	Black	Shield
Reference Tooth gear	Module 1.0~1.5 t=4.0mm or more low carbon steel		Signal	Vcc	Signal	0V	N.C
Air gap	1±0.5mm (gear ⇄ face of sensor)/recommended value:1.0mm*	Conductor: AWG 28					
Supply Voltage	Open Collector	Main material	SUS304(screw), PPS(tip)				
	Voltage Output		Signal High : Dark lighting				
Current consumption(Unloaded)	DC30mA Max (without sink current)	Checking LED(RED)	Signal Low : Bright lighting				
Sink current	40mA Max		VCC ON : Bright lighting(when non-rotating of gear)				
Output Voltage	[H] : (Vcc-1.1V)or more (unloaded, at 25°C)(Voltage Output only)	Operating temperature	-20°C~+85°C				
	[L] : 0.4V or less (Vcc 16V, sink current 40mA, at 25°C)	Storage temperature	-25°C~+85°C				
Pull-up resistor	2.2kΩ±5%(*Voltage Output only)	Humidity	RH 85% Max No Condensation				
Response speed	12000P/Sec Max	Vibration	10~55Hz/1mm (X,Y,Z each 1.5 hours)				
Output waveform	25~75%(H/(H+L)×100)Square wave	Shock	490m/s <sup>2</sup> ,11ms (X,Y,Z each 10 times)				
Maximum output voltage	DC 30V	Ingress Protection	IP67				

\* It's different depending on a used module and the material of the gear.  
\* Please refer to the latest specifications.



# Encoders for Customers

## [Develop Custom Made Encoders]

Followings are several kinds of the products developed by coordinated efforts with our customers.  
(Only the small portion of the such products are shown by the limit of the paper.)

### 12SA Model

Shaft Type  
Sine-Wave Output Encoder(A, B)



- Feature
- Small-size house encoder with OD12mm (OD12mm x L13.5mm).
- Low torque, low inertia type.
- Highly accurate signal.

### 60H Model

Hollow Shaft Type Encoder  
Square Type



- Feature
- OD60mm Hollow shaft type Encoder(OD60mm × 38mm)
- Through type
- Suitable shape for mounting

### 47H Model

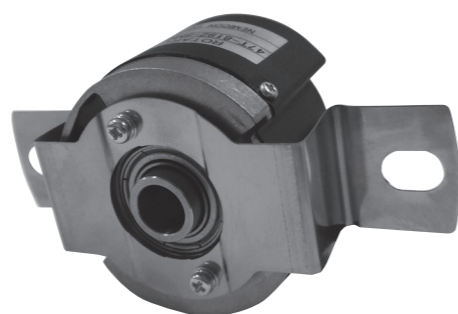
Hollow Shaft Type Encoder



- Feature
- OD47mm hollow shaft type encoder (OD47mm x L34mm).
- High resolution type with 8192 P/R.
- Output signal of 6 signals of ABZUVW with linedriver.

### 47T Model

Tepared Shaft Type Encoder

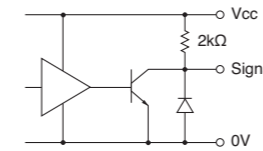


- Feature
- OD47mm Tepar shaft type encoder (OD47mm x L38.4mm).
- High resolution of 8192P/R.
- Output signal of 6 signals of ABZUVW with linedriver.

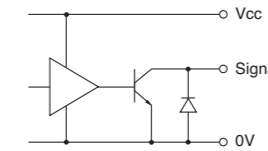
## Output Circuit

(Example circuits are as follows, if you need more information, please see the detail catalog.)

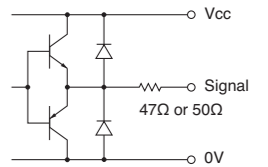
1) Voltage Output



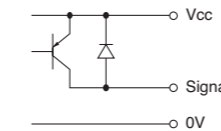
2)Open Collector output



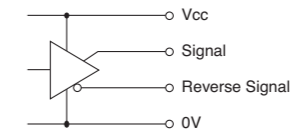
3)Push-Pull output



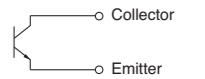
4)PNP Mode Open Collector Output



5)Line Driver Output



6)Sine Wave Signal Output



## Output signal timing

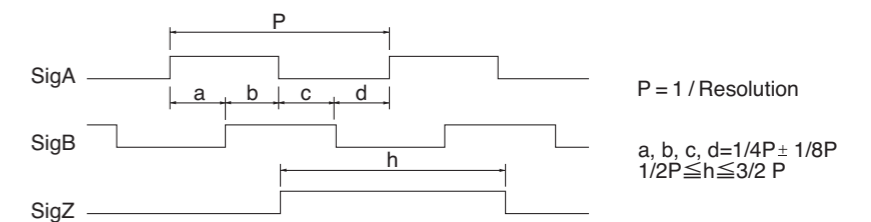
(Example circuits are as follows, it's typical output timing chart. If you need more information, please see the detail catalog.)

1)Voltage Output

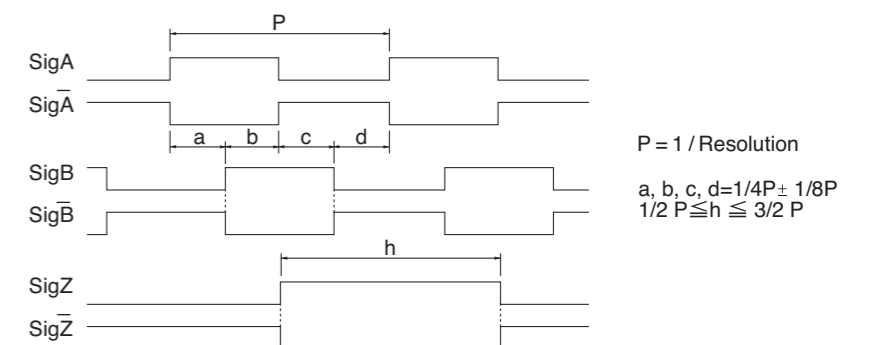
2)Open Collector Output

3)Push-Pull Output

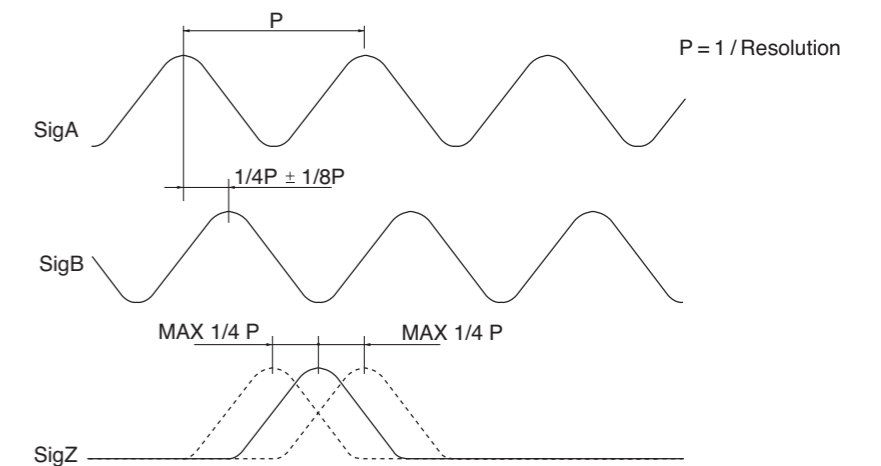
4)PNP Mode Open Collector Output



5)Line Driver Output

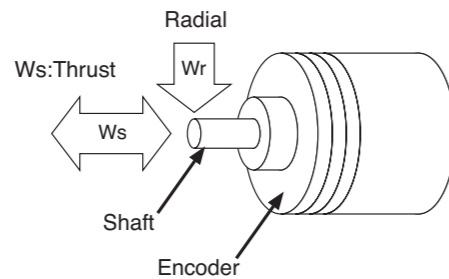


6)Sine Wave Signal Output



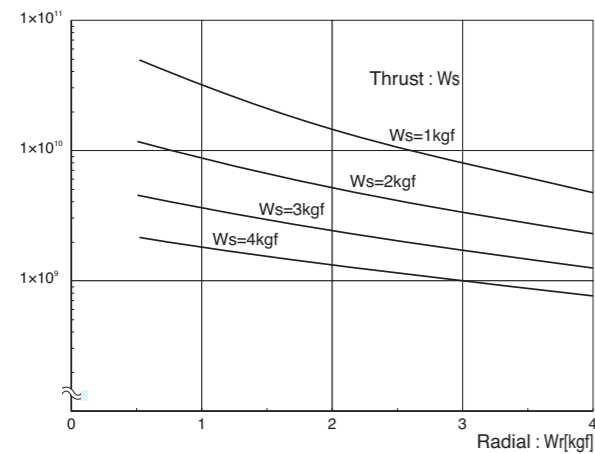
## Bearing Life

The followings are the examples of different bearing lives when exerting radial and thrust loading to the bearings.(Theoretical value)



### 38S

Total Rotation [R]



### NE

Total Rotation [R]

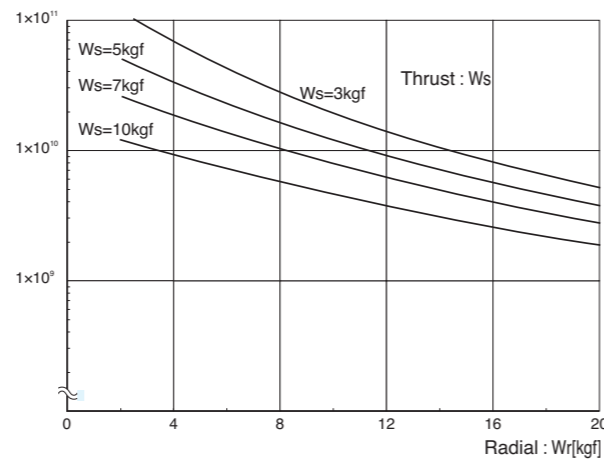


Table for Cable in Use

Applicable Models	Cable Model	Nominal Cross-Section Area(mm <sup>2</sup> )	Number of Cores	Outer Diameter (mm)
OEZ/OSS OVF/HEF	5C×0.09mm <sup>2</sup>	0.09mm <sup>2</sup>	5	φ 4.0
OEZ/OSS OVF/HEF/ SBY/	4P×0.08mm <sup>2</sup>	0.08mm <sup>2</sup>	8	φ 5.2
NOC-S/SP OEK/SBH	5C×0.3mm <sup>2</sup>	0.3mm <sup>2</sup>	5	φ 5.8
NOC-S/SP	4P×0.08mm <sup>2</sup>	0.08mm <sup>2</sup>	8	φ 5.2
ASC-SP AEW/AHS2	18C×0.08mm <sup>2</sup>	0.08mm <sup>2</sup>	18	φ 5.2
ASC-SP-12bit	8P×0.15mm <sup>2</sup>	0.15mm <sup>2</sup>	16	φ 7.8
SBH	4P×0.18mm <sup>2</sup>	0.18mm <sup>2</sup>	8	φ 5.6
SBY	8P×0.2mm <sup>2</sup>	0.2mm <sup>2</sup>	16	φ 8.7

## Warranty and Maintenance

The Followings are Warranty and Maintenance of our products:

### 1. Warranty

- (1) Our products provide a warranty of two year period after shipment.
- (2) In this period, the warranty is not available if in following cases:
  - (a) The products are dropped, shocked, mis-handled, or used beyond the specifications determined.
  - (b) The natural disasters such as flood, fire, etc.
  - (c) The products are repaired or modified by others except NEMICON CORP.

### 2. Charged Repair

- (1) The repair out of Warranty Period will be charged in accordance with NEMICON's Regulations.
- (2) Overseas (including on-visit) repairing service will be charged otherwise on discussion.
- (3) In case of request for test report, extra charge is necessary.

### 3. Service Network

Please contact our sales department or nearest agents for maintenance service.

### 4. Others

- (1) The specification and mechanical dimensions are subject to be changed without prior notice.
- (2) For more details or those other than these items will be stipulated otherwise.

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