

NEMICON

The General Catalog

ROTARY ENCODER & SENSORS

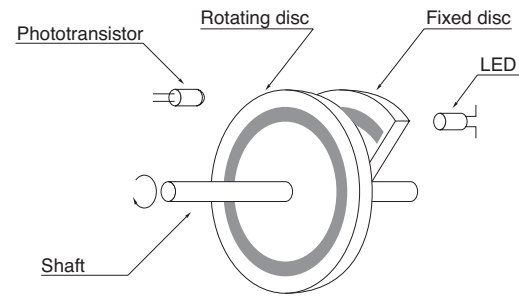


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Theories of Rotary Encoder

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.



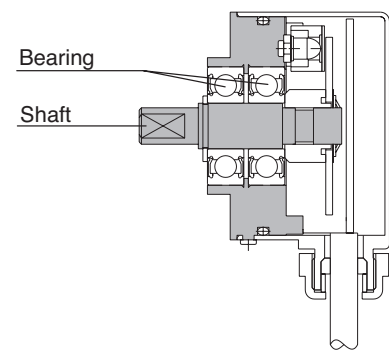
Construction of Rotary Encoder

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.

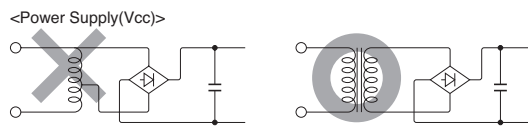
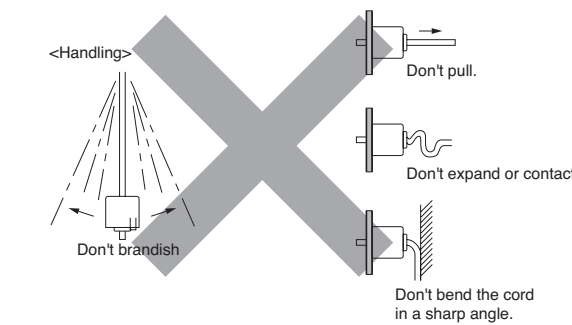
We resolve these problems by our original technologies of the photo-electronic system and the electronic circuit design.



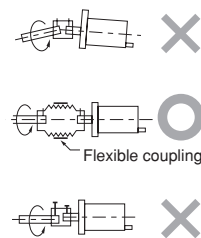
Precautions for Installation

- 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



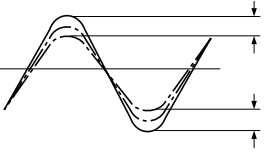
- Connect with a flexible coupling such as a bellows coupling between the encoder and the revolutionary shaft.



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



Explanations on NEMICON Encoder Phraseology

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

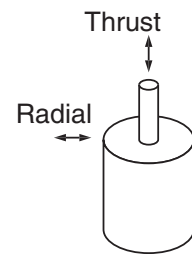


Table of Rotary Encoder

○Micro Encoder

	Model	Style	External Dimensions	Power Supply(V _{CC})	Resolution	Page
	7S φ 7.2			DC 4.5~5.5V	100 200 400	12
	OMS T φ 12			—	50 100 60 125 90	14
	18S φ 18			DC 4.5~13.2V 4.5~5.5V	100 500 160 800 200 1000 300 1024 360 1600 400	16
	18M φ 18			DC 4.5~13.2V 4.5~5.5V	200 1000 300 1024 360 1600 400 500 800	18
	OME-T φ 18			—	100 256 176 300 200 360 250	20
	OME-N φ 18			—	100 256 157 300 200 360 250	22

○Shaft Encoder

	Model	Style	External Dimensions	Power Supply(V _{CC})	Resolution	Page
Small Standard Model	NOM φ 24			DC 4.5~13.2V 10.8~26.4V	100 400 200 500 300 600 360	24
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	26

Table of Rotary Encoder

	Model	Style	External Dimensions	Power Supply(V _{CC})	Resolution	Page
Small Standard Model	OSS φ 30			DC 4.5~13.2V 4.5~5.5V 21.6~26.4V	60 250 100 300 150 360 200 400 500 600	28
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	30
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	32
Heavy Duty Model	OVF 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 100 512 2000 125 600 2048 200 800 2500 250 900 3600	34
Heavy Duty Model	50S φ 50			DC 4.5~30V 4.5~5.5V	360 500 1000 1024 2000 5000	36
Standard Model	NOC-S 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	38
Heavy Duty Model	NOC-SP 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	40
Low Pulse Model	OEK φ 58			DC 4.5~13.2V 10.8~26.4V	20 50 60 100 200 300 360	42

Table of Rotary Encoder

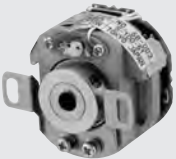
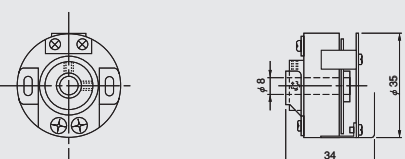

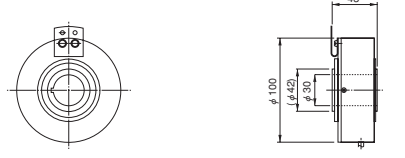
	Model	Style	External Dimensions	Power Supply(V _{CC})	Resolution	Page
Heavy Duty Model	OPN φ 68			DC 4.5~13.2V 10.8~26.4V	20 500 2048 50 600 2500 60 1000 3600 100 1024 4096 200 1250 5000 300 1800 360 2000	44
Super Heavy Duty Model	NE φ 68			DC 4.75~5.25V	20 500 2048 50 600 2500 60 1000 3600 100 1024 4096 200 1250 5000 300 1800 360 2000	46

○ Hollow Shaft Encoder


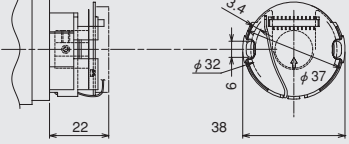
	Model	Style	External Dimensions	Power Supply(V _{CC})	Resolution	Page
Small Standard Model	38H φ 38			DC 4.5~13.2V 4.5~30V	100 512 2500 200 600 3600 250 800 4000 300 1000 4096 360 1024 400 2000 500 2048	50
Small & Short delivery Model	38HG φ 38			DC 3.35~5.25V 3.35~34.5V 3.35~13.2V	100 600 200 1000 300 1024 360 1800 400 2000 500 2048	52
Heavy Duty Model	HEF 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	54
Hollow Shaft Model	NOC-H 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	56
Heavy Duty Model	NOC-HP 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	58

Table of Rotary Encoder

○ Built-in Encoder

	Model	Style	External Dimensions	Power Supply(V _{CC})	Resolution	Page
Standard Built-in Model	SBY φ 35			DC 4.75~5.25V	100 1000 1024 2000 2500 3000	60
Big Size Built-in Model	SBH φ 100			DC 4.5~5.5V 10.8~13.2V 4.75~5.25V	512 1024 *4096 *8192 *10000	62

○ Modular Encoder

	Model	Style	External Dimensions	Power Supply(V _{CC})	Resolution	Page
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	64

○ Absolute Encoder


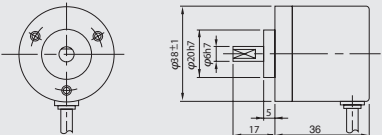

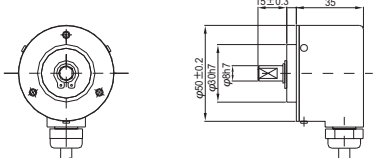

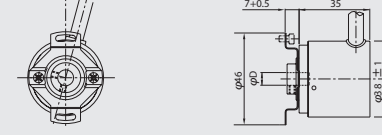
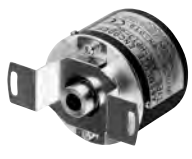
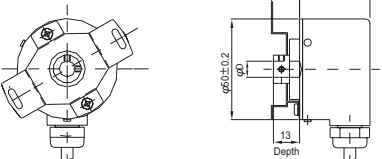

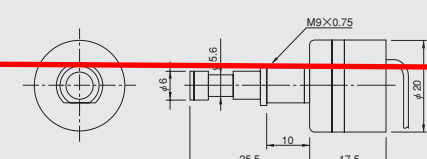

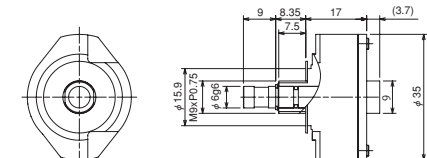

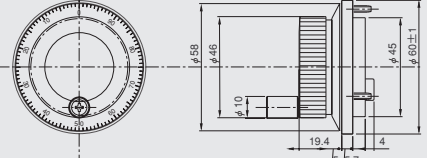

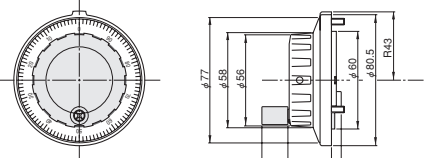

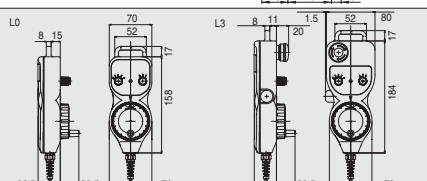

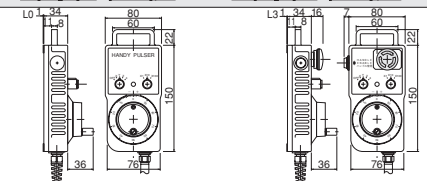

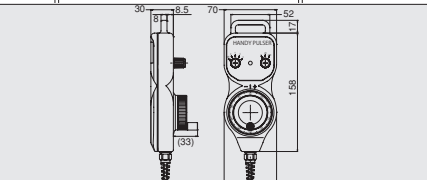
	Model	Style	External Dimensions	Power Supply(V _{CC})	Resolution	Page
Absolute Model	AEW2 φ 38			DC 4.5~13.2V 10.8~26.4V	6bit (64) 8bit (256)	68
Heavy Duty Absolute Model IP65	ASC-SP φ 50			DC 4.5~13.2V 10.8~26.4V	8bit (256) 10bit (720) 10bit (1024) 12bit (4096)	70
Hollow Shaft Absolute Model	AHS2 φ 38			DC 4.5~13.2V 10.8~26.4V	6bit (64) 8bit (256)	72
Heavy Duty Hollow Shaft Absolute Model IP65	ASC-HP φ 50			DC 4.5~13.2V 10.8~26.4V	8bit (256) 10bit (720) 10bit (1024) 12bit (4096)	74

Table of Rotary Encoder

○ Manual Encoder

	Model	Style	External Dimensions	Power Supply(V _{CC})	Resolution	Page
Manual	MIKE φ 20			DC 4.75~5.25V	250 500	78
Manual Pulse Generator	35PG φ 35			DC 4.5~5.5V	100	80
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	82
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	84
Handy Pendant	HP-U			DC 4.5~13.2V 4.5~5.5V 4.75~5.25V	100	86
Handy Pendant	HP-V			DC 4.5~13.2V 4.5~5.5V 10.8~13.2V 4.75~5.25V	25 100	88
Handy Pendant	HP-M			DC 4.5~13.2V 4.5~5.5V 4.75~5.25V	25 100	90

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

Incremental Shaft Encoder

Micro Encoder

7S	12
OMS-T	14
18S	16
18M	18
OME-T	20
OME-N	22

Shaft Encoder

NOM	24
OEZ	26
OSS	28
38S	30
38SG	32
OVF	34
50S	36
NOC-S	38
NOC-SP	40
OEK	42
OPN	44
NE	46

MINIATURE TYPE

7S Model



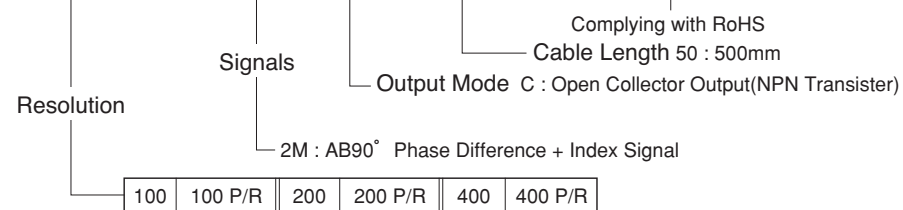
Miniature Model

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

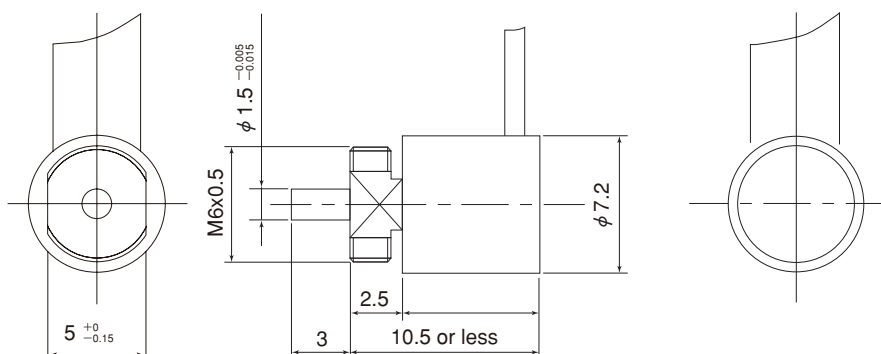


Model

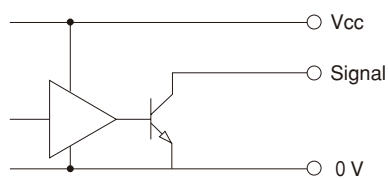
7S- [] [] -2MC-50-00E



External Dimension



Output Circuit



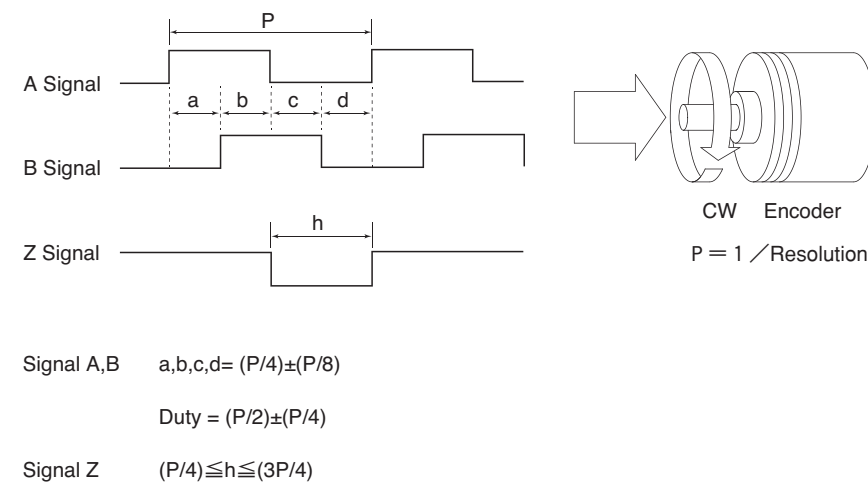
Electrical Spec

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 ⁻⁴ N·m Max
Angular Acceleration	1×10 ⁵ rad/s ²
Shaft Loading	Thrust 0.98N
	Radial 1.90N
Moment of Inertia	1×10 ⁻⁹ kg·m ²
Maximum Permissible Speed	6000min ⁻¹
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 ² X, Y, Z Each 3 times

MINIATURE TYPE

OMS-T Model



Miniature Model

- Ultra Micro Encoder : $\phi 12$.
- Ultra Light Encoder Max : 10g.



Model

OMS- [] - [] - [] T-060-000-00E

Resolution

Signals

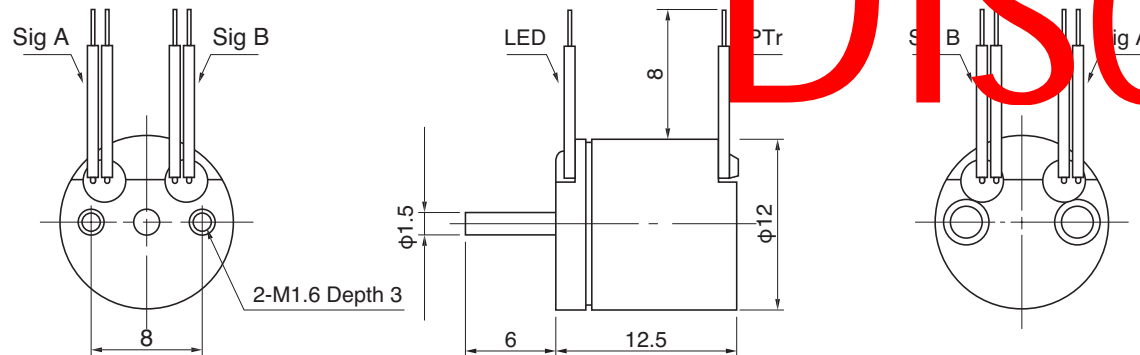
- 1 : Only A Signal
- 2 : AB90°Phase Difference

NOTE) Output Mode is Sine Wave Signal

Complying with RoHS

50	50 P/R	90	90 P/R	125	125 P/R
60	60 P/R	100	100 P/R		

External Dimension



*Install without stress on wires.

Electrical Spec

TYPE	1T	2T
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

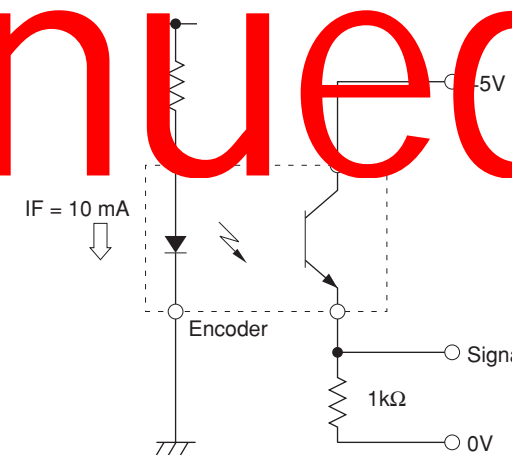
LED Light Emitting Diode

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

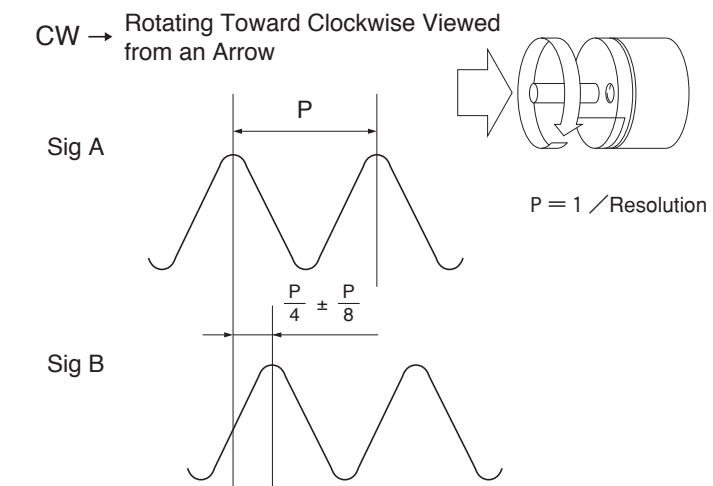
PTr Photo Transistor

Collector-Emitter Voltage	V _{CEO} ; 20 V
Emitter-Collector Voltage	V _{ECO} ; 5 V
Collector Current	I _c ; 20 mA
Collector Power Dissipation	P _c ; 75 mW
Power Dissipation(25 to 70°C)	- 1.0 m W / °C

Test Circuit

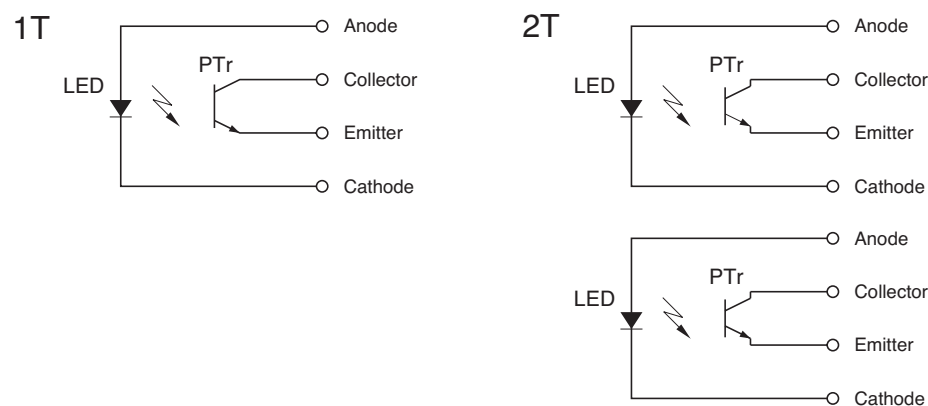


Wave Form



Discontinued

Output Circuit



Mechanical Spec

Starting Torque	9.8×10 ⁻⁵ N·m Max	
Shaft Loading	Thrust	0.98N
	Radial	0.98N
Moment of Inertia	2×10 ⁻⁹ kg·m ²	
Maximum Permissible Speed	6000min ⁻¹	
Net Weight	10g 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 ² ,11ms 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

Resolution: []

Output Mode: []

Cable Length: 15 : 150mm

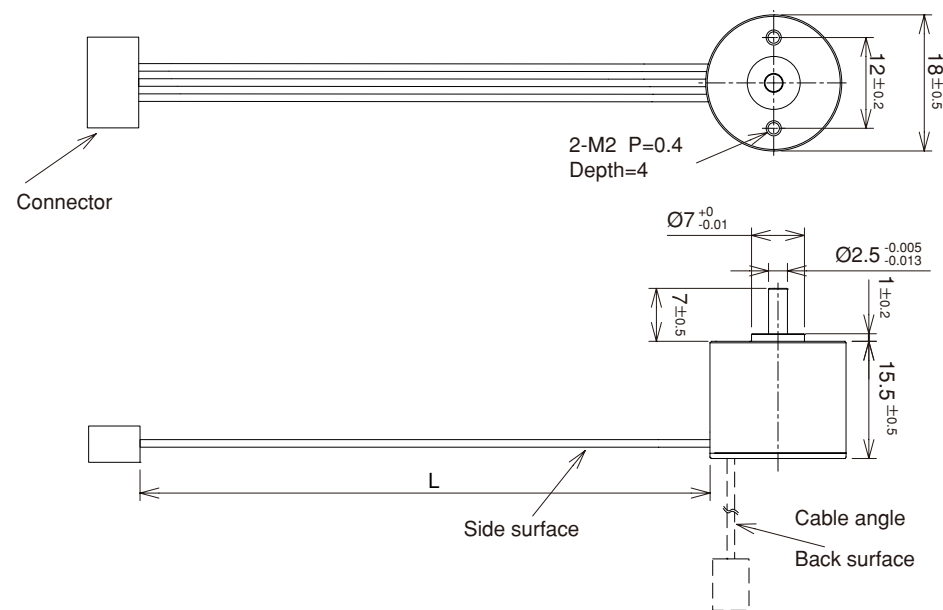
Complying with RoHS

1 : Back Cable Out-let
2 : Side Cable Out-let

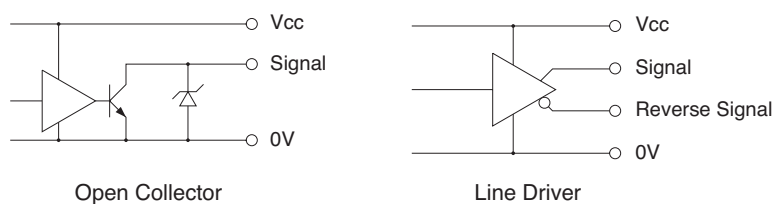
2MC : A, B, Z Open Collector Output
2MD : A, B, Z Line Driver Output

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

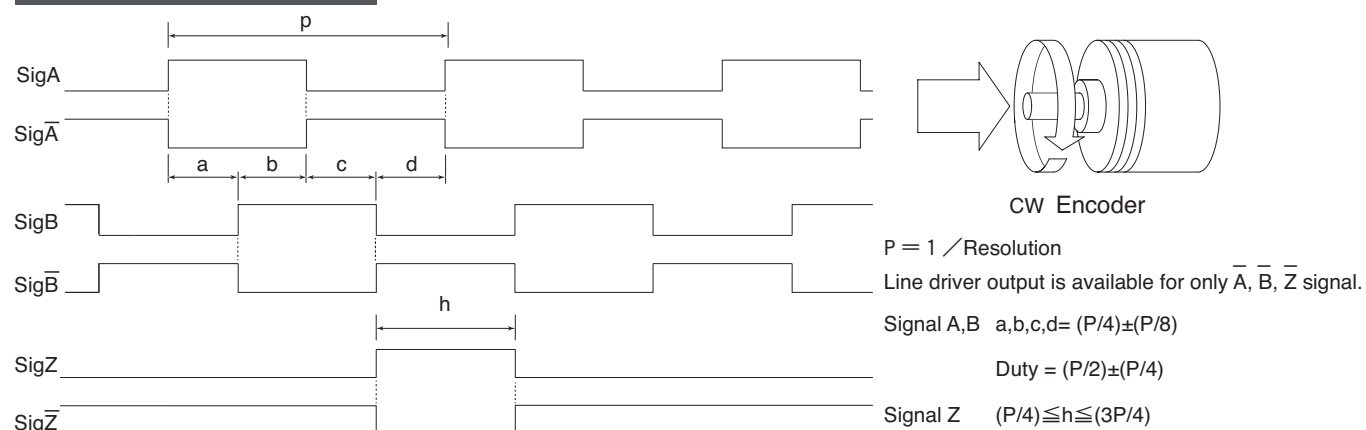
Connector Hirose Electric Co., Ltd. DF3-5S-2C

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 ⁻⁴ N·m Max
Shaft Loading	Thrust 4.9N
	Radial 2.94N
Moment of Inertia	1×10 ⁻⁸ kg·m ²
Angular Acceleration	1×10 ⁻⁵ rad/s ²
Maximum Permissible Speed	6000min ⁻¹
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

MINIATURE TYPE

Miniature Model

•Small-size Encoder with OD 18mm.

18M Model



Model

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

Complying with RoHS

Outer diameter shaft Cable Length 15 : 150mm

Resolution

Output Mode

Mounting pitch 25 : φ2.5 30 : φ3 40 : φ4 50 : φ5 60 : φ6

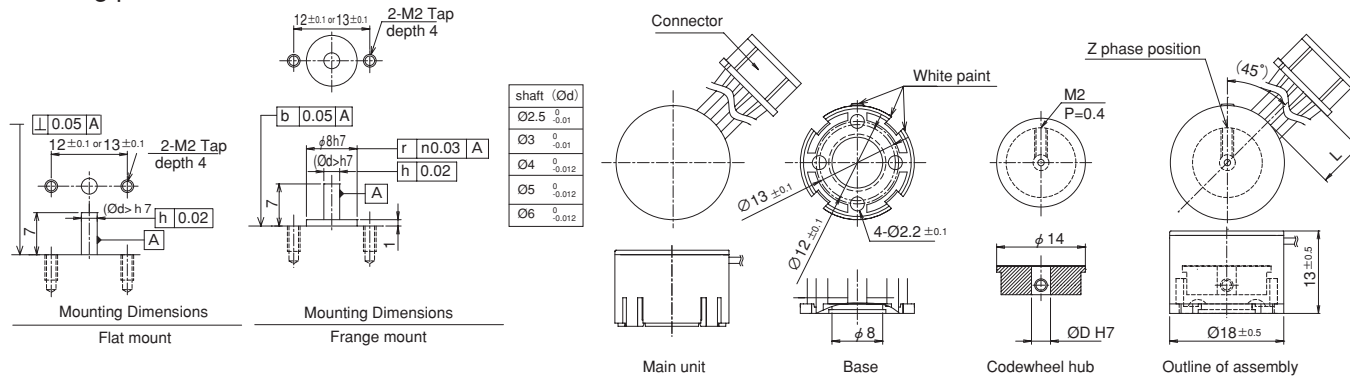
A : φ12 or φ13 B : φ22

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

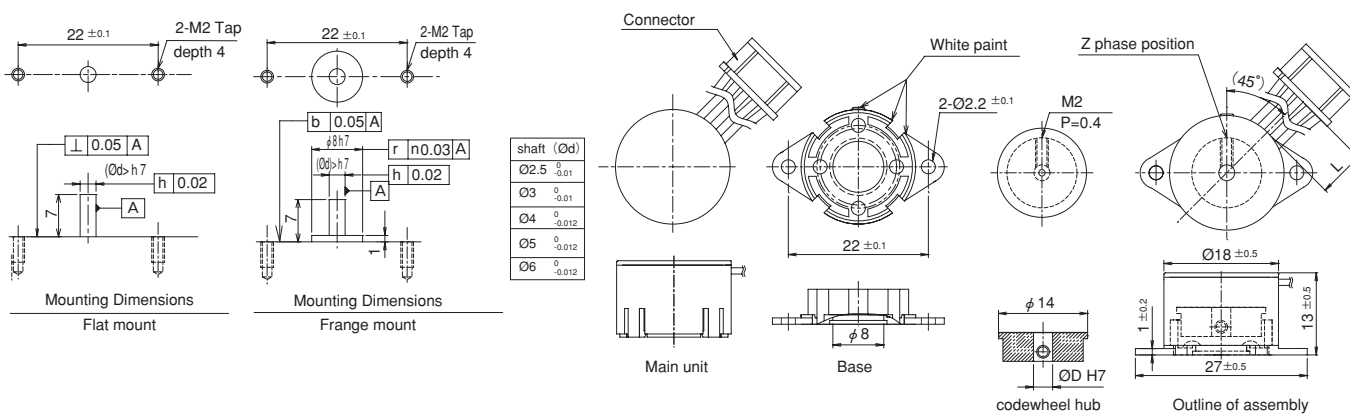
200	200 P/R	400	400 P/R	1000	1000 P/R
300	300 P/R	500	500 P/R	1024	1024 P/R
360	360 P/R	800	800 P/R	1600	1600 P/R

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

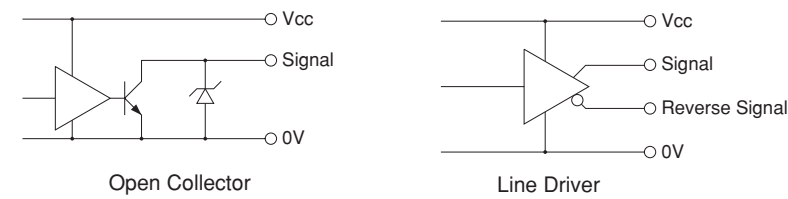
Connector Hirose Electric Co., Ltd. DF3-5S-2C

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

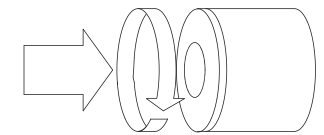
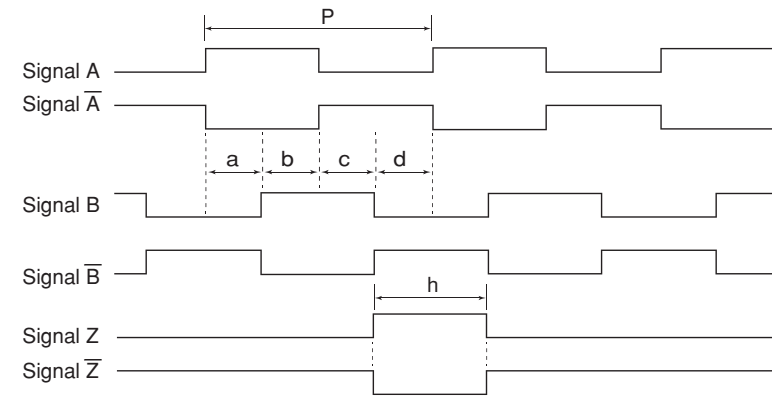
Connector Hirose Electric Co., Ltd. DF3-9S-2C

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

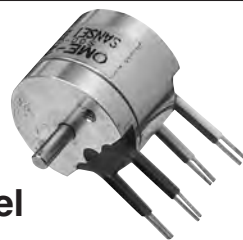
Moment of Inertia	$8 \times 10^{-8} \text{kg} \cdot \text{m}^2$
Allowable Value of shaft play	Thrust : $\pm 0.3 \text{mm}$
Angular Acceleration	$1 \times 10^5 \text{rad/s}^2$
Maximum Permissible Speed	18000min^{-1}
Net Weight	10g Max (Without Cable)

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	$490 \text{m/s}^2, 11 \text{ms}$ X, Y, Z Each 3 times

MINIATURE TYPE

OME-T Model



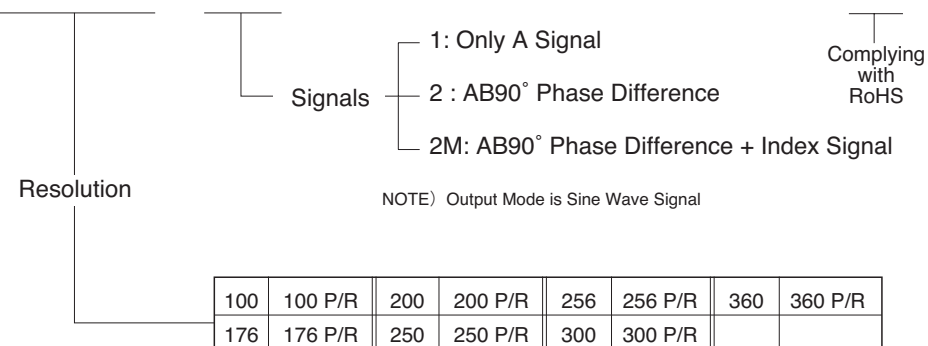
Miniature Model

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

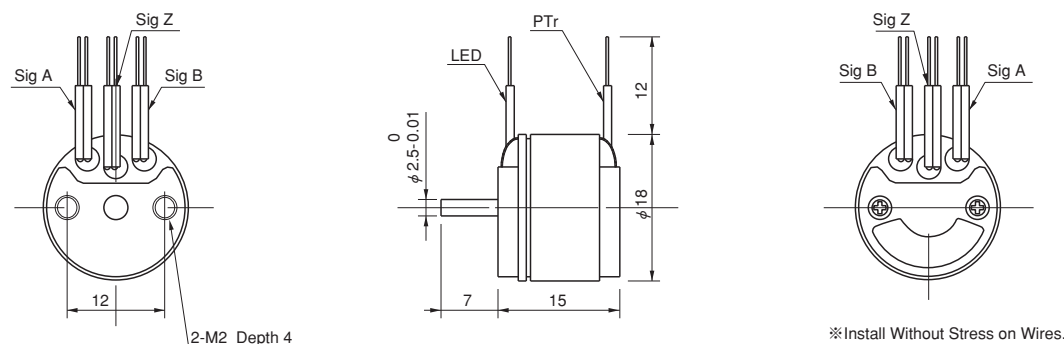


Model

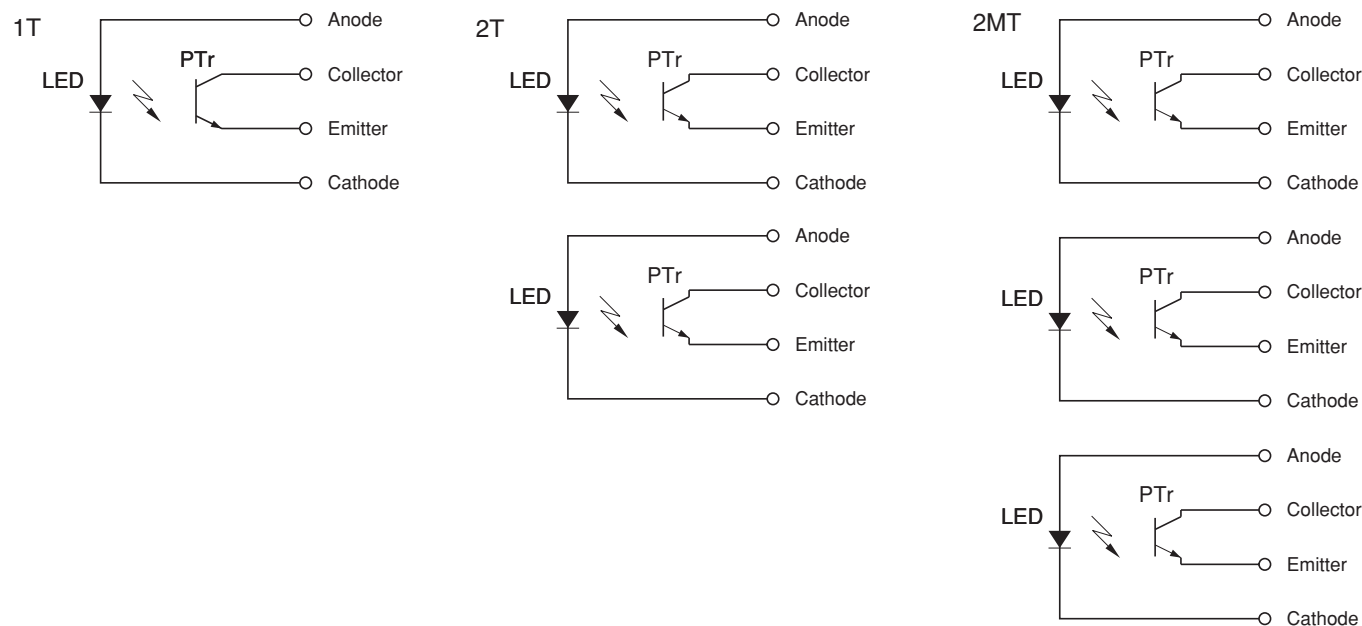
OME- [] - [] - [] T-070-000-00E



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

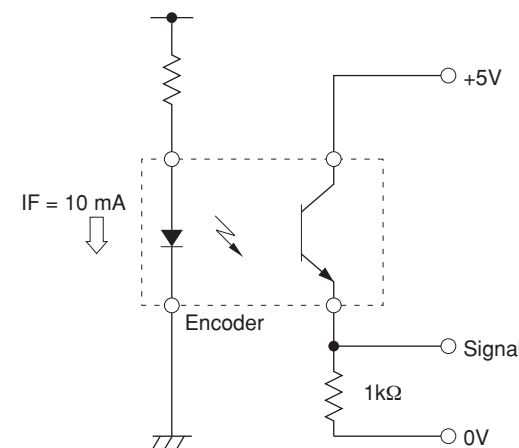
LED Light Emitting Diode

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

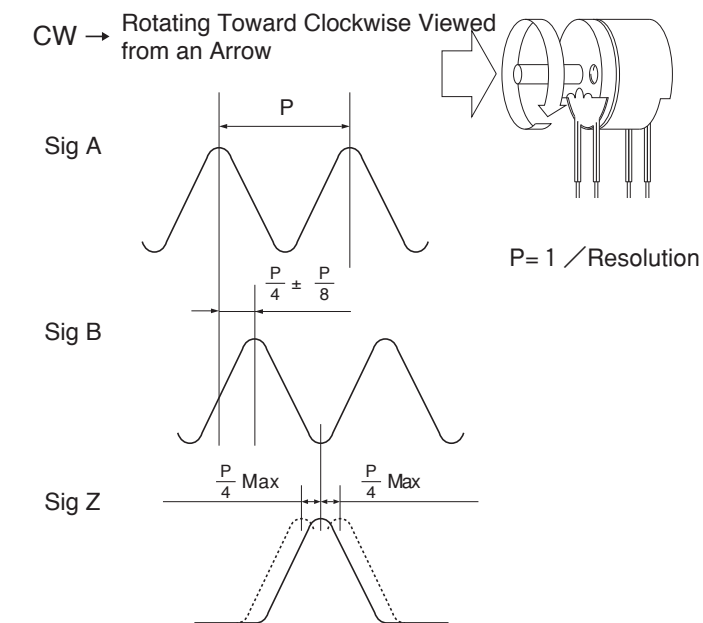
PTr Photo Transistor

Collector-Emitter Voltage	V _{CEO} ; 20 V
Emitter-Collector Voltage	V _{ECO} ; 5 V
Collector Current	I _c ; 20 mA
Collector Power Dissipation	P _c ; 75 mW
Power Dissipation(25 to 70°C)	- 1.0 m W / °C

Test Circuit



Wave Form



Mechanical Spec

Starting Torque	4.9×10 ⁻⁵ N·m Max	
Shaft Loading	Thrust	1.96N
	Radial	1.96N
Moment of Inertia	1×10 ⁻⁸ kg·m ²	
Maximum Permissible Speed	6000min ⁻¹	
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 ² , 11ms X, Y, Z Each 3 times

MINIATURE TYPE

OME-N Model



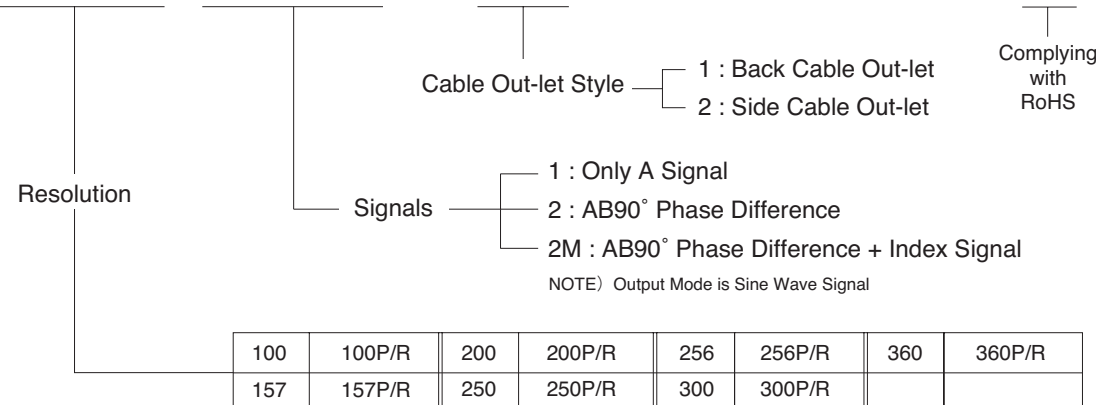
Miniature Model

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

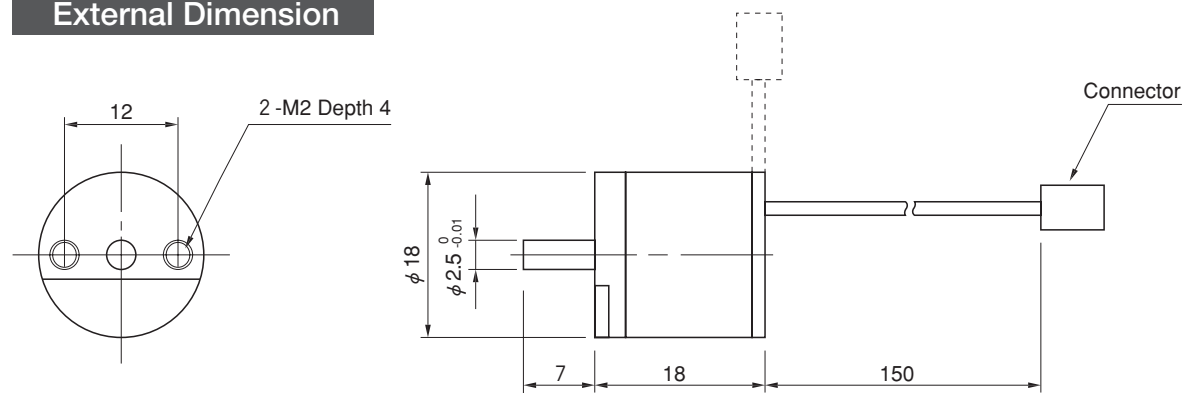


Model

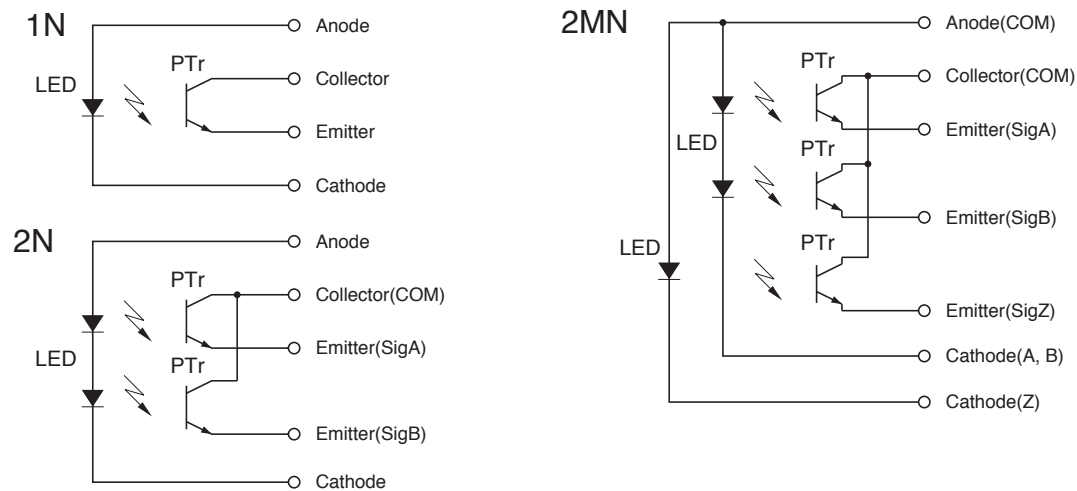
OME- [] - [] - [] - [] N - [] 00-015-00E



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

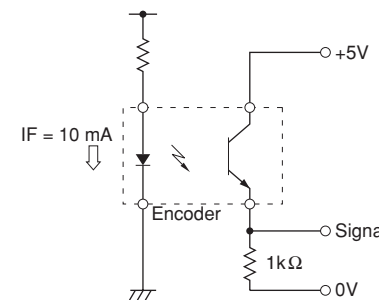
LED Light Emitting Diode

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 _{CEO} ; 20 V
Emitter-Collector Voltage	V _{ECO} ; 5 V
Collector Current	I _c ; 20 mA
Collector Power Dissipation	P _c ; 75 mW
Power Dissipation(25 to 70°C)	- 1.0 m W / °C

Test Circuit



Mechanical Spec

Starting Torque	4.9×10 ⁻⁴ N·m Max	
Shaft Loading	Thrust	1.96N
	Radial	1.96N
Moment of Inertia	1×10 ⁻⁸ kg·m ²	
Maximum Permissible Speed	6000min ⁻¹	
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

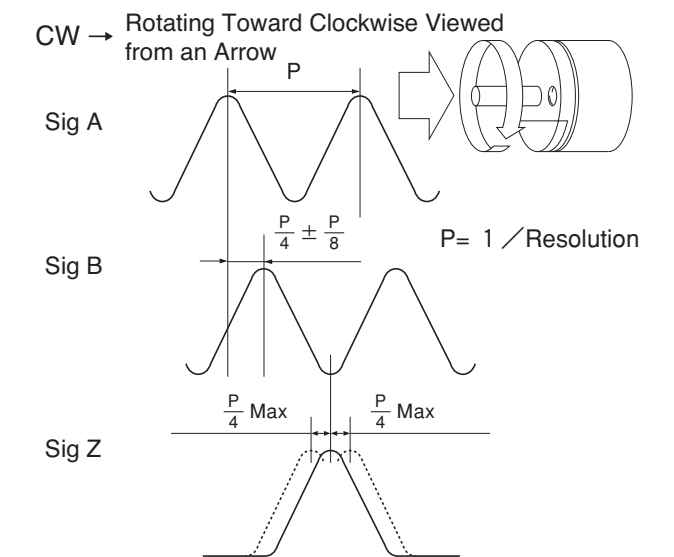
2N Connector Hirose Electric Co., Ltd. DF3-5S-2C

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 ² , 11ms X, Y, Z Each 3 times

SHAFT TYPE

Small Diameter with High Function

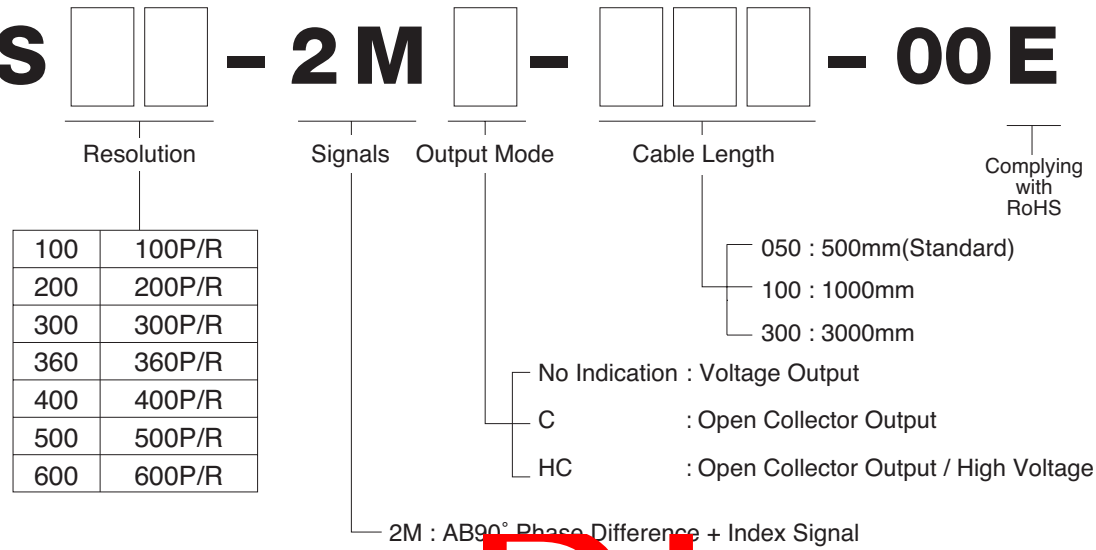
•600P/R is Available with OD 24mm House Size.

NOM Model

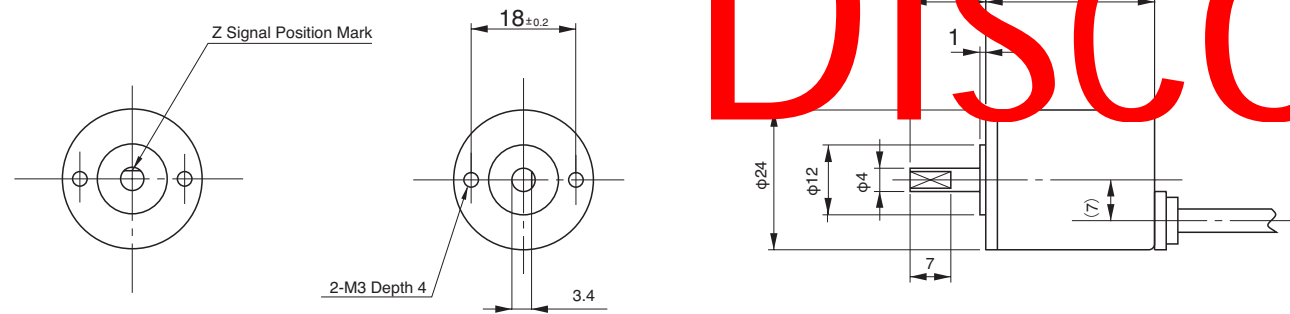


Model

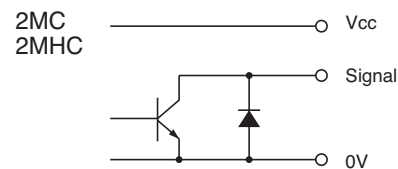
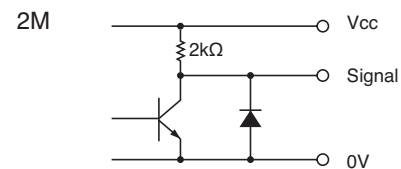
NOM-S [] [] - 2M [] - [] [] [] - 00E



External Dimension



Output Circuit

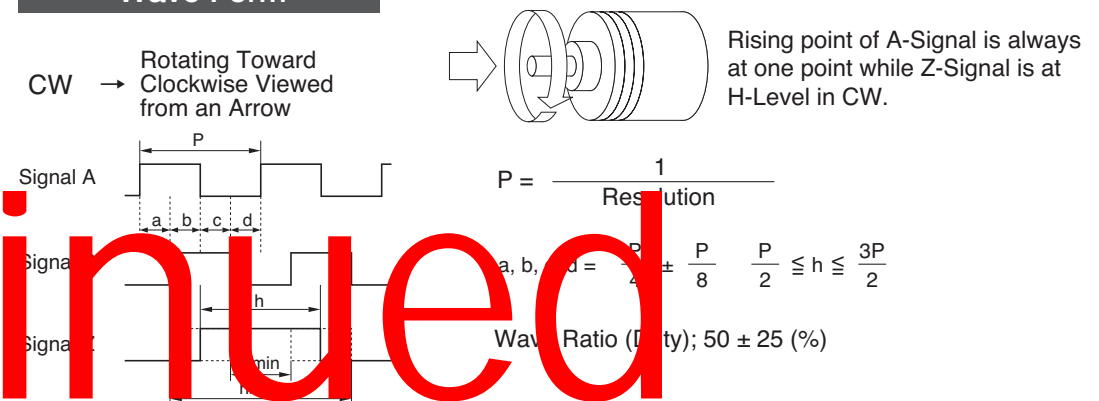


Electrical Spec

TYPE	2M	2MC	2MHC
Power Supply(Vcc)	DC 4.5~13.2 V		DC 10.8~26.4 V
Current Consumption	50 mA Max	30 mA Max	
Output Voltage	"H"	Vcc-1V Min	—
	"L"※1	0.5 V Max	
Maximum Sink Current	20 mA	30 mA	
Rise & Fall Time	1 μs Max		
Maximum Frequency Response	60 kHz		
Withstanding Voltage of Output Tr.	—	50 V Max.	

※1) at Maximum Sink Current

Wave Form



Discontinued

Electrical Connections

	Color	Signal
2M	Red	Power Supply(Vcc)
2MC	Black	0V
2MHC	Green or Blue	Signal A
	White	Signal B
	Yellow	Signal Z
	Shield	NC

Mechanical Spec

Starting Torque	9.8×10 ⁻⁴ N·m Max	
Angular Acceleration	1×10 ⁵ rad/s ²	
Shaft Loading	Thrust	4.9N
	Radial	9.8N
Moment of Inertia	2×10 ⁻⁷ kg·m ²	
Maximum Permissible Speed	6000min ⁻¹	
Net Weight	35g 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 ² ,11ms X, Y, Z Each 3 times
Ingress Protection	IP50

SHAFT TYPE

OEZ Model



Small High-Speed Model

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



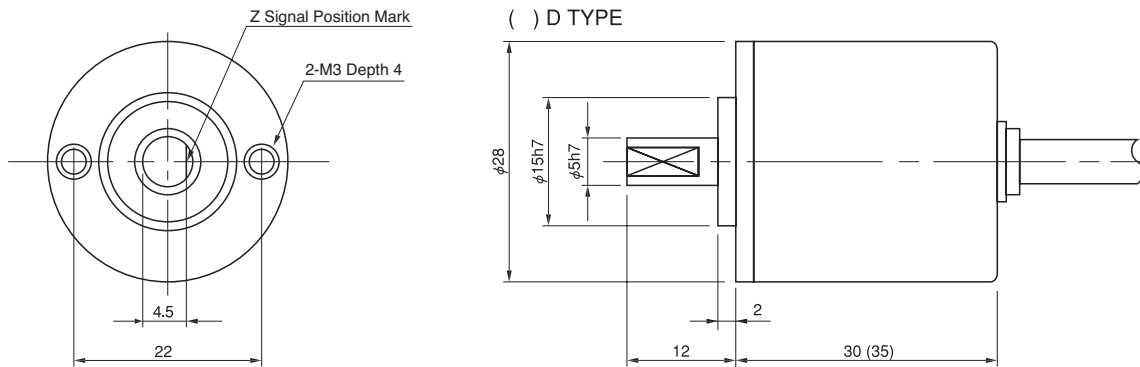
Model **OEZ- [] -2M [] - [] - [] -00E**

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		

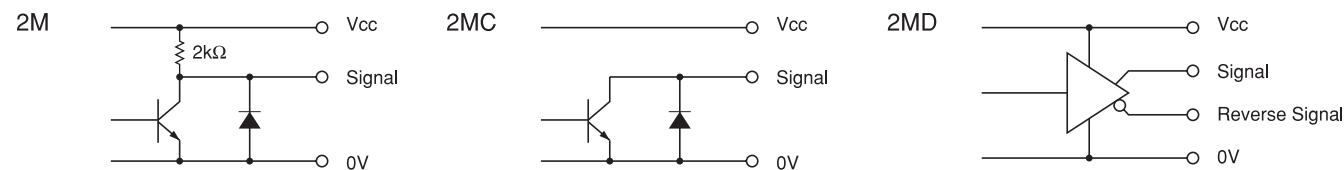
- Power Supply(Vcc)**
 - 05 : 5V
 - 12 :12V
 - 24 :24V
- Cable Length**
 - 050 :500mm (Standard)
 - 100 :1000mm
 - 300 :3000mm
- Output Mode**
 - No Indication : Voltage Output(Except 24V mode)
 - C : Open Collector Output
 - D : Line Driver Output(The Power Supply(Vcc) is only 5V)
- Signals** — 2M : AB90° Phase Difference + Index Signal

Complying with RoHS

External Dimension



Output Circuit

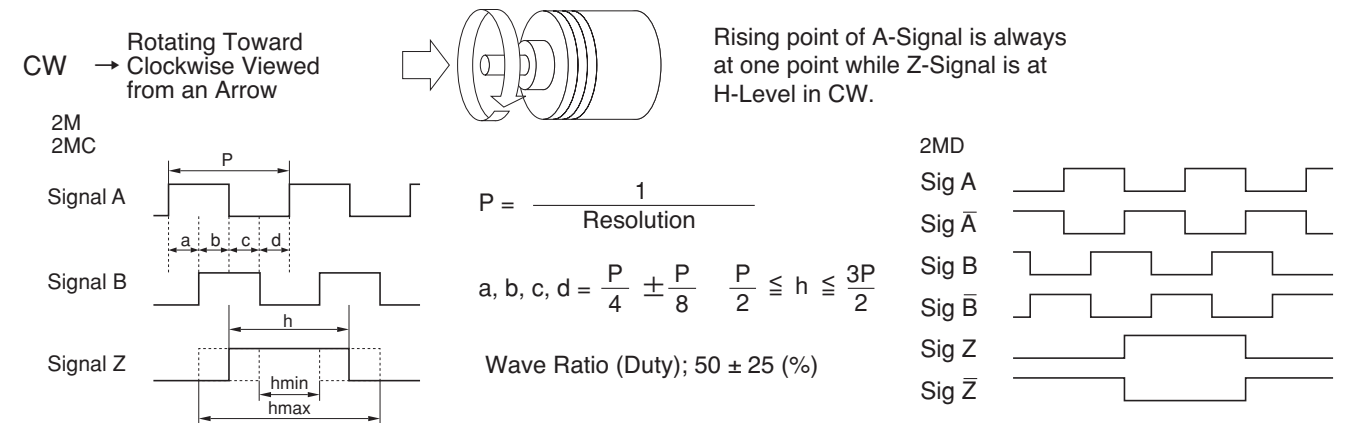


Electrical Spec

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



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 ⁻⁴ N·m Max
Angular Acceleration	1×10 ⁵ rad/s ²
Shaft Loading	Thrust 4.9N
	Radial 9.8N
Moment of Inertia	2×10 ⁻⁷ kg·m ²
Maximum Permissible Speed	6000min ⁻¹
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

SHAFT TYPE

38SG Model

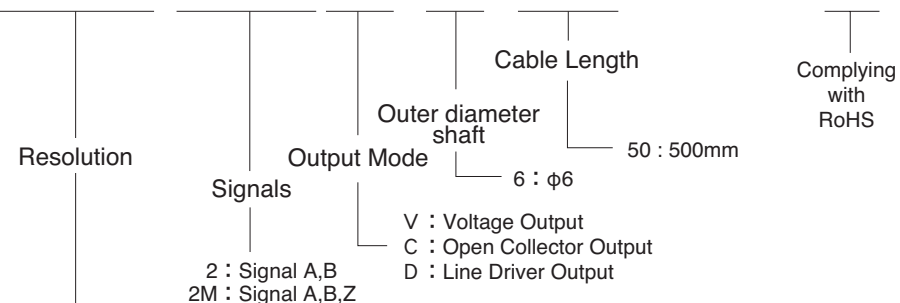


Small & Short delivery Model

Compact Sized Encoder with OD38mm x L30mm.

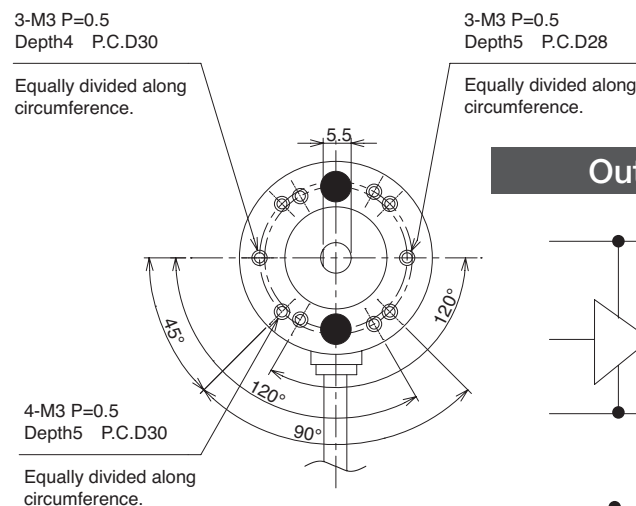
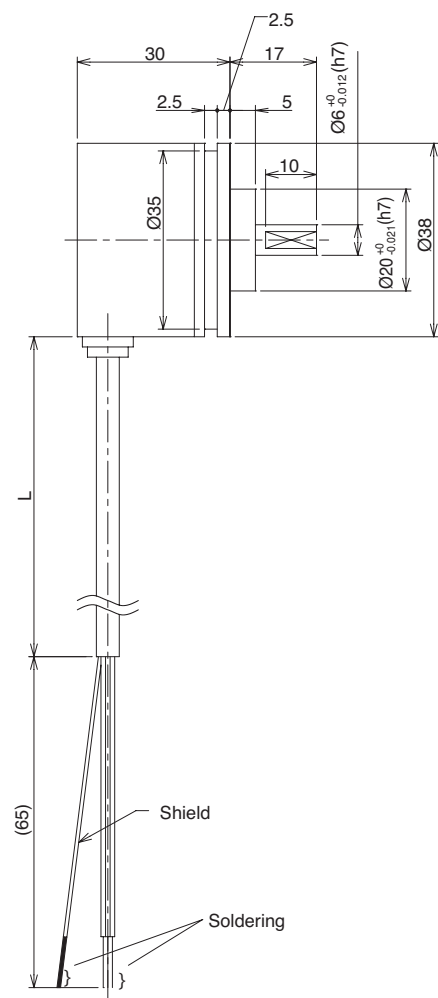


Model 38SG- - - -6-50-N 00E

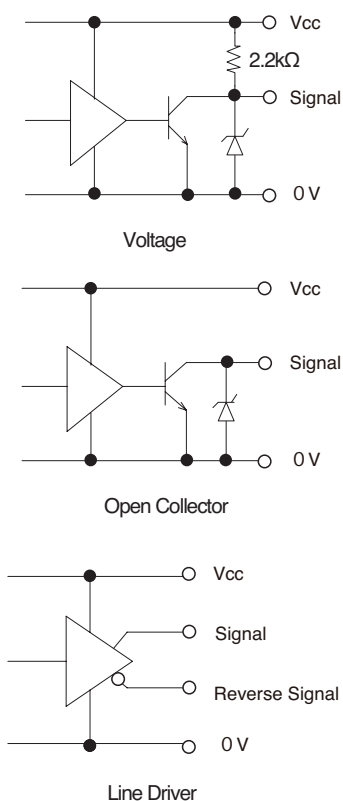


Signal A,B,Z	500	500P/R	1000	1000P/R	1024	1024P/R	1800	1800P/R	2000	2000P/R	2048	2048P/R
Signal A,B	100	100P/R	200	200P/R	300	300P/R	360	360P/R	400	400P/R	600	600P/R

External Dimension



Output Circuit

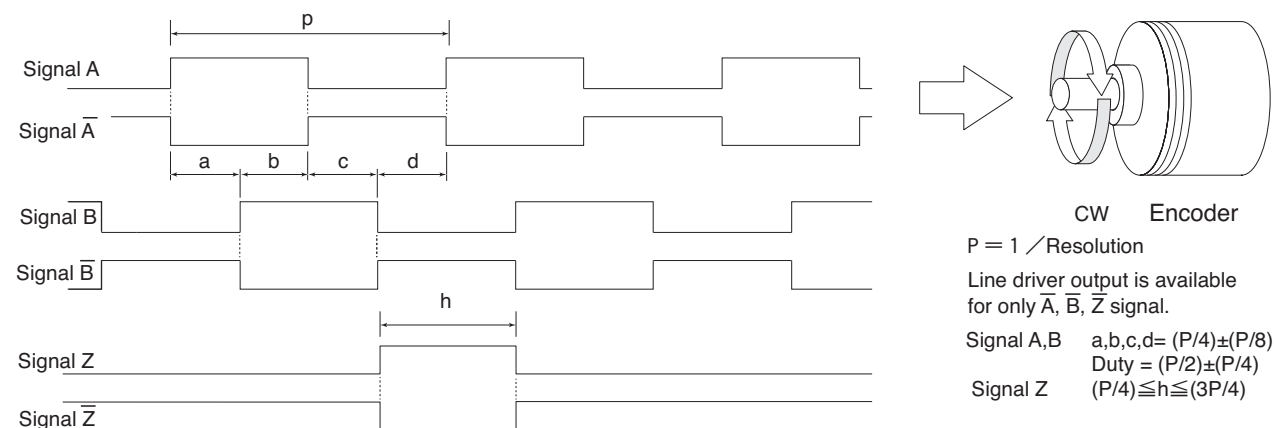


Electrical Spec

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-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	0.98x10 ⁻³ N·m Max
Shaft Loading	Thrust 19.6N
	Radial 29.4N
Moment of Inertia	1x10 ⁻⁶ kg·m ²
Maximum Permissible Speed	6000min ⁻¹

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 ² , 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

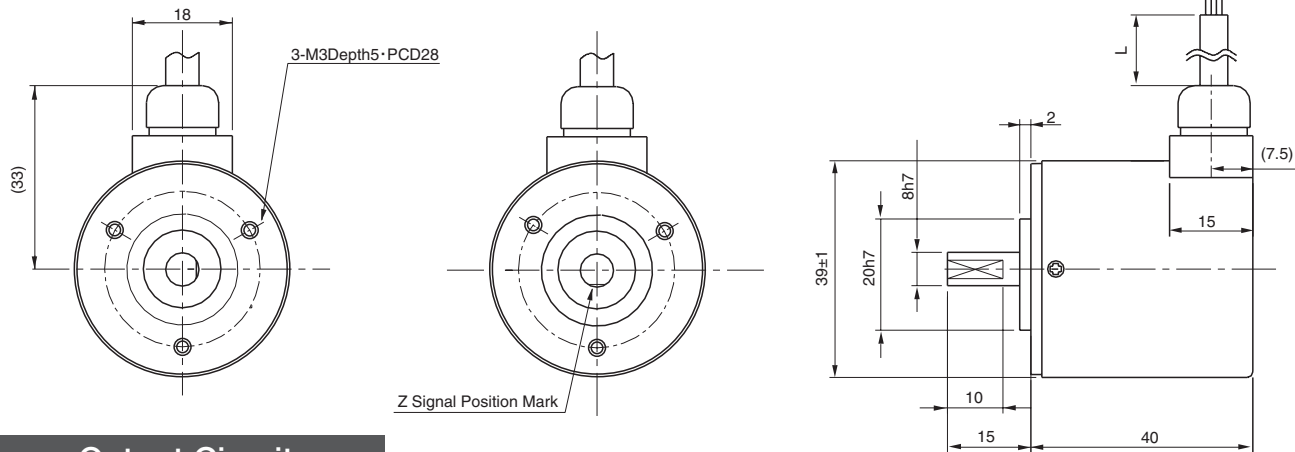
OVF- **-2M** **00E**

Resolution		Outer diameter shaft		Cable Length		Complying with RoHS
002	20P/R	05	500P/R	050	500mm (Standard)	
003	30P/R	0512	512P/R	100	1000mm	
0032	32P/R	06	600P/R	300	3000mm	No Indication : D output with LS
004	40P/R	08	800P/R			
005	50P/R	09	900P/R			C : D output with C-MOS
006	60P/R	10	1000P/R			
01	100P/R	1024	1024P/R			No Indication : Voltage Output
0125	125P/R	12	1200P/R			
02	200P/R	15	1500P/R			C : Open Collector Output
025	250P/R	18	1800P/R			
0256	256P/R	20	2000P/R			HC : Open Collector Output / High Voltage
03	300P/R	2048	2048P/R			
036	360P/R	25	2500P/R			HCP : PNP Mode Open Collector Output / High Voltage
04	400P/R	36	3600P/R			

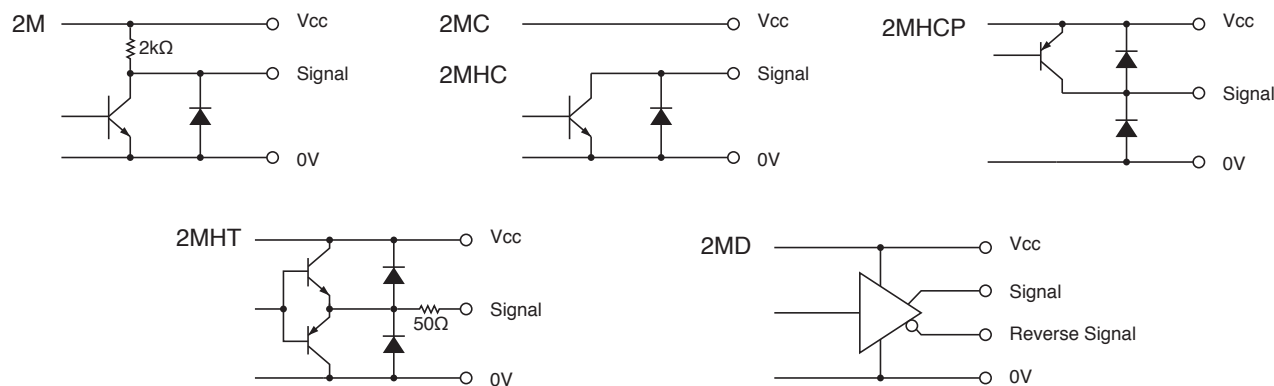
Output Mode:
 HT : Push-Pull Output / High Voltage
 D : Line Driver Output
 Low Power Consumption C-MOS Output Available

Signals 2M: AB90° Phase Difference + Index Signal

External Dimension



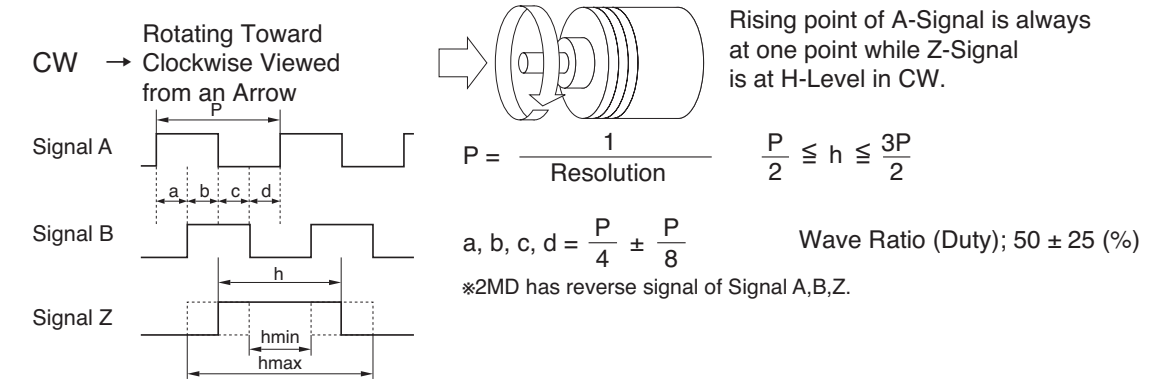
Output Circuit



Electrical Spec

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 ⁻⁴ N · m Max	
Angular Acceleration	1×10 ⁵ rad/s ²	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Moment of Inertia	1.2×10 ⁻⁶ kg · m ² Max	
Maximum Permissible Speed	5000min ⁻¹	
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 ² ,11ms X, Y, Z Each 3 times
Ingress Protection	IP65

SHAFT TYPE

50S Model



Heavy Duty Model

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



Model

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

Resolution

Outer diameter shaft 8 : $\phi 8$

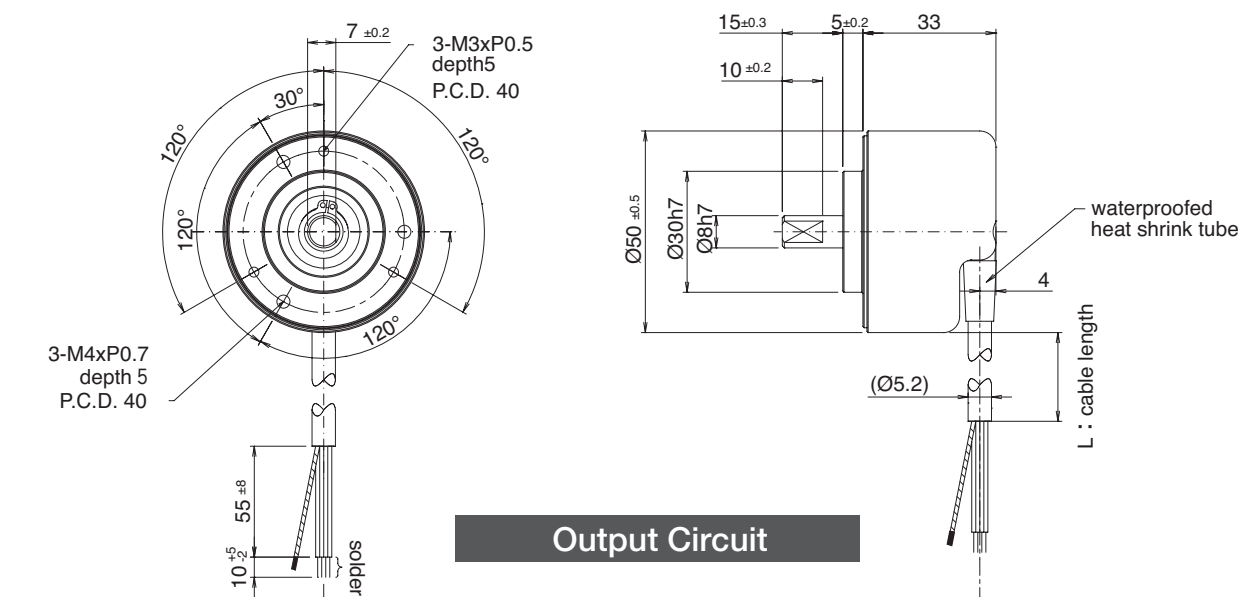
Cable Length
200 : 2000mm
300 : 3000mm
500 : 5000mm

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

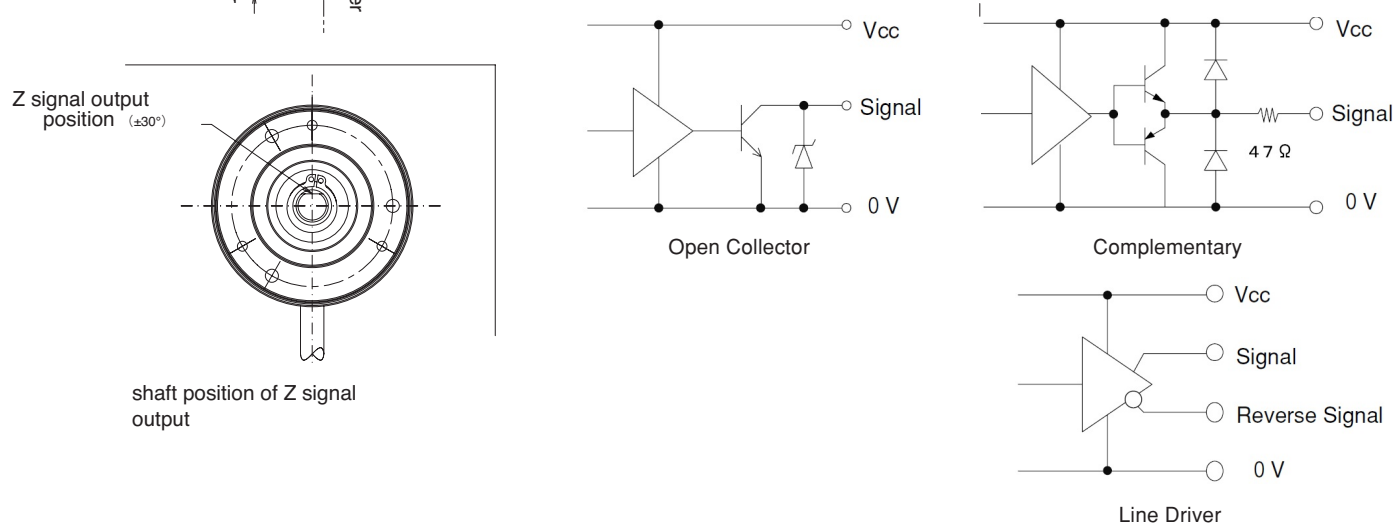
Complying with RoHS

360	360 P/R	1000	1000 P/R	2000	2000 P/R
500	500 P/R	1024	1024 P/R	5000	5000 P/R

External Dimension



Output Circuit

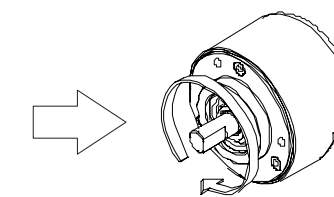
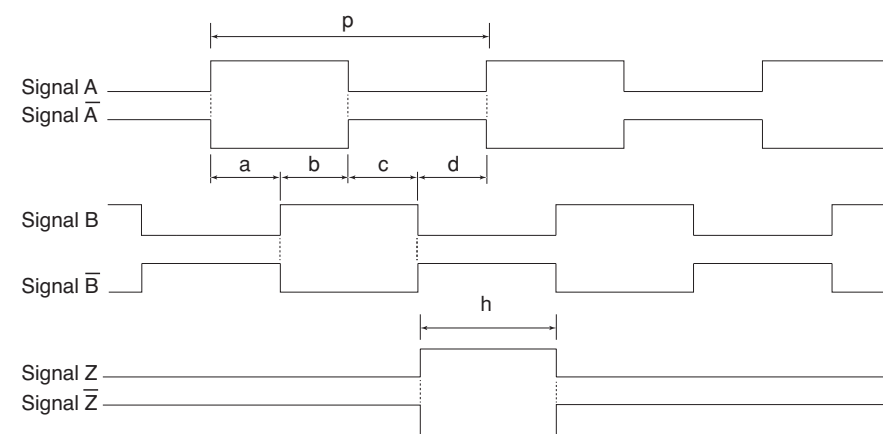


Electrical Spec

TYPE		2MC	2MT	2MD
Power Supply(Vcc)		DC 4.5 to 30V (Ripple 3% or less (P-P))		DC 4.5 to 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 μ s 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 \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	9.8x10 ⁻³ N·m Max(at 25°C)
Angular Acceleration	1x10 ⁵ rad·s ²
Shaft Loading	Thrust 49.0N
	Radial 78.4N
Moment of Inertia	8x10 ⁻⁷ kg·m ²
Maximum Permissible Speed	5000min ⁻¹
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 ² , 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 [] -2M [] - [] - [] - [] 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		

Style
S: Shaft

Resolution

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

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

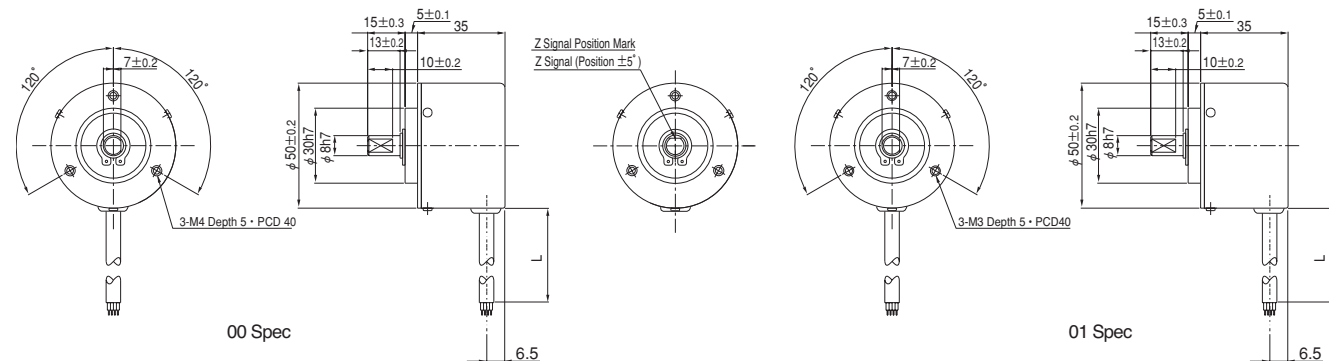
Complying with RoHS
00 : M4 3-M4 Depth5
01 : M3 3-M3 Depth5

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

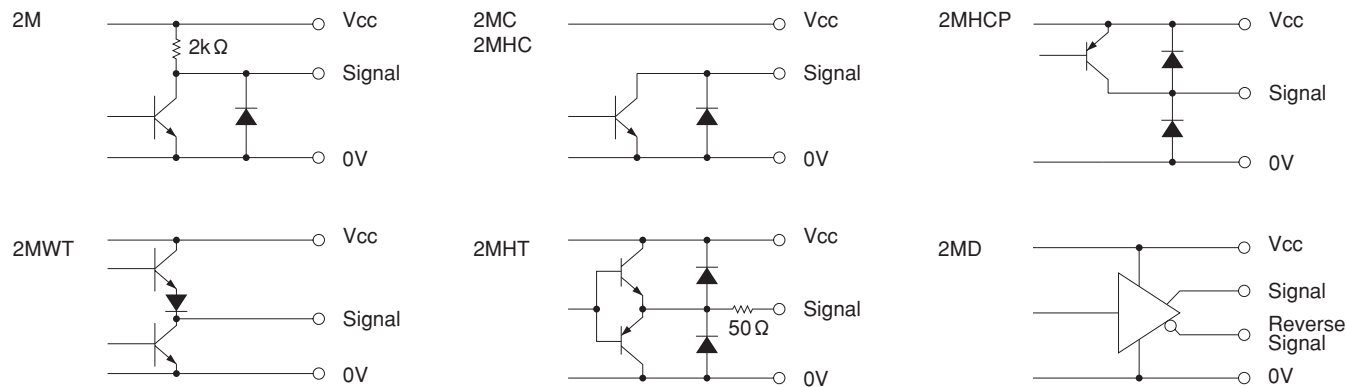
Other than D output with LS
No Indication: Other than D output
C : D output with LS

Signals 2M : AB90° Phase Difference + Index Signal

External Dimension



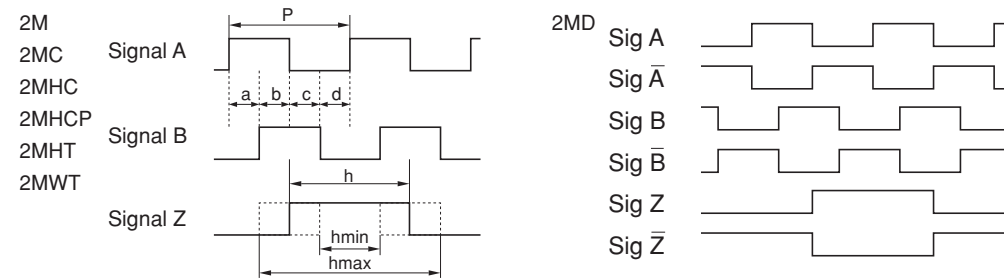
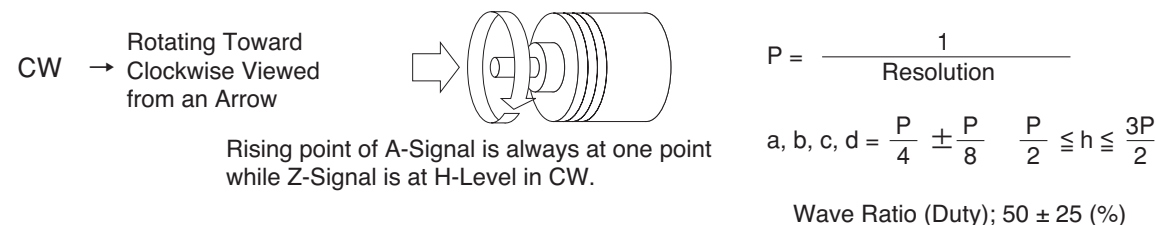
Output Circuit



Electrical Spec

		※1) at Maximum Sink Current		※2) Maximum Source Current			
TYPE	2M	2MC	2MHC	2MHCP	2MHT	2MD	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 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
	"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



Electrical Connections

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

Mechanical Spec

Starting Torque	9.8×10 ⁻⁴ N · m Max	
Angular Acceleration	1×10 ⁵ rad/s ²	
Shaft Loading	Thrust	49N
	Radial	78.4N
Moment of Inertia	3×10 ⁻⁶ kg · m ²	
Maximum Permissible Speed	5000min ⁻¹	
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 ² , 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

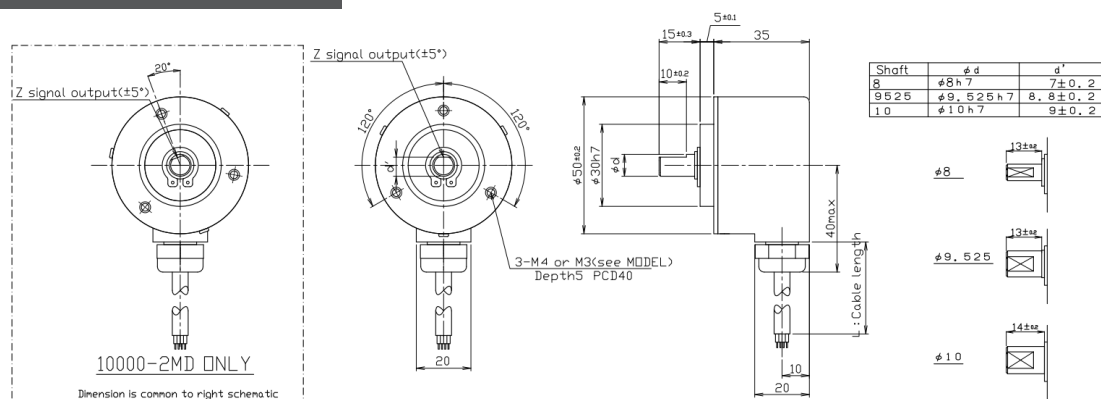
Complying with RoHS
00 : PCD40 3-M4 Depth 5
01 : PCD40 3-M3 Depth 5

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

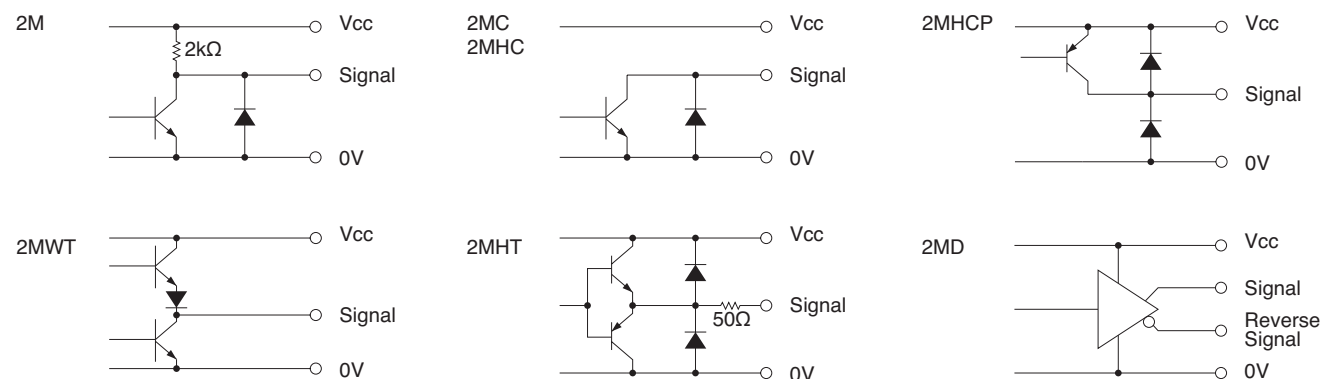
No Indication : Other than D output
C : D output with LS
C : D output with C-MOS

Signals 2M : AB90° Phase Difference + Index Signal

External Dimension



Output Circuit

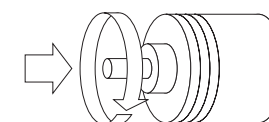


Electrical Spec

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

Rotating Toward CW → Clockwise Viewed from an Arrow

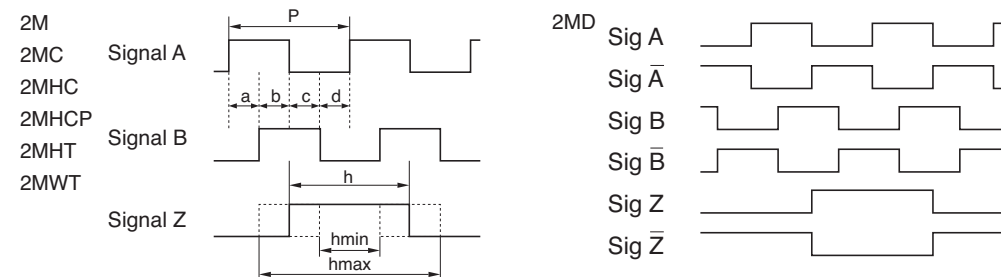


Rising point of A-Signal is always at one point while Z-Signal is at H-Level in CW.

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

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

Wave Ratio (Duty); 50 ± 25 (%)



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

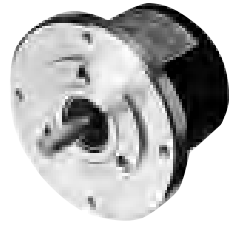
Starting Torque	9.8X10 ⁻³ N · m Max
Angular Acceleration	1X10 ⁵ rad/s ²
Shaft Loading	Thrust : 49N
	Radial : 78.4N
Moment of Inertia	3X10 ⁻⁶ kg · m ²
Maximum Permissible Speed	Instantaneous : 5000min ⁻¹ Continuous : 3000min ⁻¹
Net Weight	250g Max

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 ² , 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

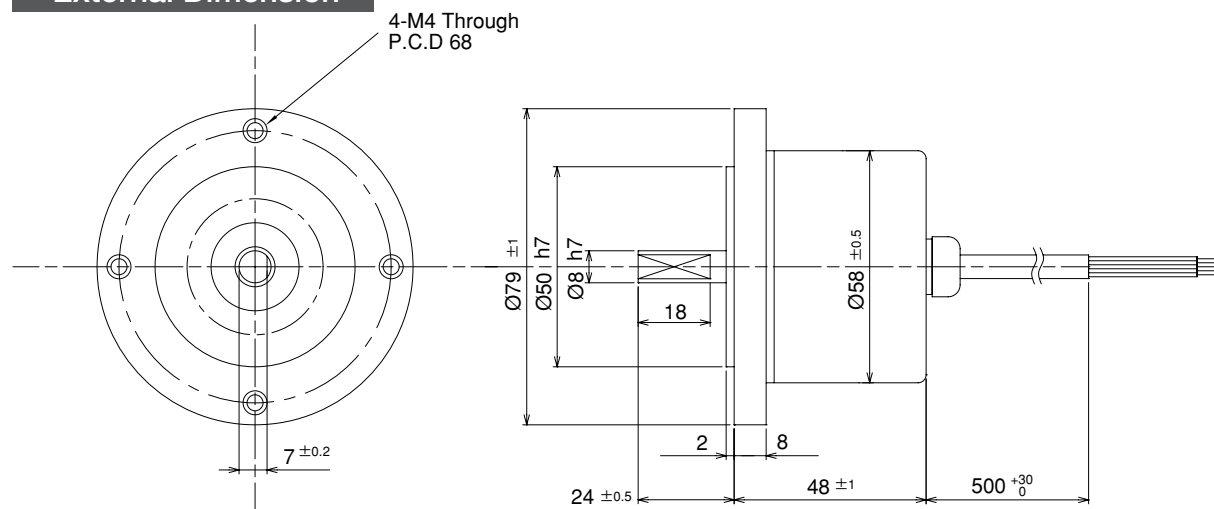
Resolution
 Signals
 Output Mode
 Cable Length 050 : 500mm
 Complying with RoHS

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

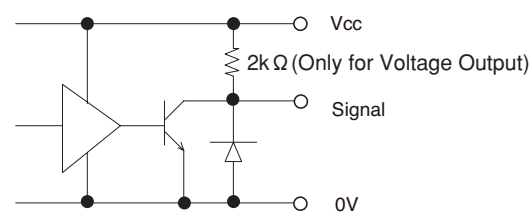
1 : Only A Signal
 2 : AB90° Phase Difference
 2M : AB90° Phase Difference + Index Signal

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

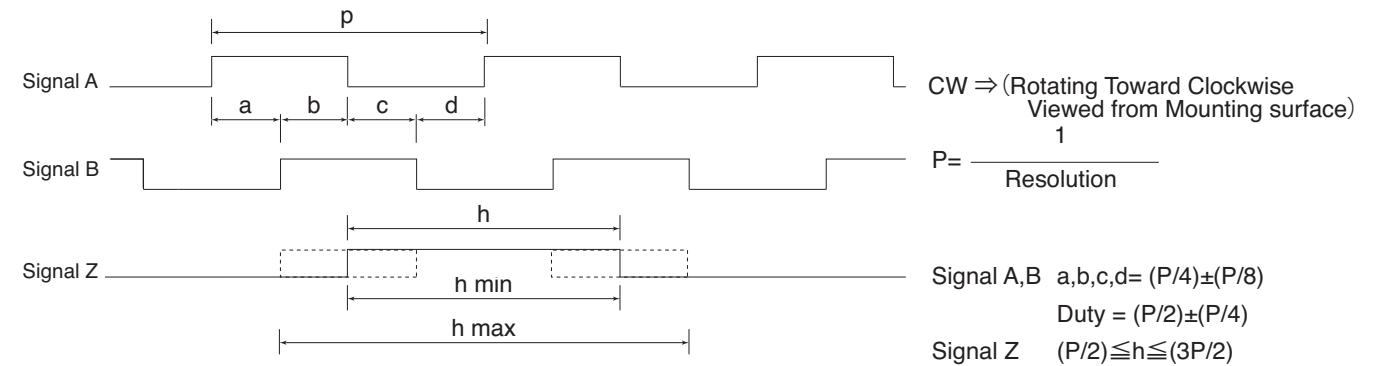


Electrical Spec

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 ⁻³ N · m Max	
Angular Acceleration	1x10 ⁵ rad/s ²	
Shaft Loading	Thrust	29.4N
	Radial	49N
Moment of Inertia	4x10 ⁻⁶ kg · m ²	
Maximum Permissible Speed	6000min ⁻¹	
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 ² , 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

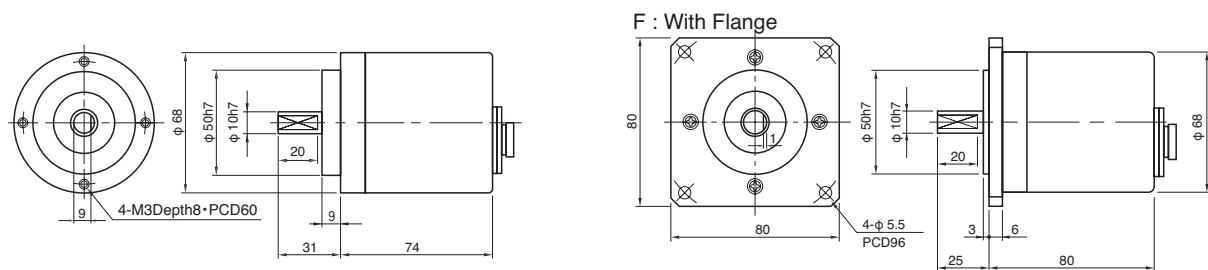
Output Mode
 No Indication: Voltage Output
 C : Open Collector Output
 HC : Open Collector Output / High Voltage

Flange Style
 0 : No Flange
 F : With Flange

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

Complying with RoHS

External Dimension



Output Circuit

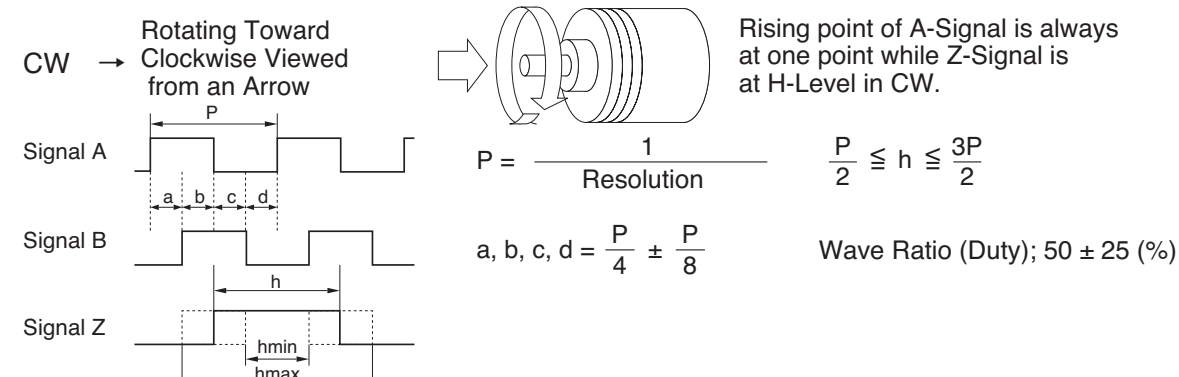


Electrical Spec

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 ⁻³ N · m Max
Angular Acceleration	1x10 ⁵ rad/s ²
Shaft Loading	Thrust 39.2N
	Radial 78.4N
Moment of Inertia	6x10 ⁻⁶ kg · m ²
Maximum Permissible Speed	5000min ⁻¹
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 ² , 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⁻¹Spec, IP54, Without additional Connector
- 01 : 5000min⁻¹Spec, IP54, With additional Connector※
- 04 : 9000min⁻¹Spec, IP54, With additional Connector※
- 05 : 9000min⁻¹Spec, IP54, Without additional Connector
- 08 : 10000min⁻¹Spec, IP66, Without additional Connector
- 09 : 10000min⁻¹Spec, IP66, With additional Connector※

※with Connector : D/MS3057-12A (DDK or its equivalent)

Flange Style

- 000 : No Flange
- 068 : With 68mm SQ Flange

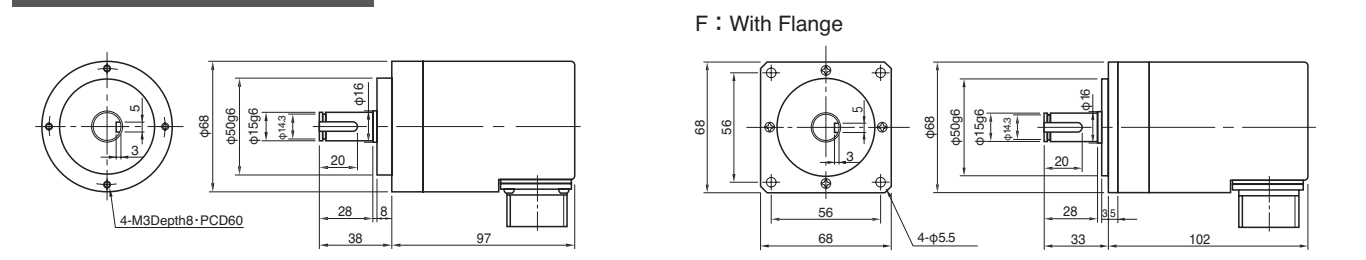
Flange Style

- 0 : No Flange
- F : With Flange

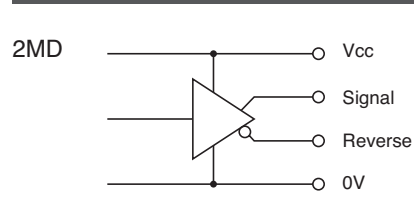
Output Mode — D : Line Driver Output

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

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

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

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

Electrical Connections

Receptacle DDK MS3102A20-29P

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 ⁻² N · m Max
Angular Acceleration	2x10 ⁵ rad/s ²
Shaft Loading	Thrust: 49N
	Radial: 98N
Moment of Inertia	1.7x10 ⁻⁵ kg · m ²
Maximum Permissible Speed	5000min ⁻¹ (9000min ⁻¹ , 10000min ⁻¹)
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP54(IP66) Plug in

Incremental Hollow Type Encoder

Hollow Shaft Encoder

38H.....	50
38HG.....	52
HEF.....	54
NOC-H.....	56
NOC-HP.....	58

Built-in Encoder

SBY.....	60
SBH.....	62

Modular Encoder

38M.....	64
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HOLLOW TYPE

38H Model

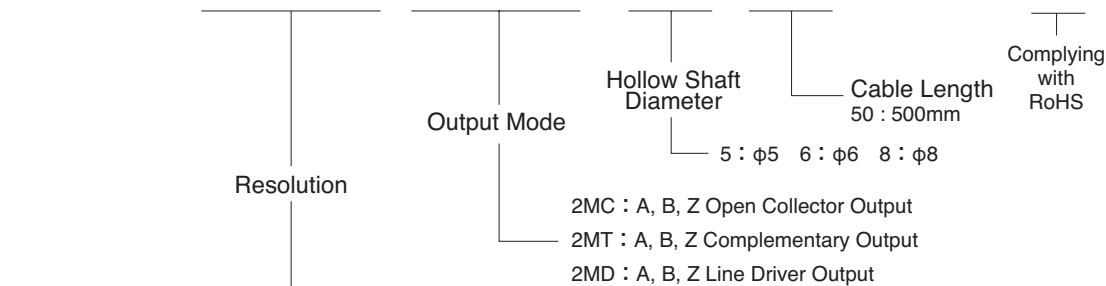


Small Standard Model

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

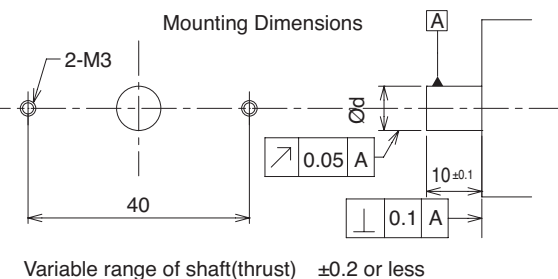
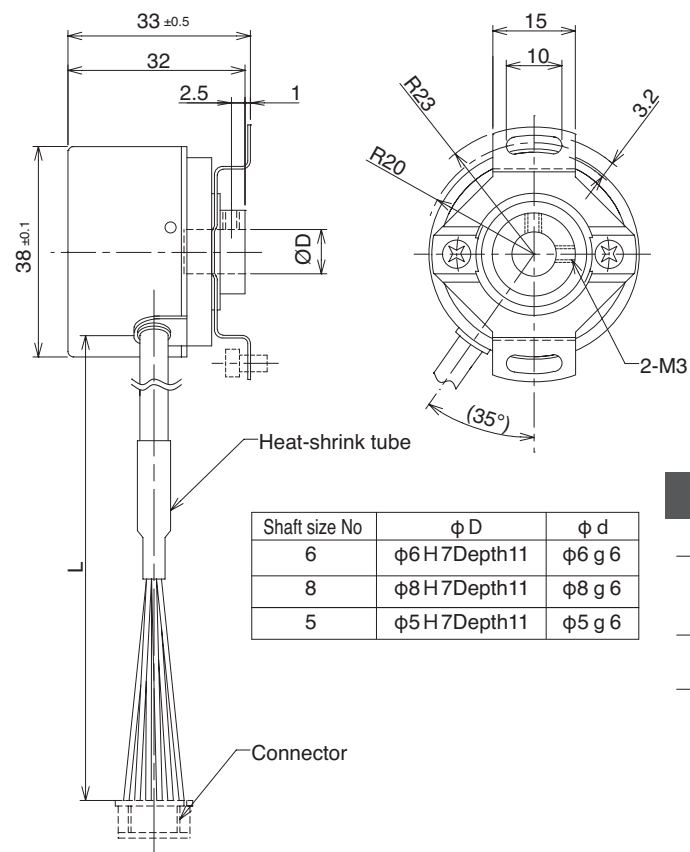


Model
38H- [] - [] - [] -50-B00E

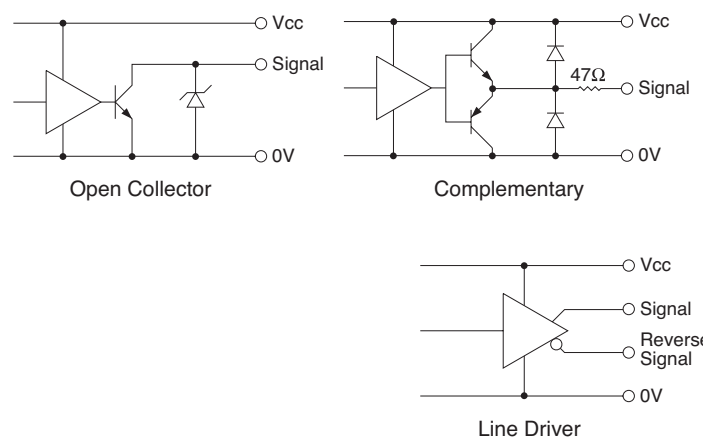


100	100P/R	360	360P/R	600	600 P/R	2000	2000 P/R	4000	4000 P/R
200	200P/R	400	400P/R	800	800 P/R	2048	2048 P/R	4096	4096 P/R
250	250P/R	500	500P/R	1000	1000 P/R	2500	2500 P/R	-	-
300	300P/R	512	512P/R	1024	1024 P/R	3600	3600 P/R	-	-

External Dimension



Output Circuit

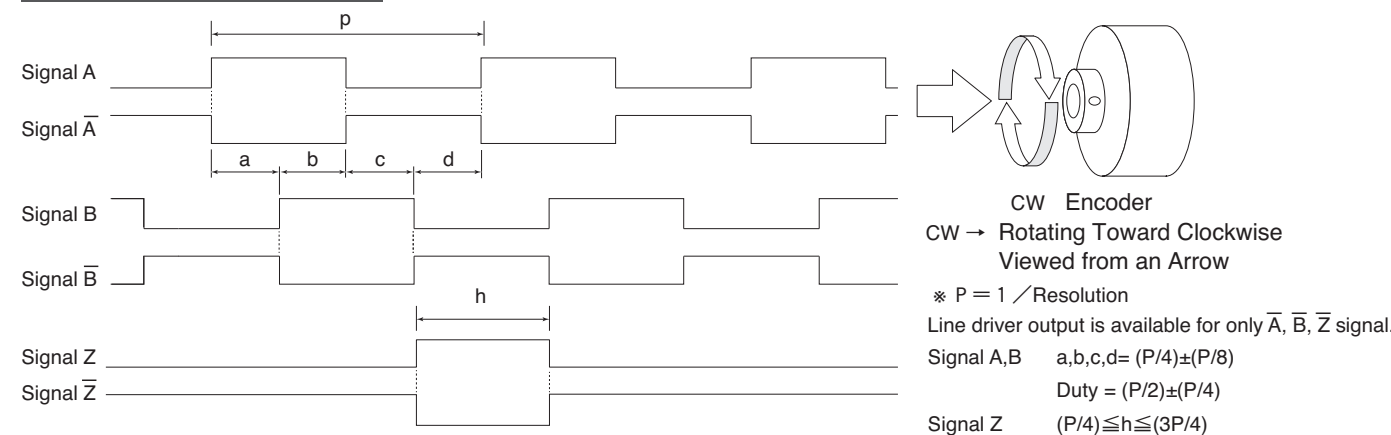


Electrical Spec

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	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



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 ⁻³ N·m Max
Angular Acceleration	1x10 ⁵ rad/s ²
Shaft Loading	Thrust 9.8N
	Radial 29.4N
Moment of Inertia	8x10 ⁻⁷ kg·m ²
Maximum Permissible Speed	6000min ⁻¹
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

HOLLOW TYPE

38HG Model



Small & Short delivery Model

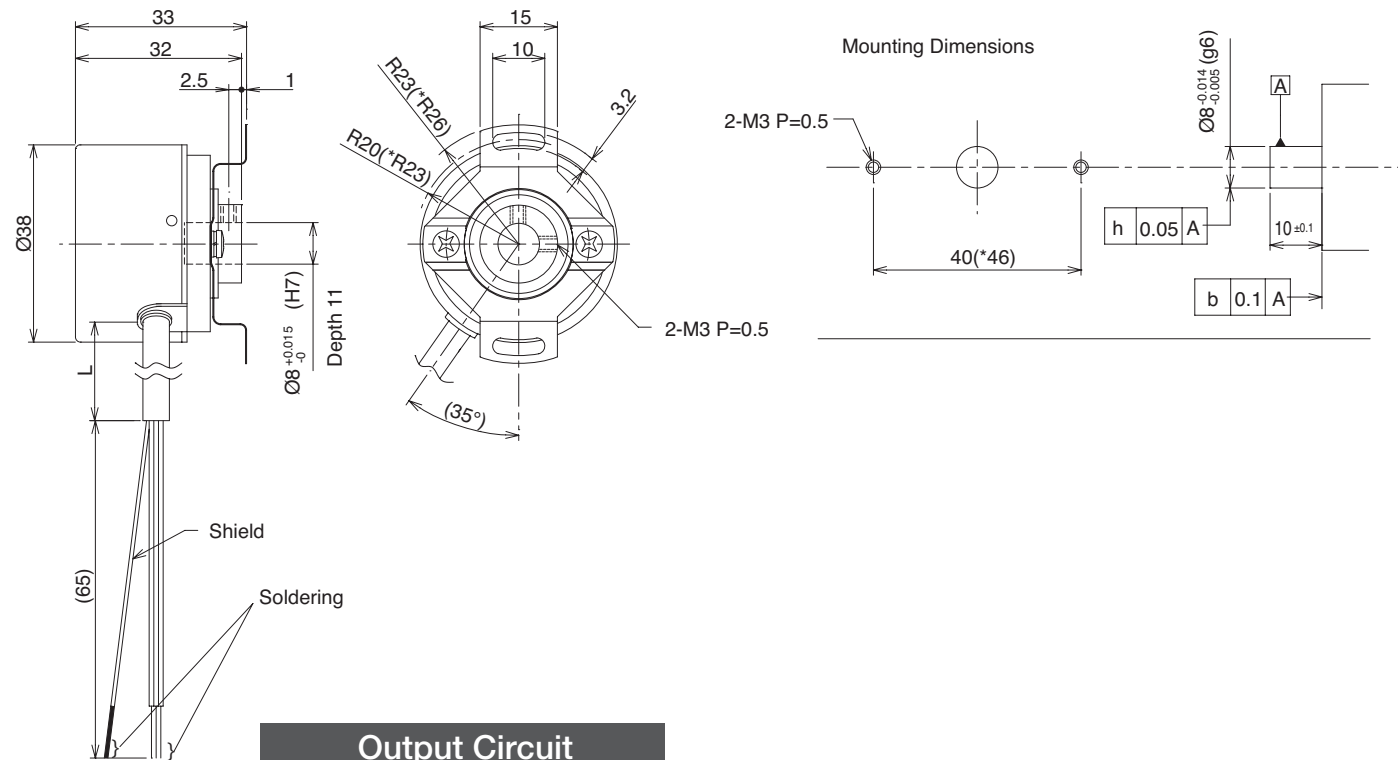
• Compact Sized Encoder with OD38mm x L33mm.

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

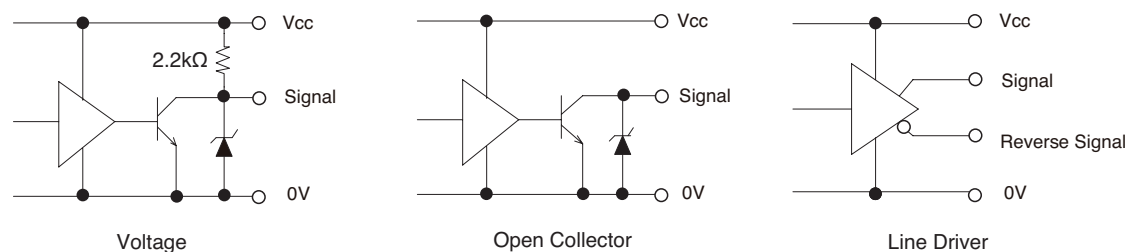


Resolution	2 : Signal A,B 2M : Signal A,B,Z	Hollow Shaft Diameter 8 : φ8	Cable Length 50 : 500mm	Mounting 00: PCD40mm 01: PCD46mm	Complying with RoHS							
Output Mode	V : Voltage Output C : Open Collector Output D : Line Driver Output											
Signal A,B,Z	500	500P/R	1000	1000P/R	1024	1024P/R	1800	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

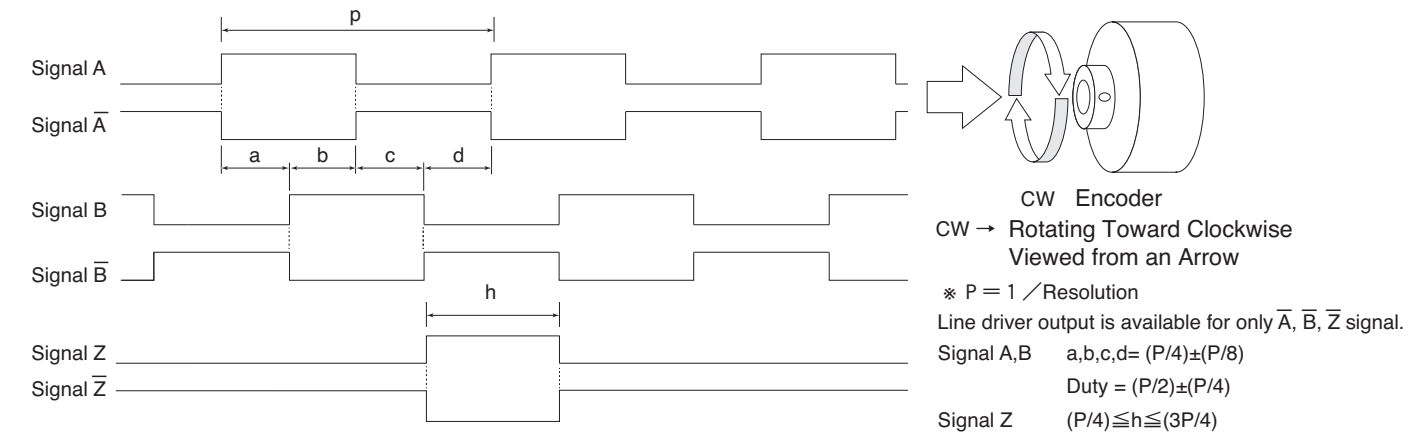


Electrical Spec

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 3.35V 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 ±20 mA)

*1) at Maximum Sink Current

Wave Form



Electrical Connections

Open Collector · Complementary		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 ⁻³ N · m Max
Angular Acceleration	1x10 ⁵ rad/s ²
Shaft Loading	Thrust 9.8N
	Radial 29.4N
Moment of Inertia	1x10 ⁻⁶ kg · m ²
Maximum Permissible Speed	6000min ⁻¹
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

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
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		

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)

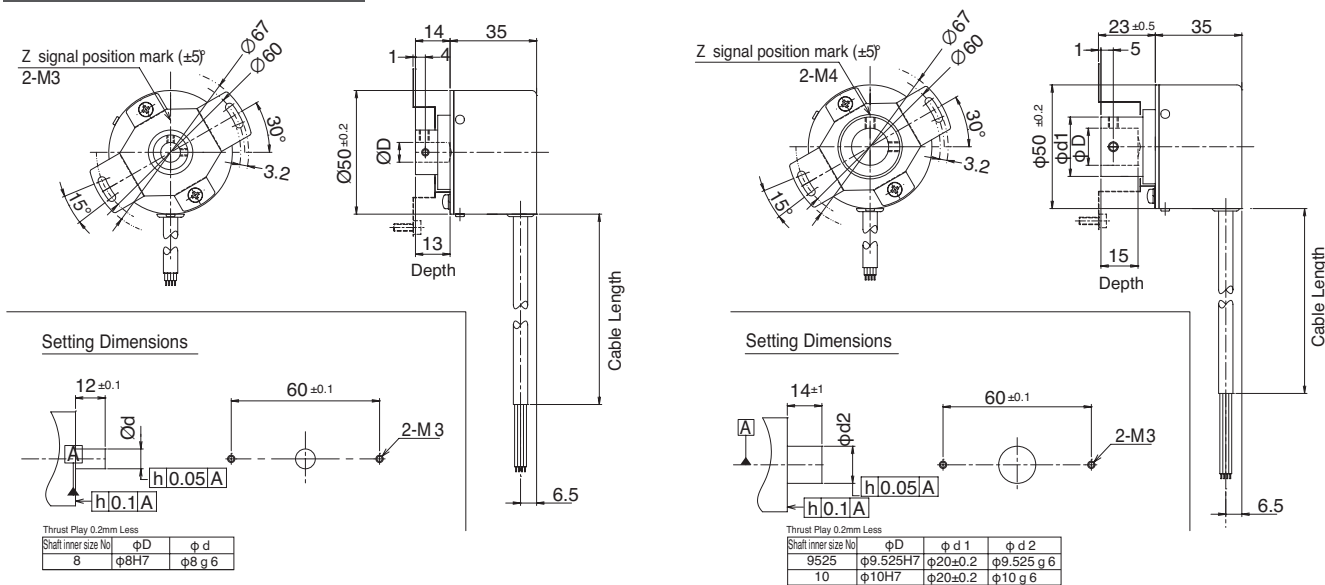
Hollow Shaft Diameter
8 : φ 8
*9525 : φ 9.525
10 : φ 10
* Option

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

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

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

External Dimension



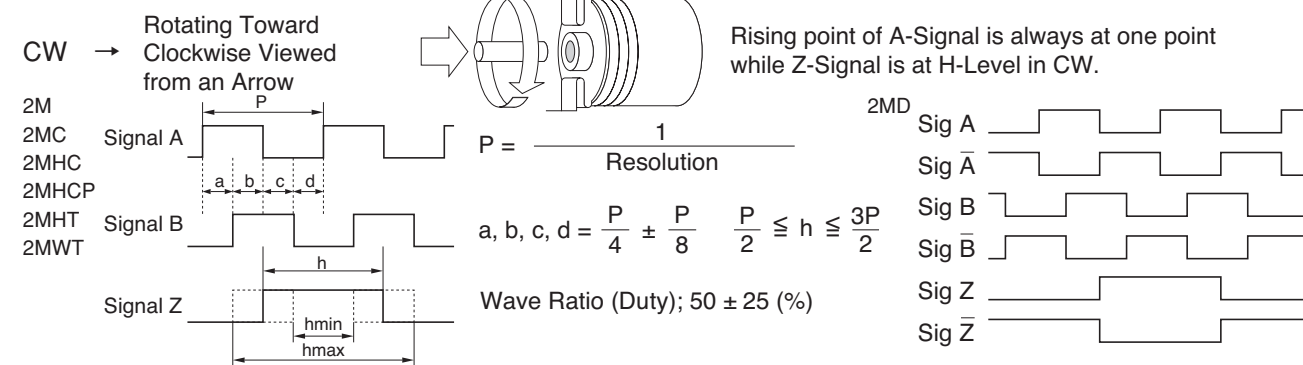
Electrical Connections

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					

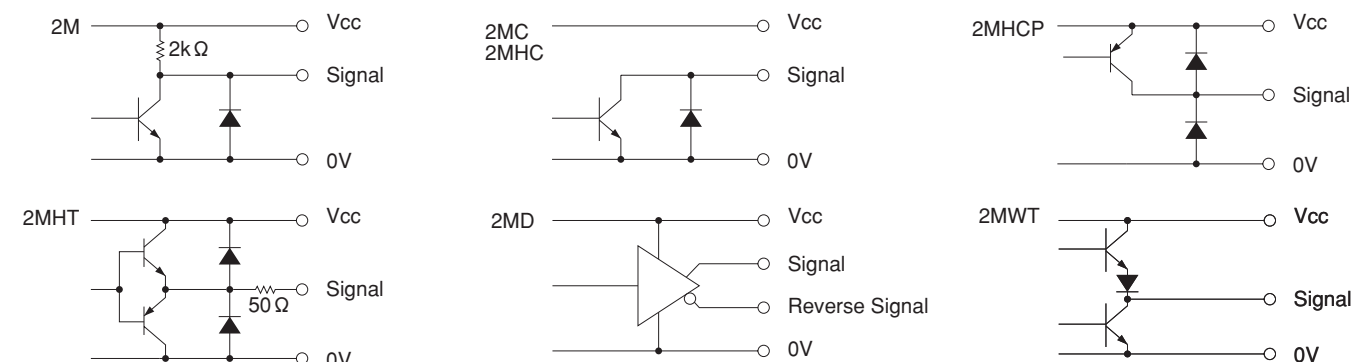
Electrical Spec

	TYPE	2M	2MC	2MHC	2MHCP	2MHT	2MD	2MWT
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 ^{※2}	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



Output Circuit



Mechanical Spec

Starting Torque	9.8x10 ⁻⁴ N · m Max
Angular Acceleration	1x10 ⁵ rad/s ²
Shaft Loading	Thrust 49N
	Radial 78.4N
Moment of Inertia	3x10 ⁻⁶ kg · m ²
Maximum Permissible Speed	5000min ⁻¹
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 ² ,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	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	10000	10000P/R		

8 : φ8
 *9525 : φ9.525
 10 : φ10
 * Option

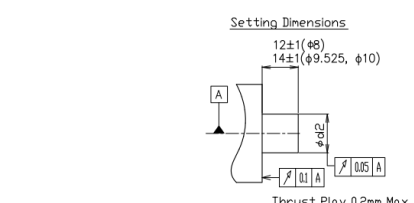
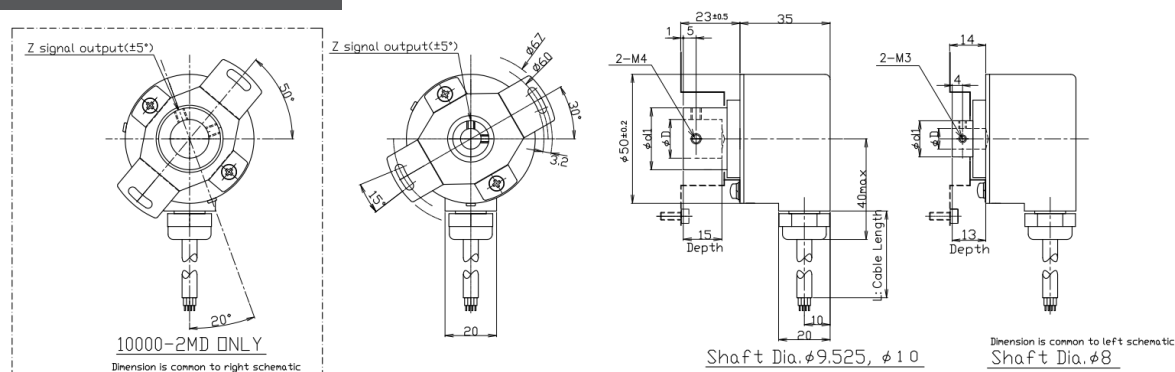
050 : 500mm (Standard)
 100 : 1000mm
 300 : 3000mm

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

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

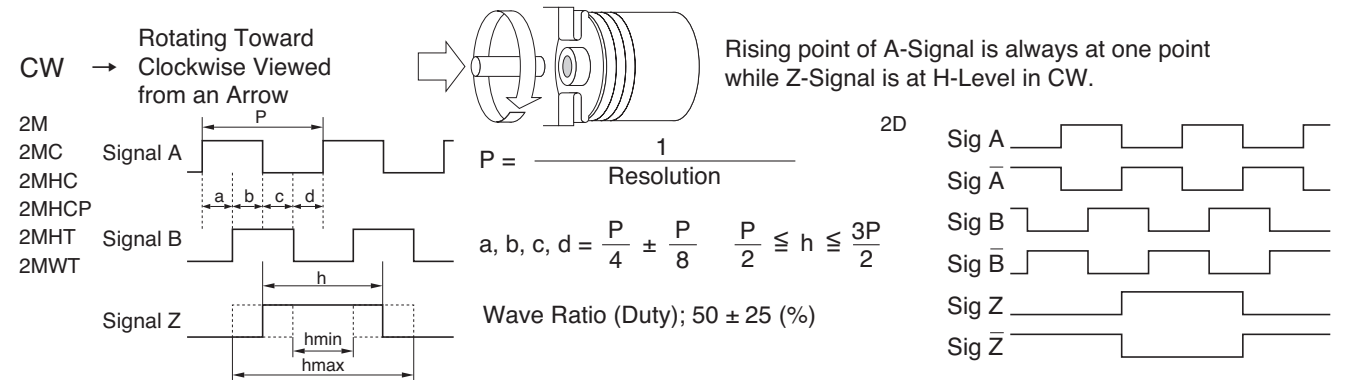
Color	Signal	Color	Signal
Red	Power Supply(Vcc)	White	Signal B
Black	0V	Gray	Signal B
Green	Signal A	Yellow	Signal Z
Blue	Signal B	Orange	Signal Z
White	Signal A		
Yellow	Signal Z		
Shield	F·G		

Electrical Spec

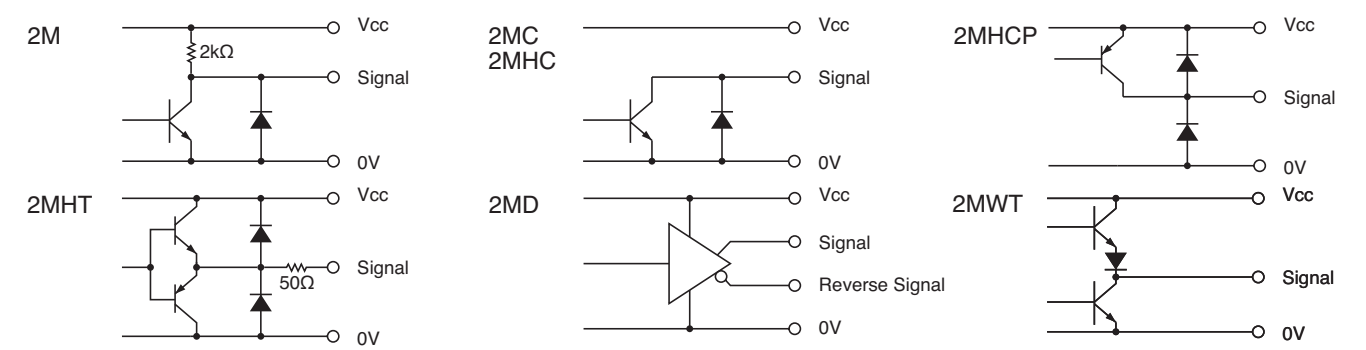
TYPE	2M	2MC	2MHC	2MHCP	2MHT	2MD	2MWT
Power Supply(Vcc)	DC4.5~13.2 V		DC10.8~26.4 V			DC4.5~5.5V (C-MOS)	DC 4.75~30V
Current Consumption	90 mA Max	70 mA Max		100 mA Max	90 mA Max	70 mA Max (C-MOS)	60 mA Max
Output Voltage	"H"	Vcc-1V Min	Vcc-1V Min		Vcc-3V Min	2.5 V Min	Vcc-2.5V Min
	"L" *1	0.5 V Max		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						

*1) at Maximum Sink Current *2) Maximum Source Current

Wave Form



Output Circuit



Mechanical Spec

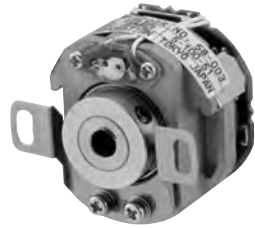
Starting Torque	9.8x10 ⁻³ N · m Max
Angular Acceleration	1x10 ⁵ rad/s ²
Shaft Loading	Thrust 49N
	Radial 78.4N
Moment of Inertia	3x10 ⁻⁶ kg · m ²
Maximum Permissible Speed	Instantaneous : 5000min ⁻¹ Continuous : 3000min ⁻¹
Net Weight(Without Cable)	250g Max

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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65

BUILT-IN TYPE

SBY Model

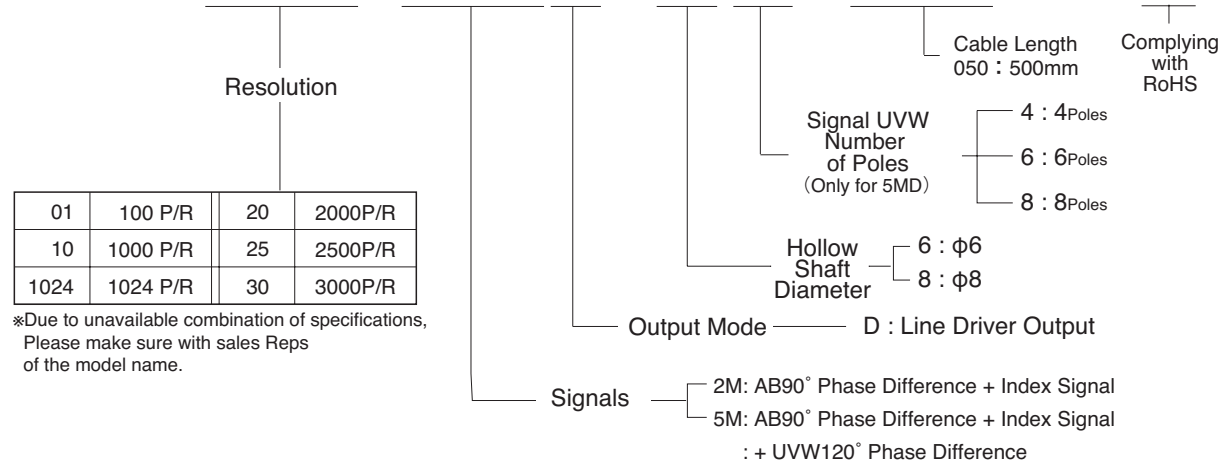


Standard Built-in Model

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

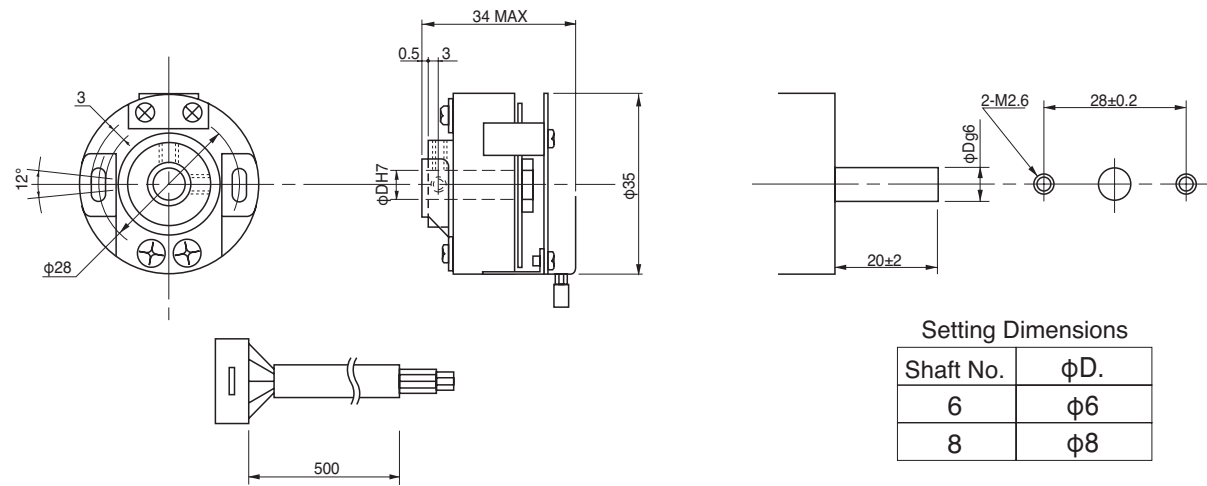


Model
SBY- [] - [] D - [] - 050 - 00E

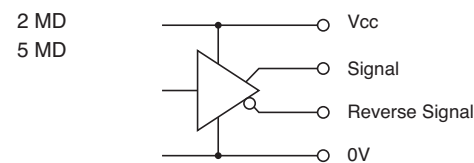


※Due to unavailable combination of specifications, Please make sure with sales Reps of the model name.

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

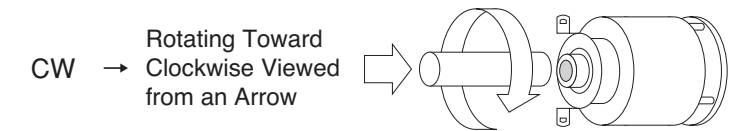
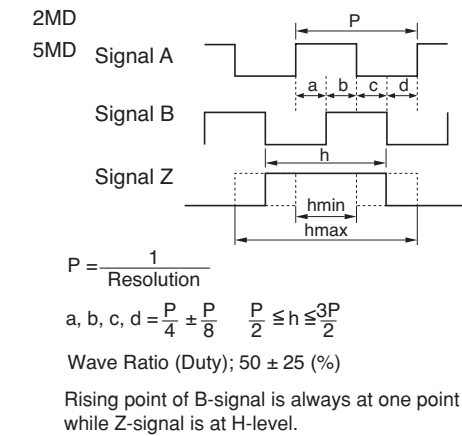
2MD

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		

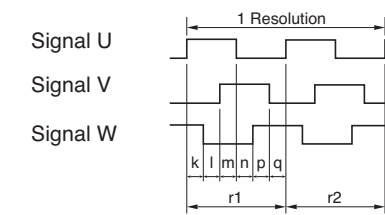
5MD

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 Angular k ~ q 30° ± 3° Position Relation between U and Z phases
 r1, r2 180° ± 1° Mechanical Angular 0° ± 2°

$\bar{A} \bar{B} \bar{Z} \bar{U} \bar{V} \bar{W}$ signal are reverse signal of ABZUWV.

Mechanical Spec

Starting Torque	2.94x10 ⁻³ N · m Max
Angular Acceleration	1x10 ⁵ rad/s ²
Shaft Loading	Thrust 9.8N
	Radial 19.6N
Moment of Inertia	1x10 ⁻⁶ kg · m ²
Maximum Permissible Speed	6000min ⁻¹
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 ² ,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

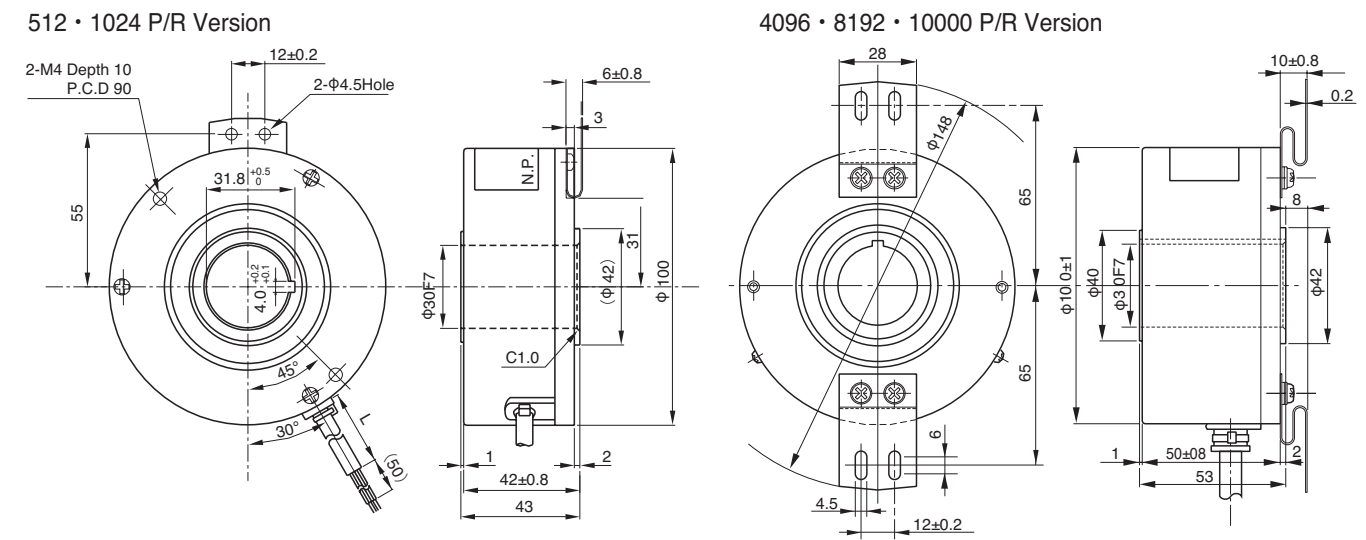
Resolution

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

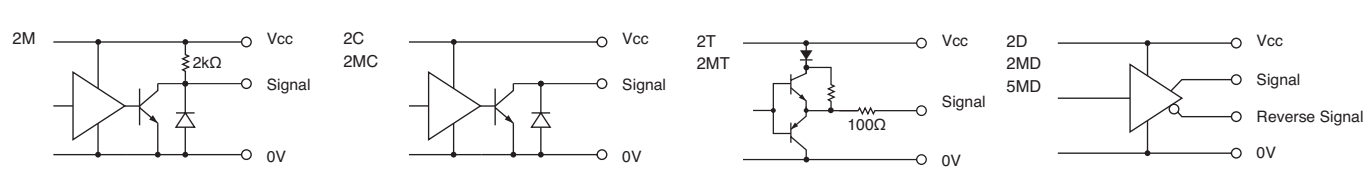
*Line Driver Only

- 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	

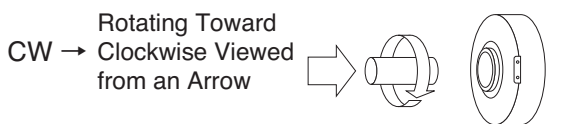
*1) at Maximum Sink Current

Electrical Connections

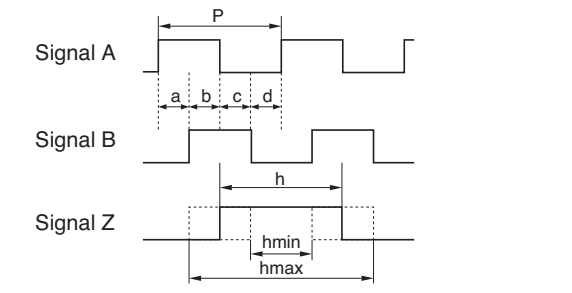
Color	Signal	Color	Signal
Red	Power Supply(Vcc)	Red	Power Supply(Vcc)
Black	0V	Black	0V
Blue or Green	Signal A	*	Signal A
White	Signal B	*	Signal A
Yellow	Signal Z	*	Signal B
Shield	F. G	*	Signal B
		*	Signal Z
		*	Signal Z
		Shield	F. G

*Contact us.

Wave Form



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

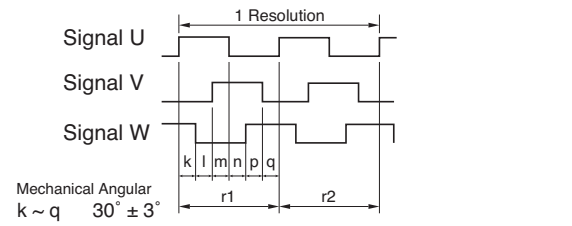


$$P = \frac{1}{\text{Resolution}}$$

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

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

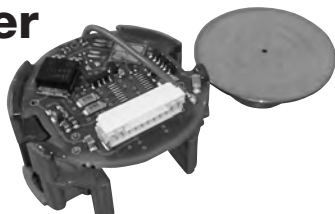
	512 • 1024 P/R	4096•8192•10000 P/R
Starting Torque	7.35x10 ⁻² N · m Max	49x10 ⁻³ N · m Max
Angular Acceleration	1x10 ⁴ rad/s ²	
Shaft Loading	Thrust	19.6N / 9.8N
	Radial	39.2N / 19.6N
Moment of Inertia	1.5x10 ⁻⁴ kg · m ²	1.8x10 ⁻⁴ kg · m ²
Maximum Permissible Speed	Continuous : 500min ⁻¹ Instantaneous : 2500min ⁻¹	500min ⁻¹
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 ² ,11ms X, Y, Z Each 3 times	

Modular Encoder

38M Model



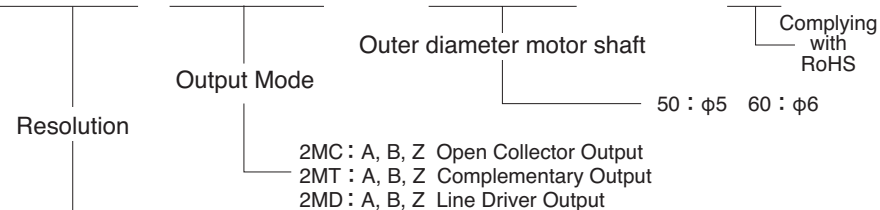
Small Modular Model

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



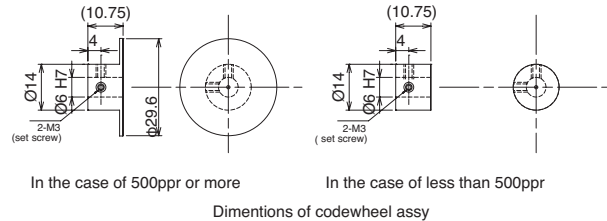
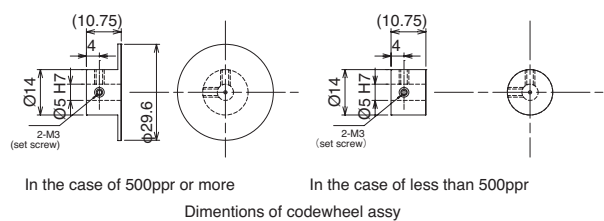
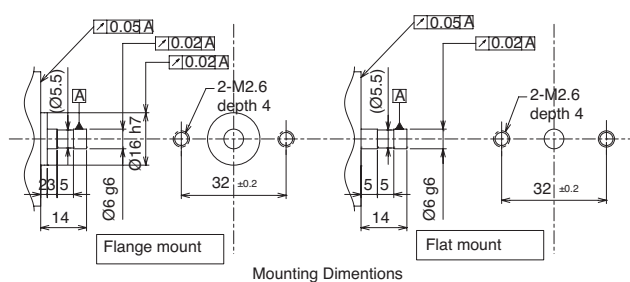
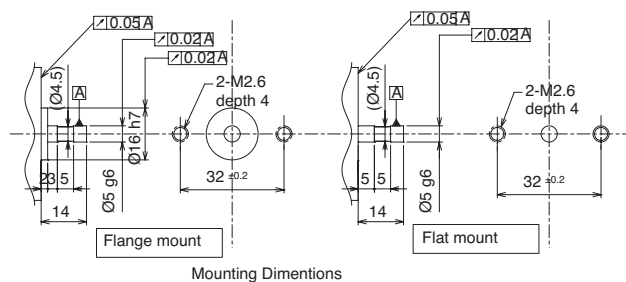
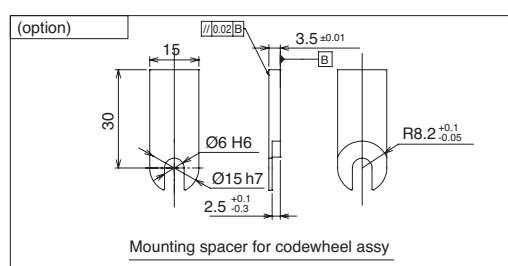
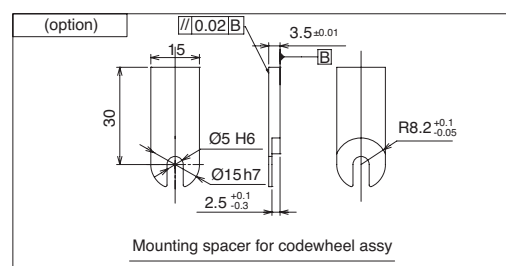
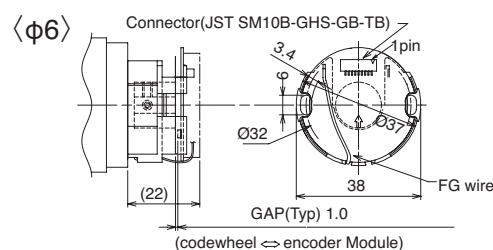
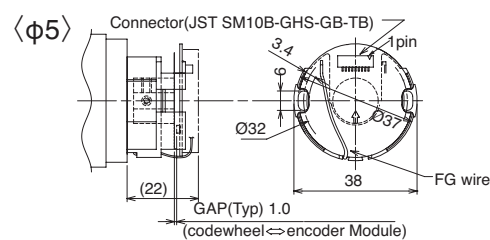
Model

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



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

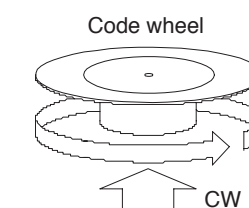
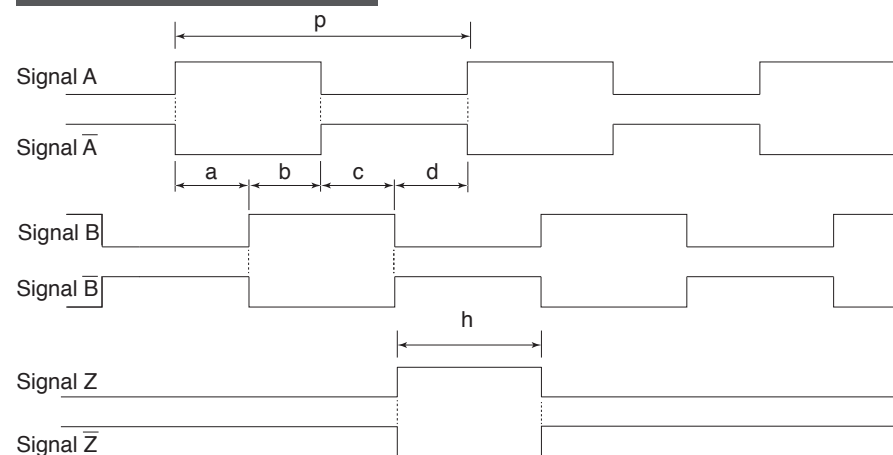


Electrical Spec

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

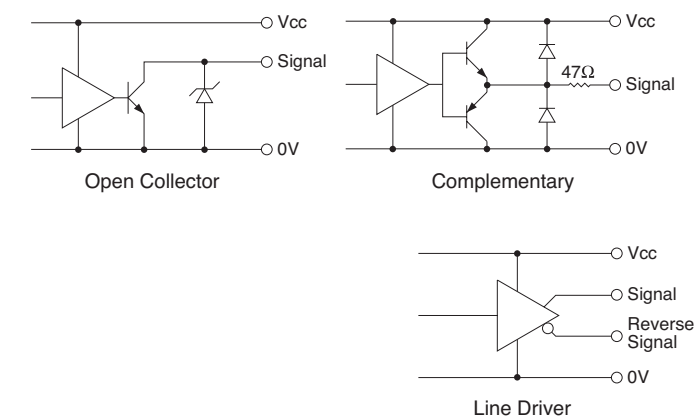
- * P = 1 / Resolution
- * Line driver output is available for only \bar{A} , \bar{B} , \bar{Z} signal.
- Signal A,B a,b,c,d= (P/4)±(P/8)
Duty = (P/2)±(P/4)
- Signal Z (P/4) ≤ h ≤ (3P/4)

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 \bar{A}
5	Sig B	5	Sig B
6	-	6	Sig \bar{B}
7	Sig Z	7	Sig Z
8	-	8	Sig \bar{Z}
9	-	9	-
10	FG	10	FG

Output Circuit



Mechanical Spec

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

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 ² , 11ms X, Y, Z Each 3 times

Absolute Encoder

Absolute Encoder	
AEW2	68
ASC-SP	70
AHS2	72
ASC-HP	74

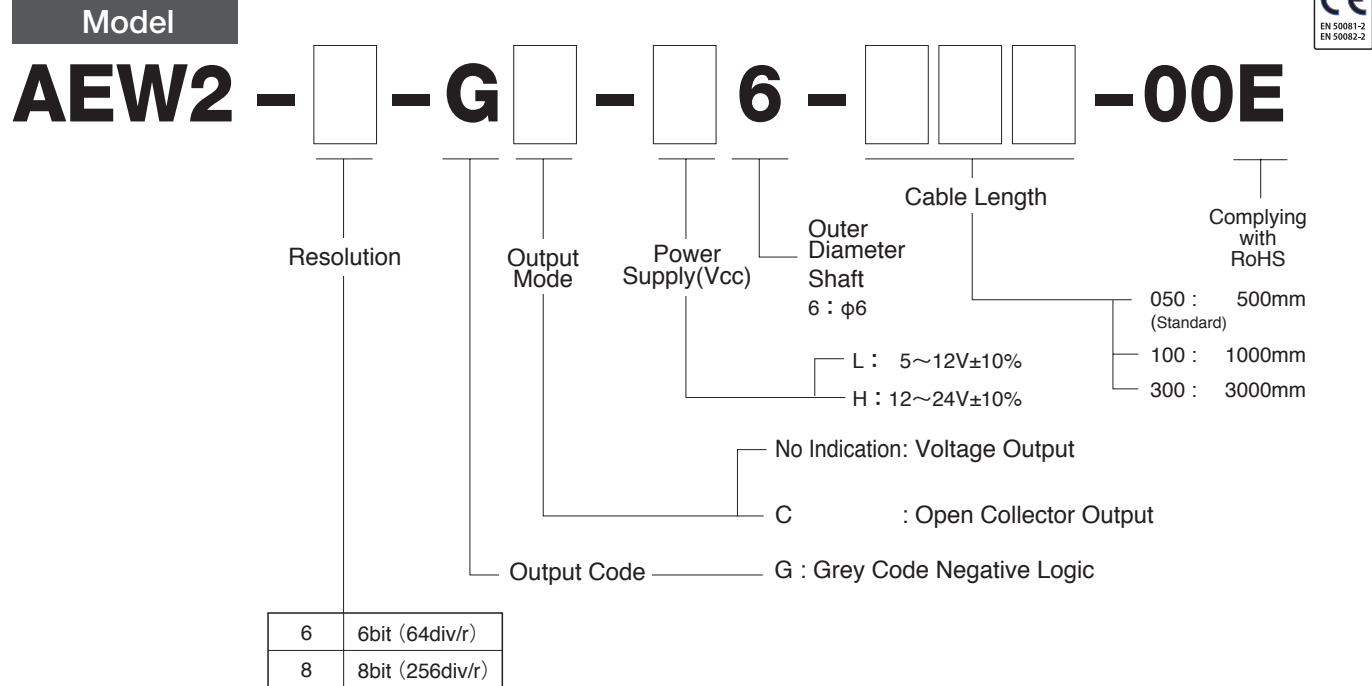
ABSOLUTE TYPE



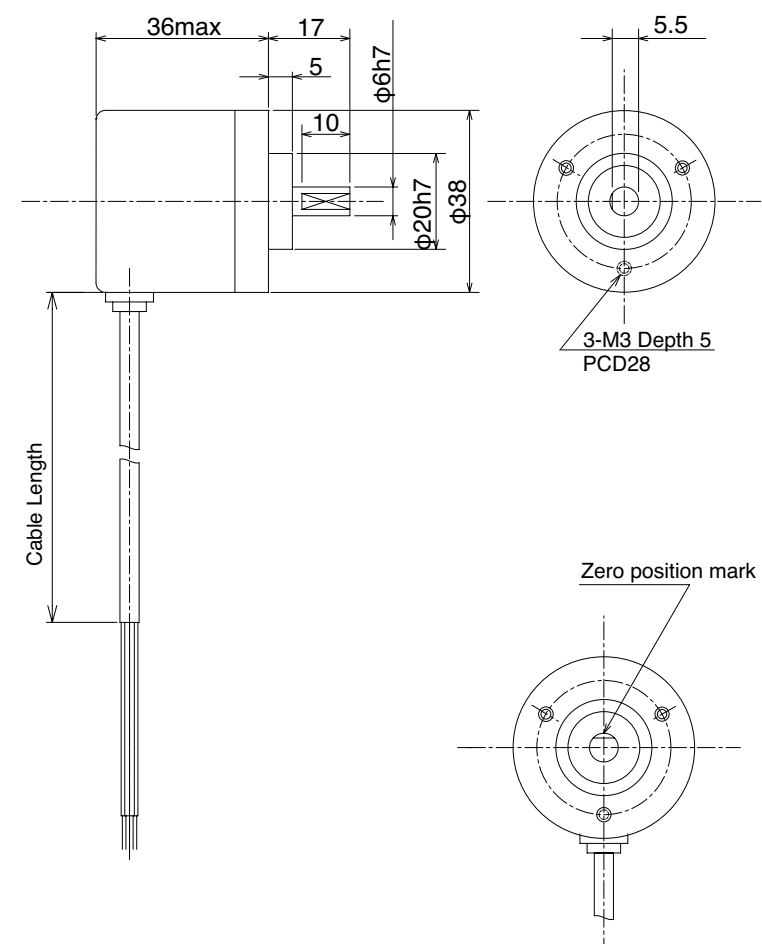
38mm Diameter Compact Shaft Type Absolute Encoder

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

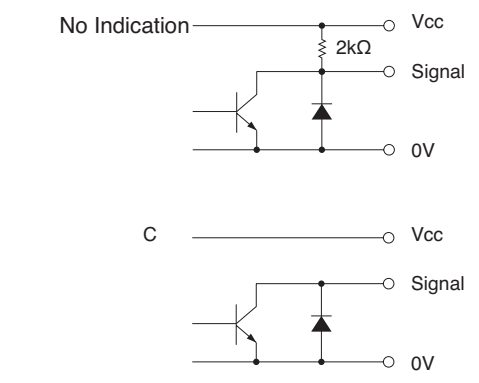
AEW2 Model



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" ^{*1}	0.5 VMax
Maximum Sink Current	20 mA	
Rise & Fall Time	1 μs Max	
Maximum Frequency Response ^{*2}	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 ⁰
Orange	Signal 2 ¹
Yellow	Signal 2 ²
Green	Signal 2 ³
Blue	Signal 2 ⁴
Purple	Signal 2 ⁵
Gray	Signal 2 ⁶ Only available for 8bit output
White	Signal 2 ⁷ Only available for 8bit output
Shield	F.G

Wave Form



Mechanical Spec

Starting Torque	9.8x10 ⁻⁴ N · m Max
Angular Acceleration	1x10 ⁵ rad/s ²
Shaft Loading	Thrust 19.6N
	Radial 29.4N
Moment of Inertia	8x10 ⁻⁷ kg · m ²
Maximum Permissible Speed	6000min ⁻¹
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

ABSOLUTE TYPE

ASC-SP Model



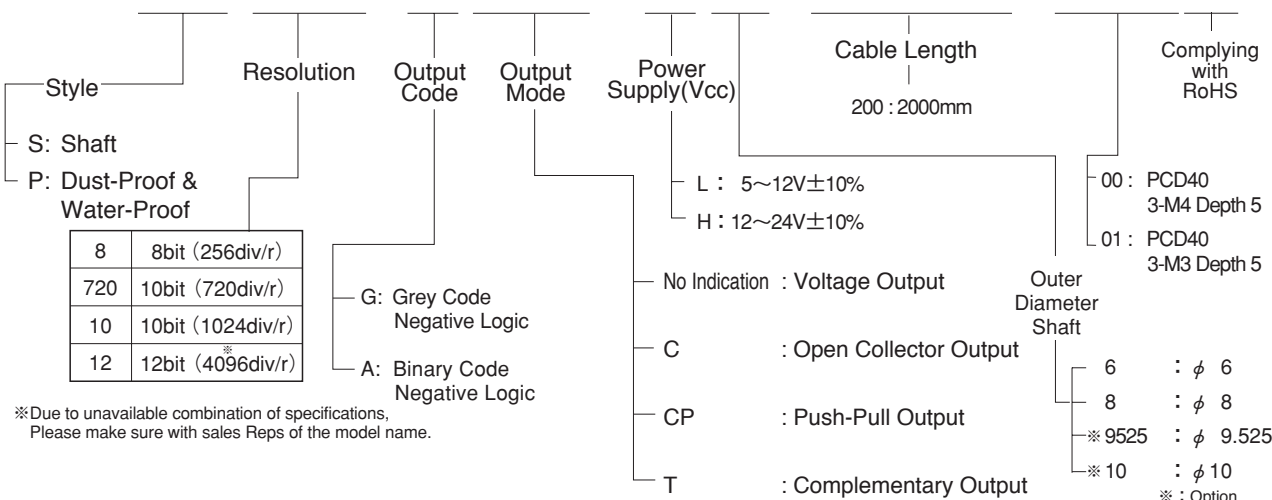
Heavy Duty 50mm Diameter Encoder

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



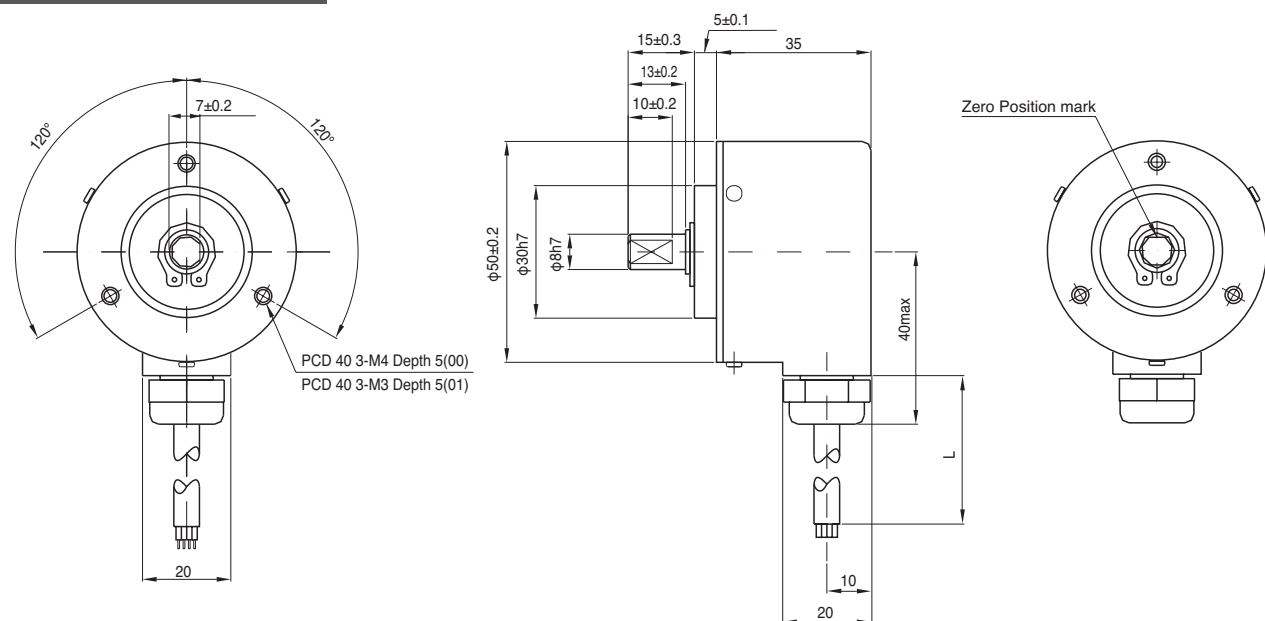
Model

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

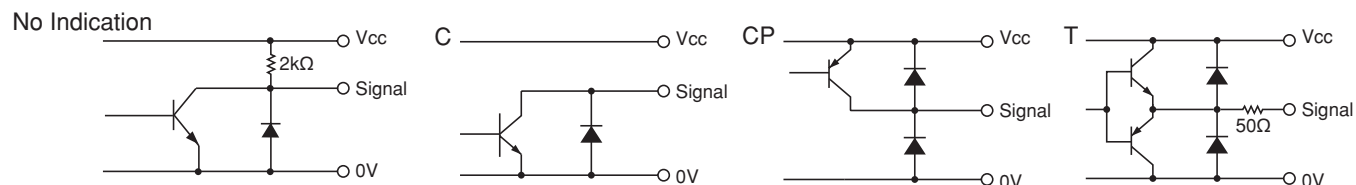


※Due to unavailable combination of specifications, Please make sure with sales Reps of the model name.

External Dimension



Output Circuit



Electrical Spec

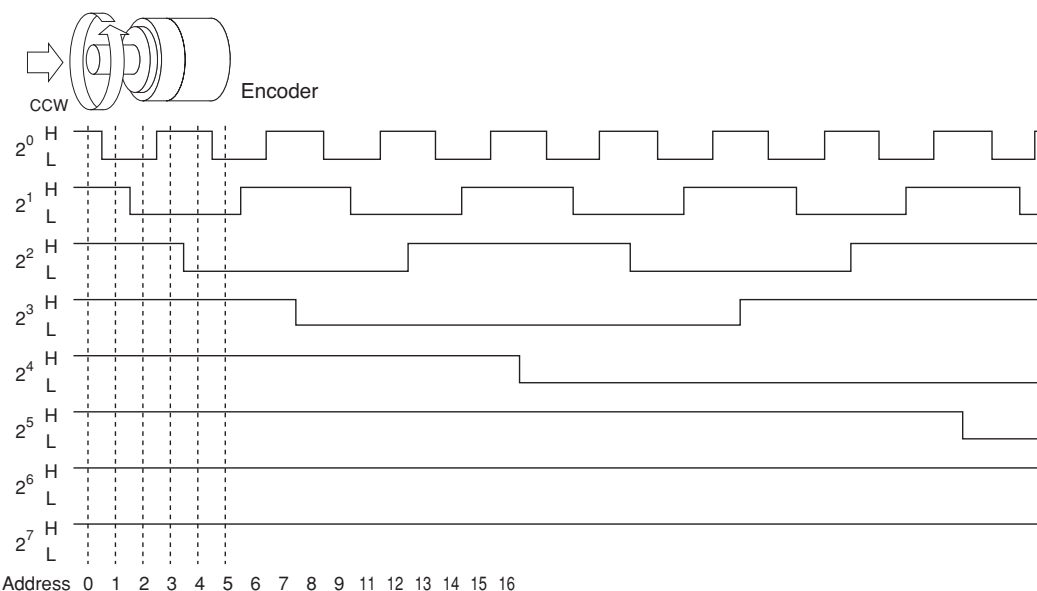
	TYPE	No Indication	C	CP	T
Power Supply(Vcc)		L : DC 4.5~13.2 V H : DC 10.8~26.4 V			
Current Consumption		100 mA Max			
Output Voltage	"H"	Vcc-1V Min	—	Vcc-1V Min	Vcc-3V Min
	"L" *1	0.5 VMax		—	3 V Max
Maximum Sink Current		20 mA			
Rise & Fall Time		2 μs Max			
Maximum Frequency Response*2		10kHz (256)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

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

Wave Form

CW Rotating Toward Clockwise Viewed from an Arrow =256 · 720 · 1024

CCW Rotating Toward Counter Clockwise Viewed from an Arrow =4096



Electrical Connections

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

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

Mechanical Spec

Starting Torque	9.8×10 ⁻³ N · m Max
Angular Acceleration	1×10 ⁵ rad/s ²
Shaft Loading	Thrust 49N
	Radial 78.4N
Moment of Inertia	3×10 ⁻⁶ kg · m ²
Maximum Permissible Speed	Instantaneous : 5000min ⁻¹ Continuous : 3000min ⁻¹
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 ² ,11ms X, Y, Z Each 3 times
Ingress Protection	IP65

ABSOLUTE TYPE

AHS2 Model

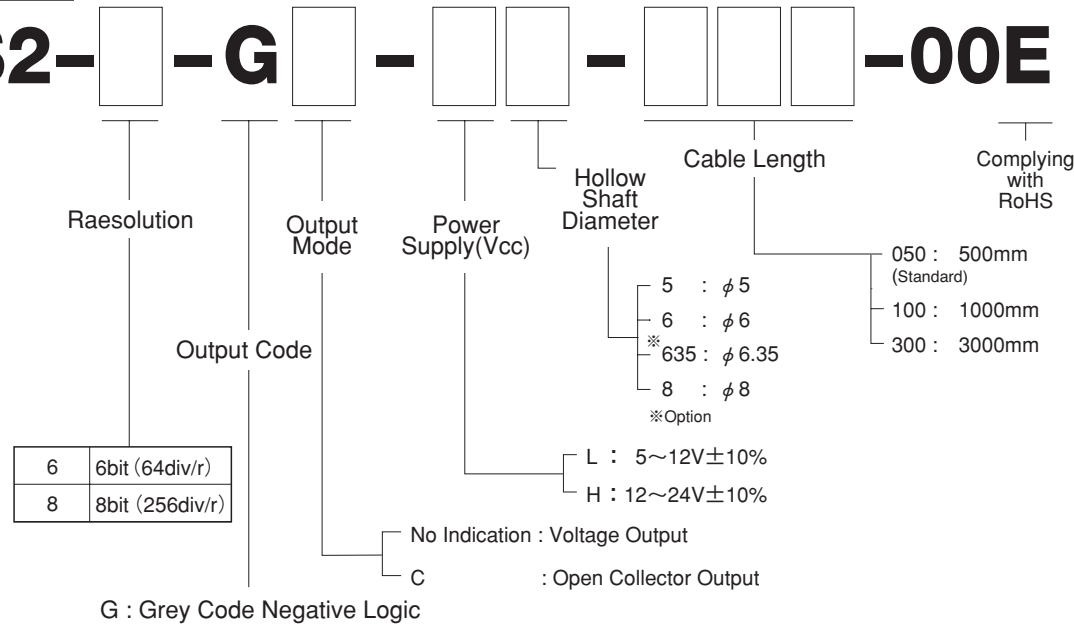


38 Series Hollow Shaft and Absolute Models

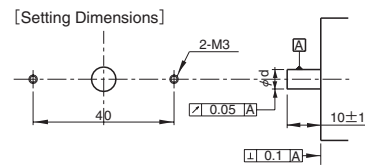
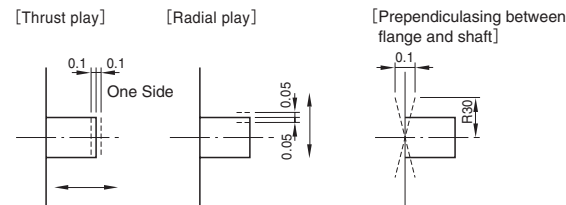
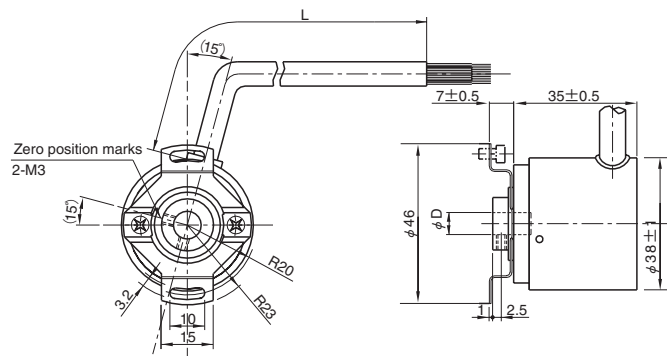
•8bit (256div/r) is Available with OD 38mm.



Model
AHS2- -G - - - -00E

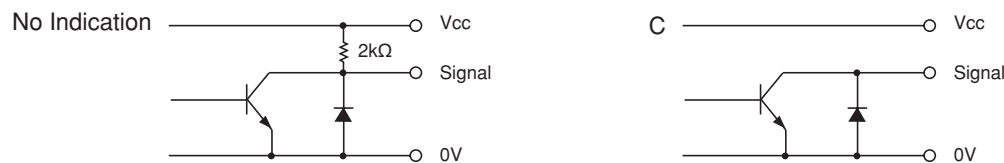


External Dimension



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

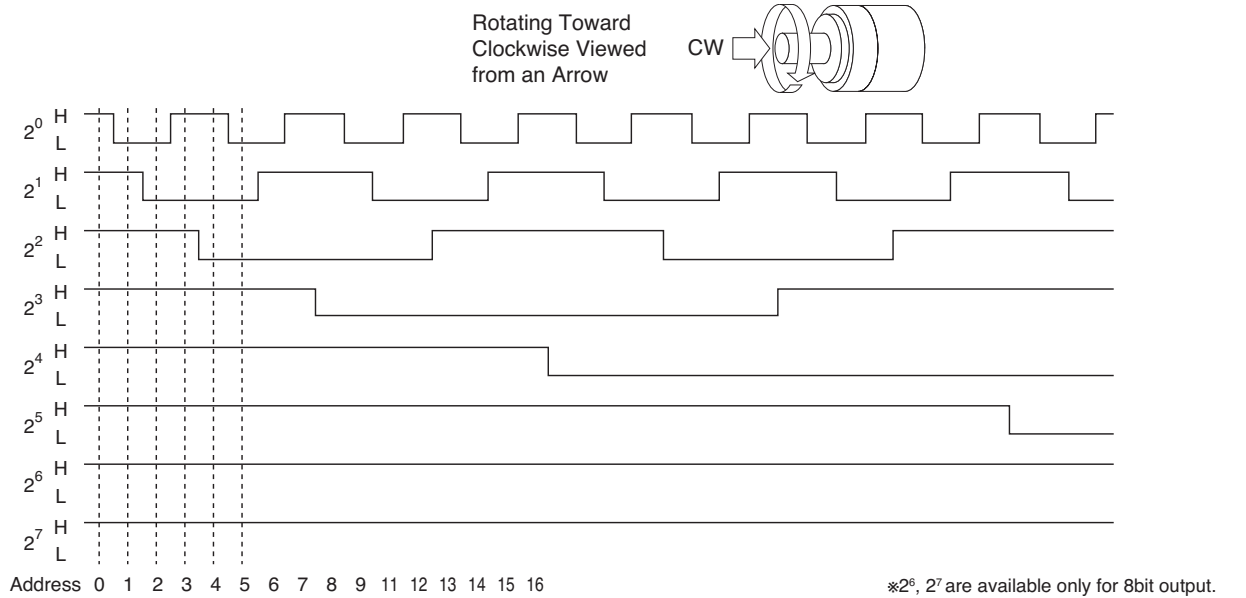
Power Supply(Vcc)	L : DC 4.5 ~ 13.2 V H : DC 10.8 ~ 26.4 V	
Current Consumption	100mA Max	
Output Voltage	"H"	Vcc-1V Min (Exclude C Mode)
	"L" ^{*1}	0.5 VMax
Maximum Sink Current	20 mA	
Rise & Fall Time	1 μs Max	
Maximum Frequency Response ^{*2}	5 kHz	

*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 ⁰
Orange	Signal 2 ¹
Yellow	Signal 2 ²
Green	Signal 2 ³
Blue	Signal 2 ⁴
Purple	Signal 2 ⁵
Gray	Signal 2 ⁶ Only available for 8bit output
White	Signal 2 ⁷ Only available for 8bit output
Shield	F.G

Wave Form



Mechanical Spec

Starting Torque	9.8x10 ⁻⁴ N · m Max	
Angular Acceleration	1x10 ⁵ rad/s ²	
Shaft Loading	Thrust	9.8N
	Radial	29.4N
Moment of Inertia	8x10 ⁻⁷ kg·m ²	
Maximum Permissible Speed	6000min ⁻¹	
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP50

Manual Encoder

Manual Encoder	
MKE	78
Manual Pulse Generator	
35PG	80
UFO-M2.....	82
UFO.....	84
Handy Pendant	
HP-U.....	86
HP-V.....	88
HP-M.....	90

MANUAL TYPE

MKE Model



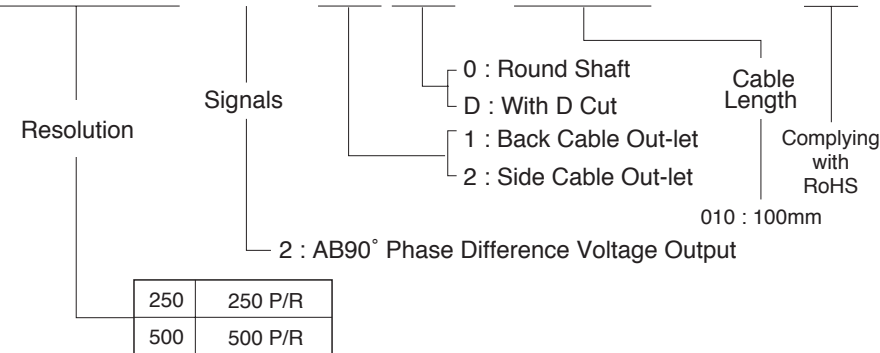
Manual Model

- High Resolution Up to 500P/R.
- Ideal for Measuring Equipment.

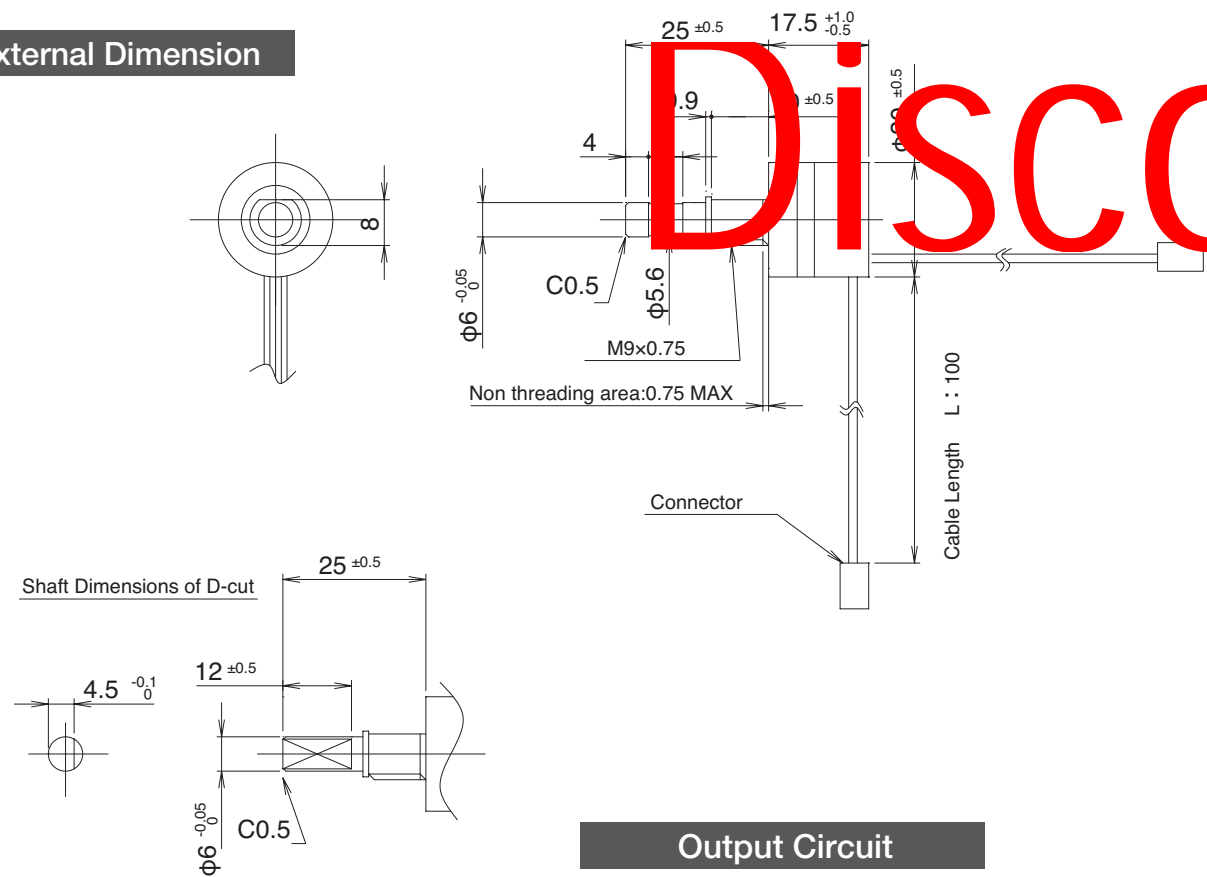


Model

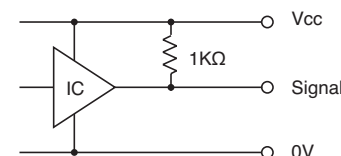
MKE- [] [] -2- [] [] -010-00E



External Dimension



Output Circuit



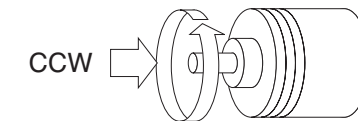
Electrical Spec

Power Supply(Vcc)	DC 4.75~5.25 V	
Current Consumption	40 mA Max	
Output Voltage	"H"	Vcc-1v Min
	"L" *1	0.5 V Max
Maximum Sink Current	1 mA	
Rise& Fall Time	1.3 μs(TYP)	
Maximum Frequency Response	5 kHz	

*1) at Maximum Sink Current

Wave Form

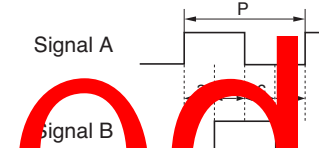
Rotating Toward Counter
Clockwise Viewed
from an Arrow



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

$$a, b, c, d = \frac{P}{4} \pm \frac{P}{8}$$

Wave Ratio (Duty): 50 ± 25 (%)



Discontinued

Electrical Connections

Connector JAE IL-S-4S-S2C2-S

Pin No.	Color	Signal
1	Blue	Power Supply(Vcc)
2	Orange	Signal A
3	Yellow	Signal B
4	Black	0V

Mechanical Spec

Starting Torque	4.9×10 ⁻³ N · m Max	
*1 Shaft Loading	Thrust	9.8N
	Radial	9.8N
Moment of Inertia	3×10 ⁻⁷ kg · m ²	
Net Weight(Without Cable)	25g Max	

*1) Without Abnormality on 5 seconds Loading.

Environmental Spec

Operating Temperature	0°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	735m/s ² ,6ms X, Y, Z Each 3 times

MANUAL TYPE

35PG Model

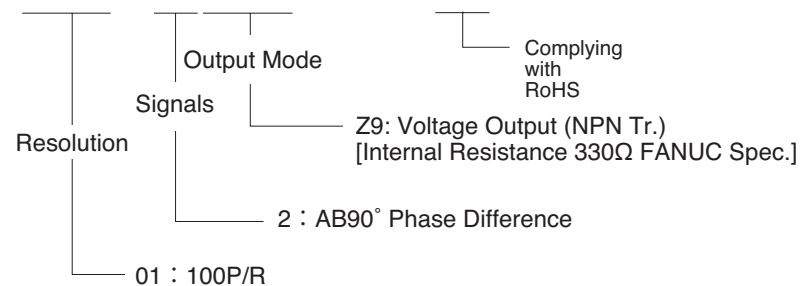


Small Size Model

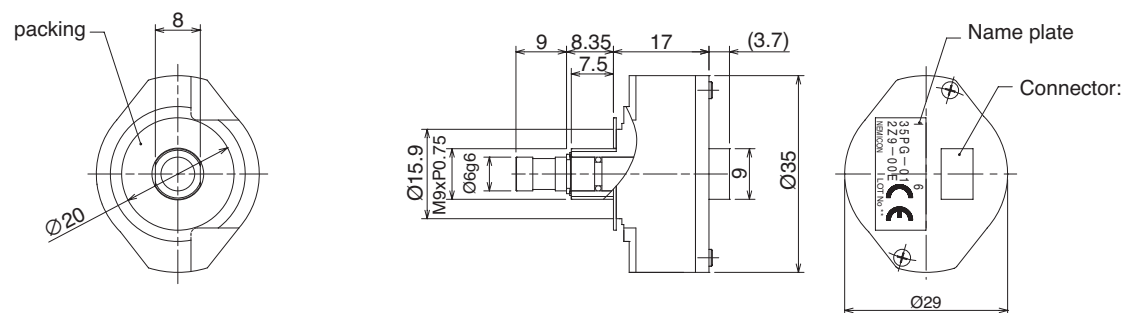
- Ideal for Measuring Equipment.
- Build-in Click Mechanism.



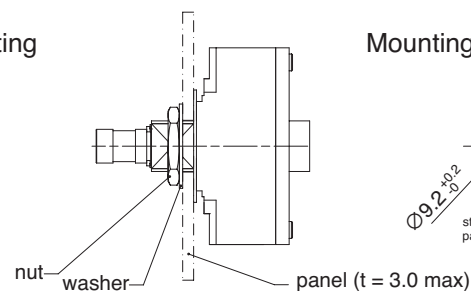
Model
35PG-01-2Z9-00E



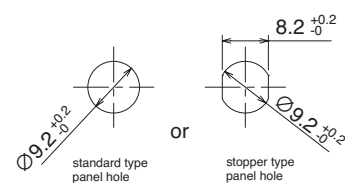
External Dimension



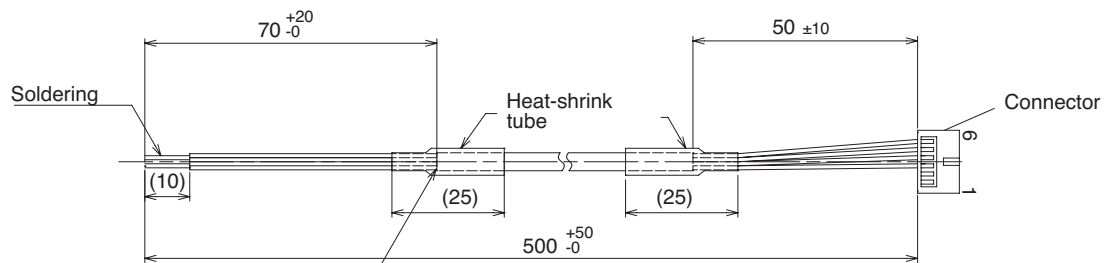
Mounting



Mounting hole



Option Cable(sold separately)

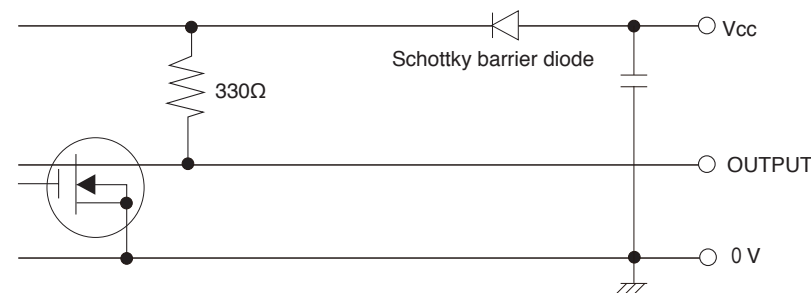


The shield is cut on the edge of the sheath.

Electrical Spec

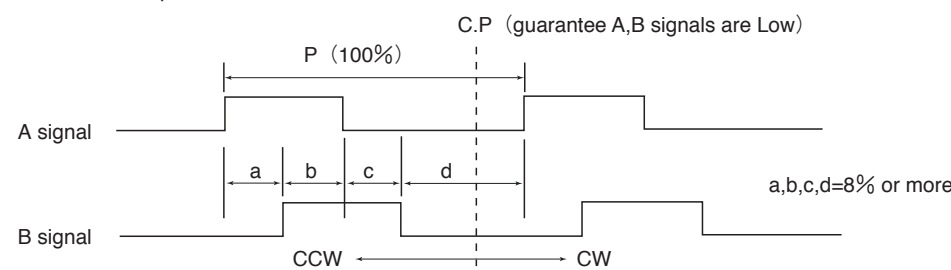
Power Supply(Vcc)	DC+5V ± 10%	Maximum Sink Current	20mA
Current Consumption	70mA Max	Maximum Frequency Response	1kHz
Resolution	100P/R	Rise & Fall Time	1µs Max
Output Signal	AB90° Phase Difference Voltage Output	Insulation Resistance	50MΩ Min DC 500V (0V ⇔ case)
Output Voltage	[H] : VCC-1V Min [L] : 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 ⁻² 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 ⁻¹)
Maximum Permissible Speed	600min ⁻¹ Max (Instantaneous)、200min ⁻¹ (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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65 (Panel Mounting)

MANUAL TYPE

Compact & Very Thin

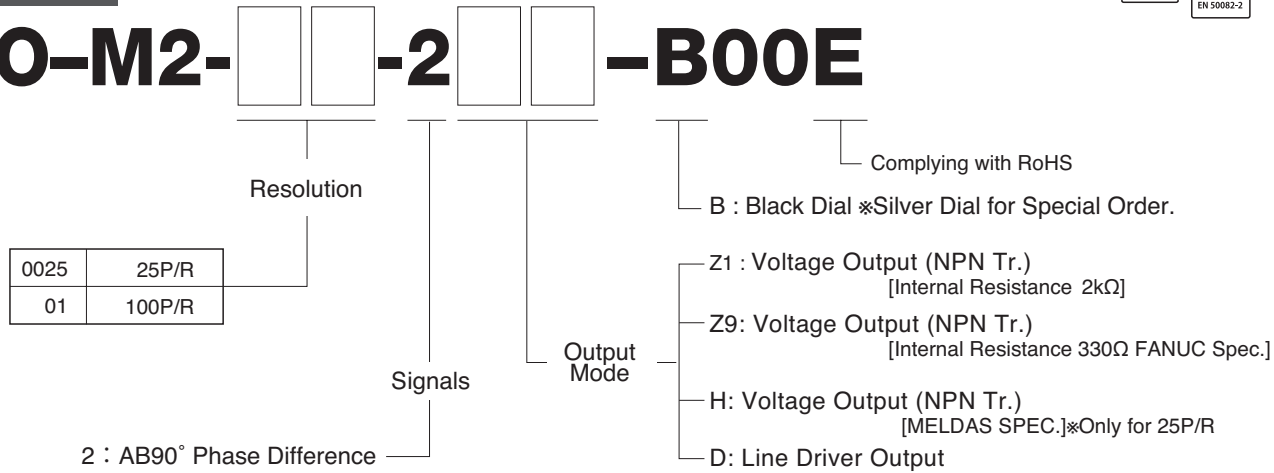
UFO-M2 Model



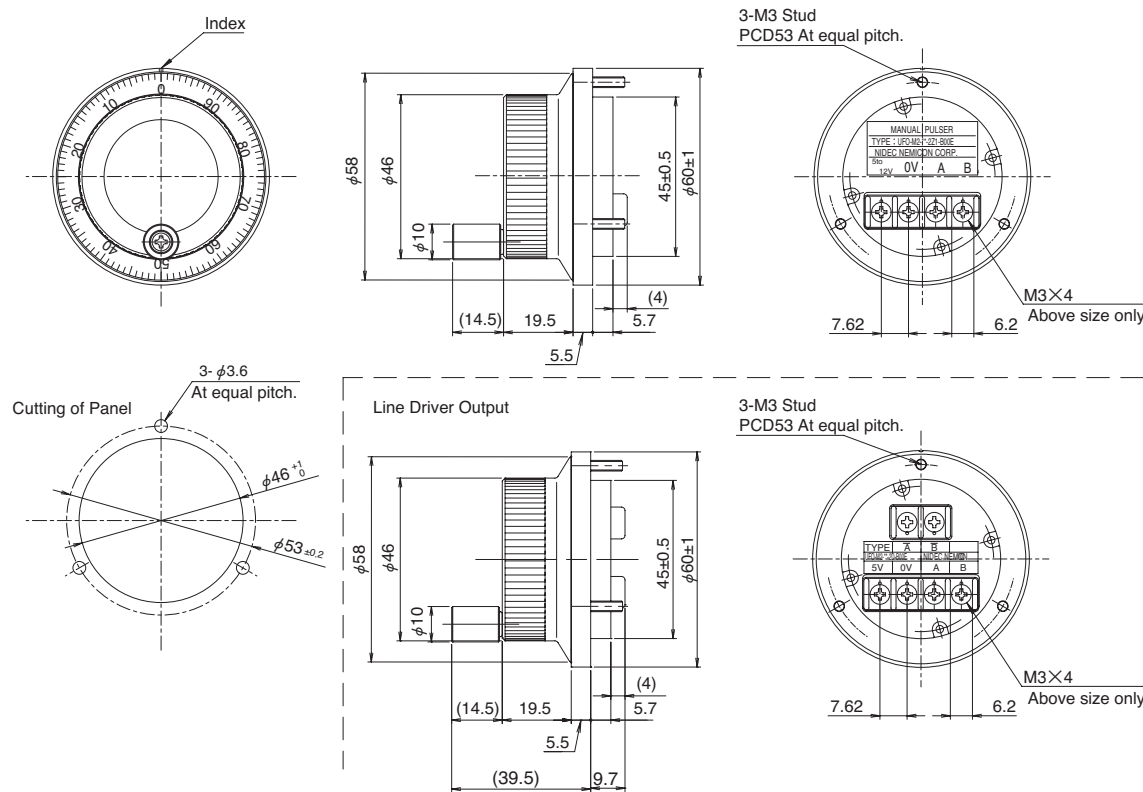
- Optical Slot Mode.
- Click Mechanism.



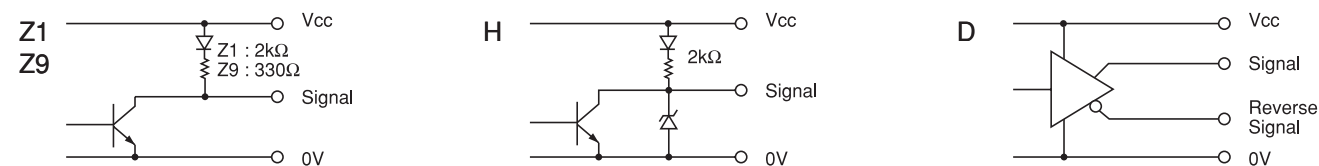
Model UFO-M2- [] -2 [] -B00E



External Dimension



Output Circuit



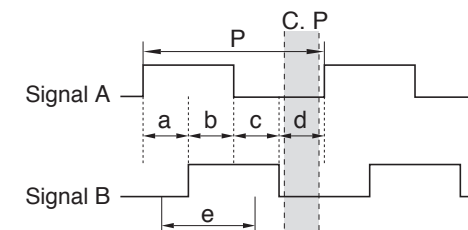
Electrical Spec

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%
	"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



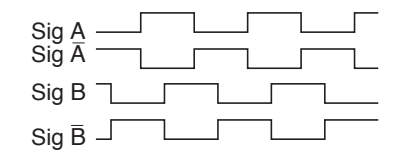
$$P = \frac{1}{\text{Resolution}}$$

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

Wave Ratio (Duty); 50 ± 25 (%)

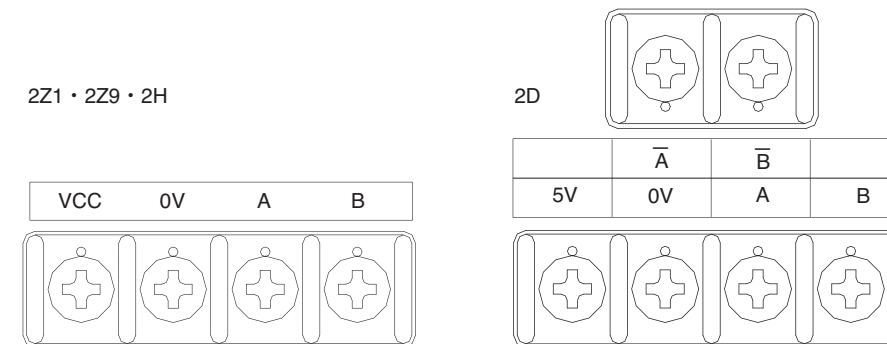
C.P=Click points

2D



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 ⁻³ N·m~2.9×10 ⁻² N·m
Shaft Loading	Thrust 9.8N
	Radial 19.6N
Maximum Permissible Speed	600min ⁻¹ (Instantaneous) 200min ⁻¹ (Continuous)
Rotational Life	> 1 million rotations (200min ⁻¹)
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 ² ,11ms X, Y, Z Each 3 times
Ingress Protection	IP64(Panel Mounting)

MANUAL TYPE

UFO Model

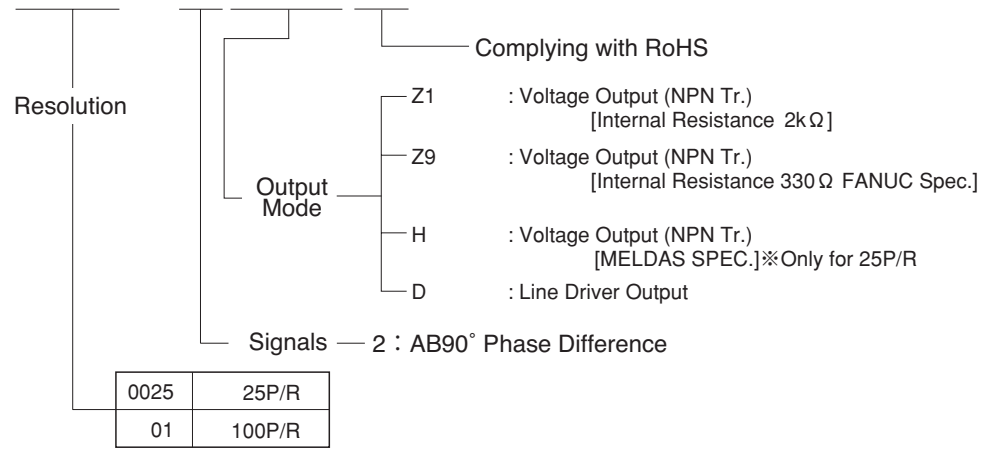


Compact & Very Thin

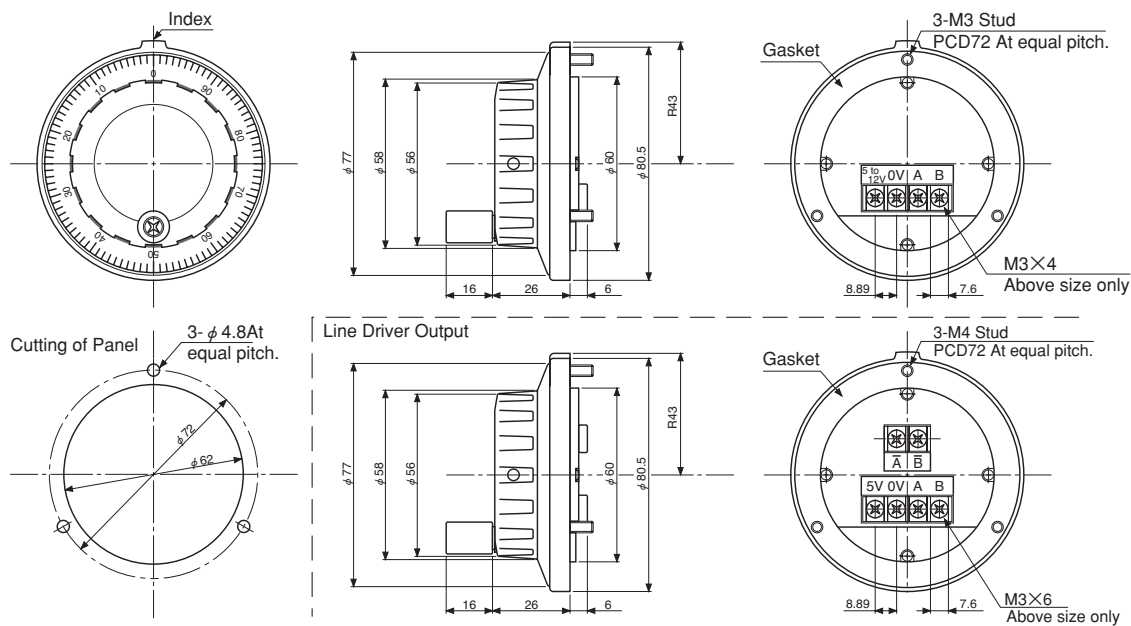
- Suitable for Thin Type Operator Panel.
- Click Mechanism.



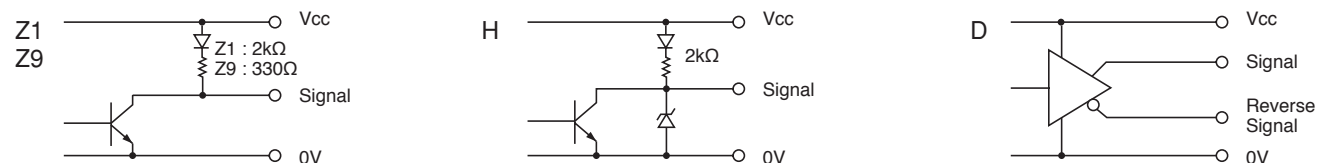
Model UFO-□□-2□□E



External Dimension



Output Circuit



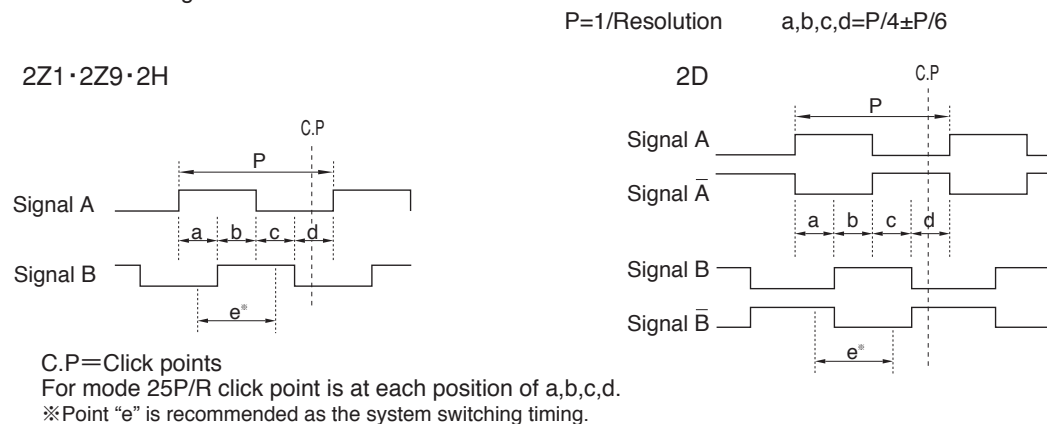
Electrical Spec

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			

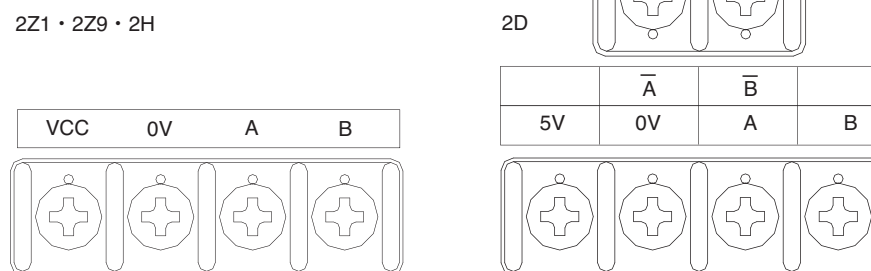
※1) at Maximum Sink Current

Wave Form

CW → Rotating Toward Clockwise Viewed from Front Side



Electrical Connections



Mechanical Spec

Starting Torque	1.96X10 ⁻² N·m~5.88X10 ⁻² N·m	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Maximum Permissible Speed	600min ⁻¹ (Instantaneous) 200min ⁻¹ (Continuous)	
Rotational Life	> 1 million rotations (200min ⁻¹)	
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP64(Panel Mounting)

HANDY PENDANT

HP-U Model



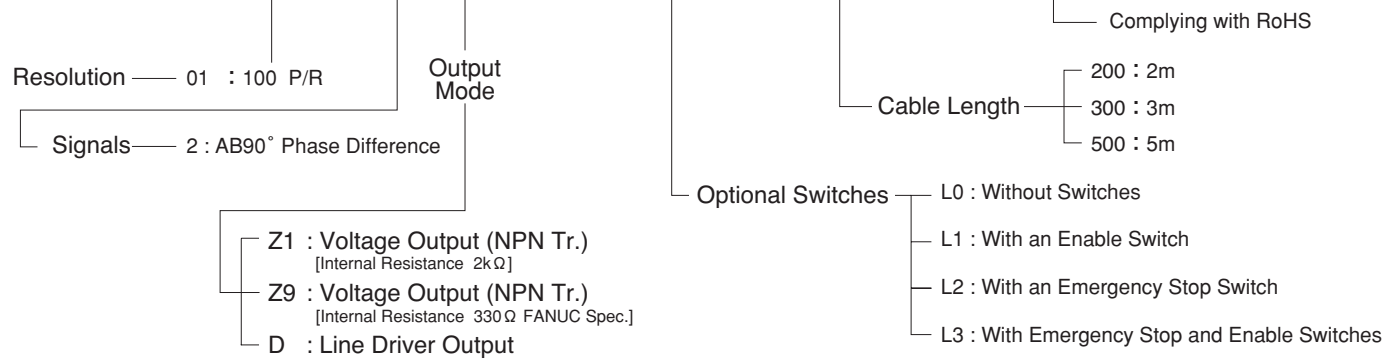
Economical Palm Size Model

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

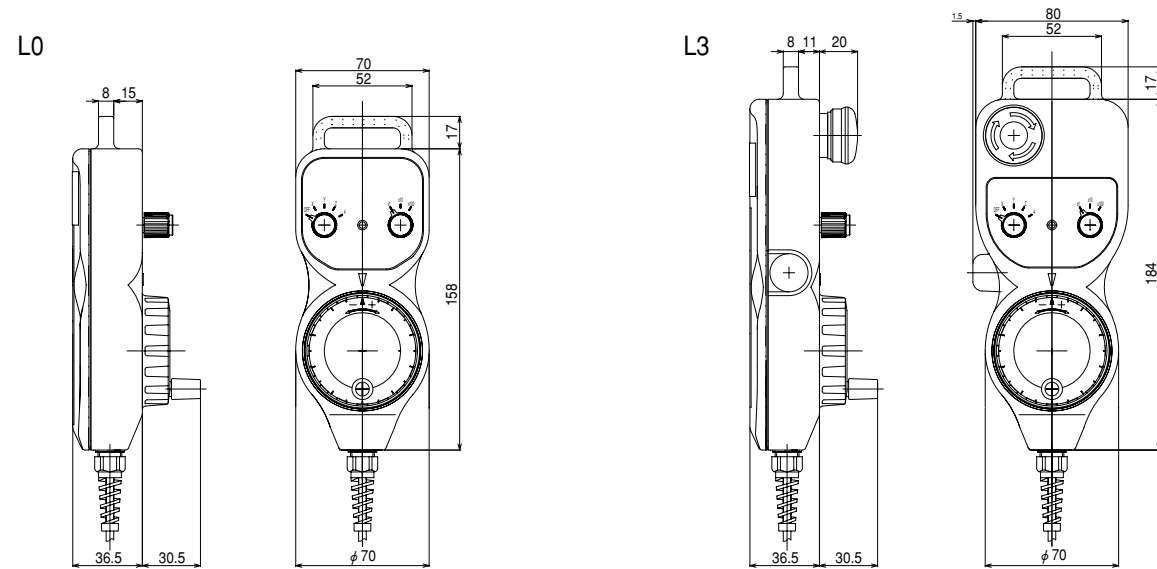


Model

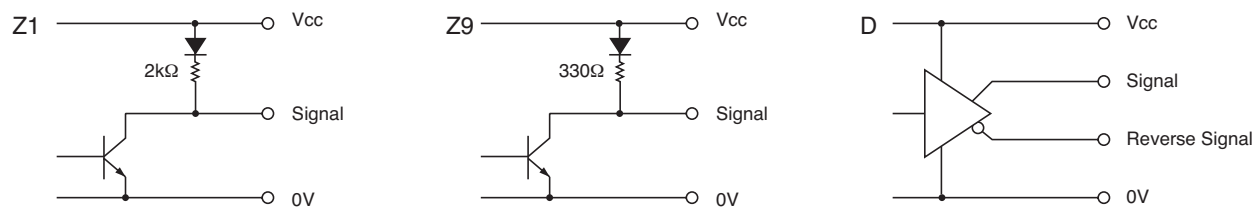
HP - U01 - 2 - P - - - - - 00E



External Dimension



Output Circuit



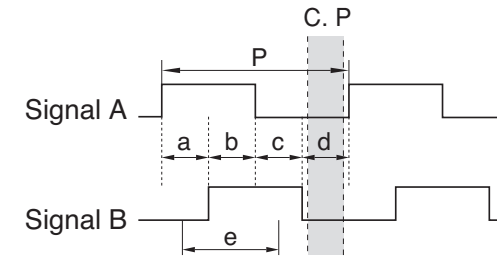
Electrical Spec

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



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

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

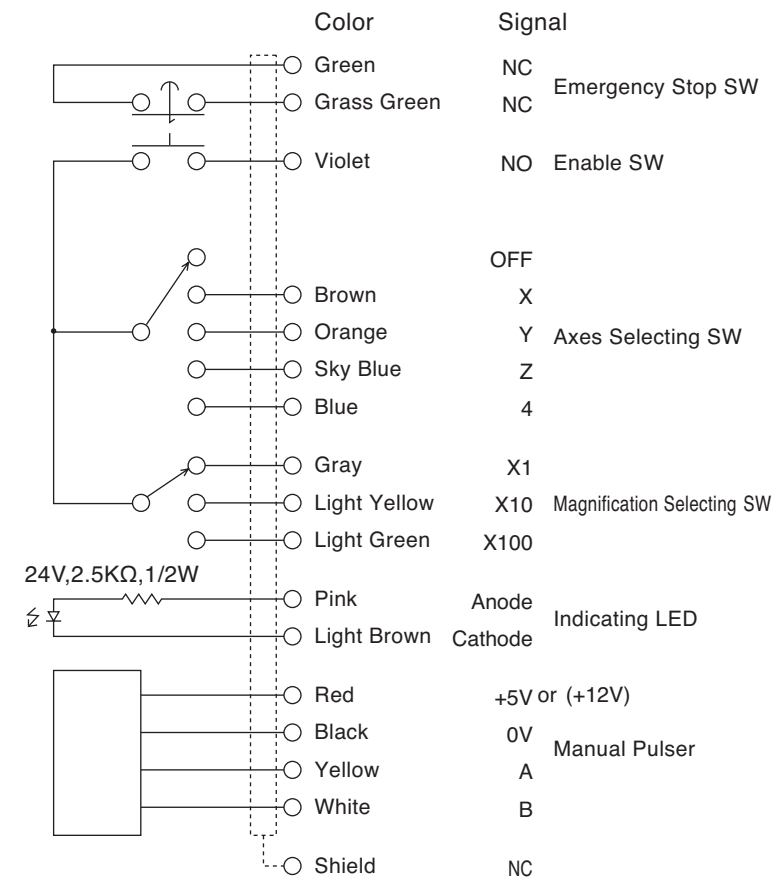
Wave Ratio (Duty): 50 ± 25(%)

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 ⁻² N·m~5.88X10 ⁻² N·m (at 20°C)	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Maximum Permissible Speed	200min ⁻¹	
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65(for Box)

HANDY PENDANT

HP-V Model



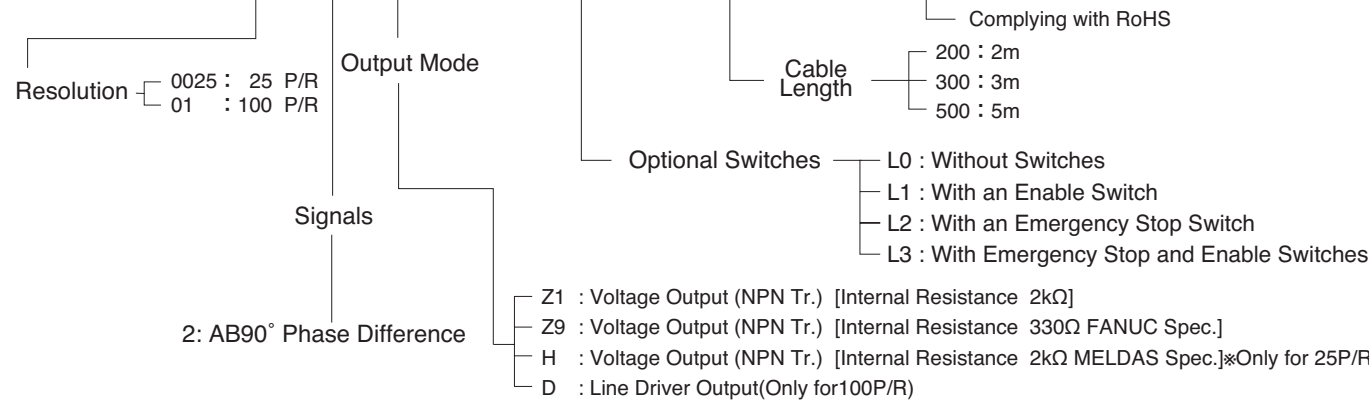
Handy Model

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

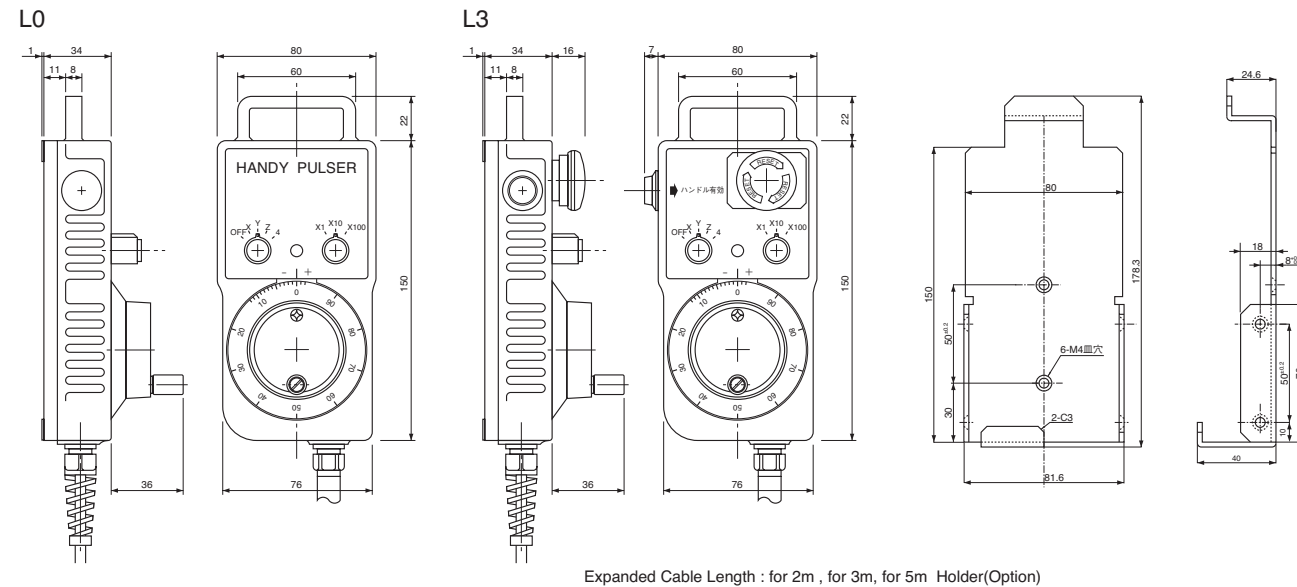


Model

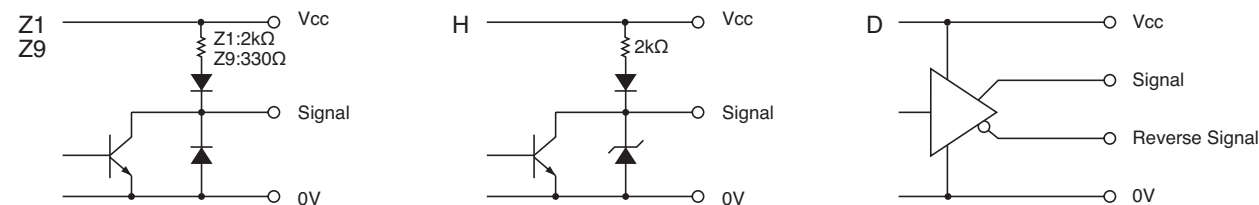
HP-V -2 -P - -00E



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

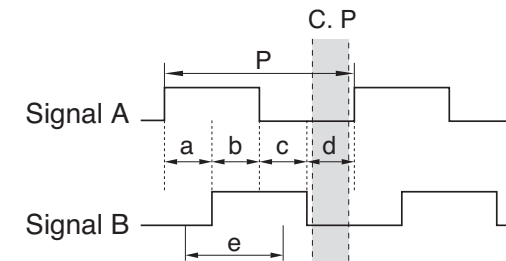
*1 Contact Rating	With AC Load Resistance	AC220V 0.5A , AC110V 1.0A
	With DC Load Resistance	DC 24V 1.0A

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

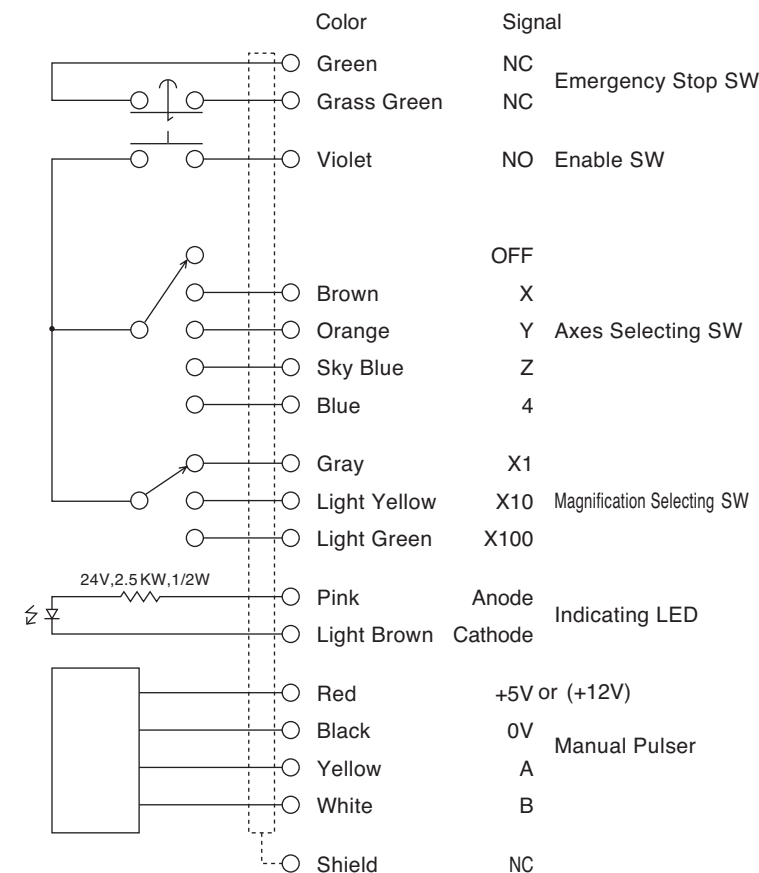
For mode 25P/R click point is at each position of a,b,c,d.

*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 ⁻² N·m~5.88×10 ⁻² N·m	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Maximum Permissible Speed	200min ⁻¹	
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65(for Box)

HANDY PENDANT



Handy Model

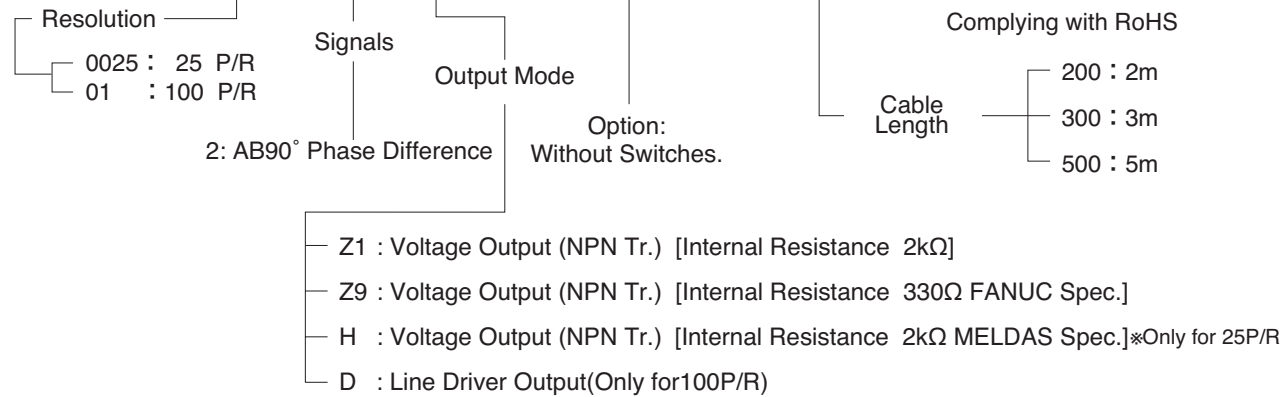
- Reasonable Cost vs. Performance.
- Fit To Hand Holding.

HP-M Model

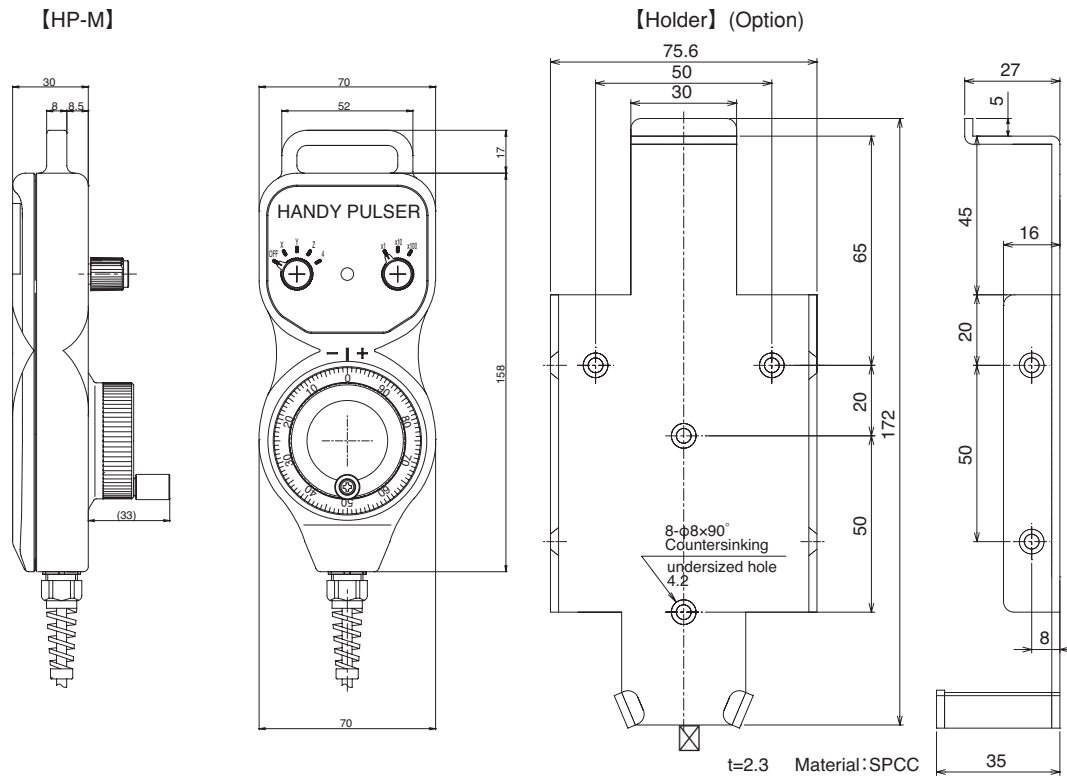


Model

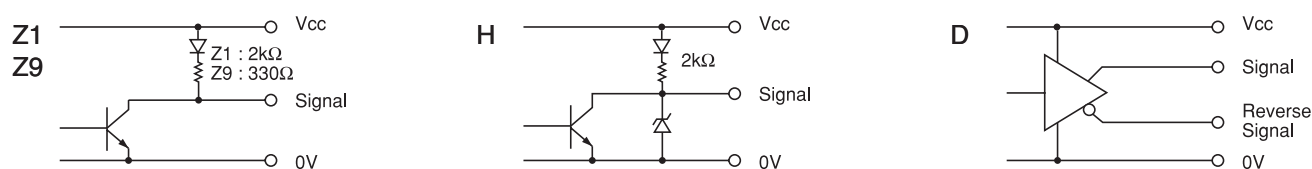
HP-M -2 -P L0 - -00E



External Dimension



Output Circuit



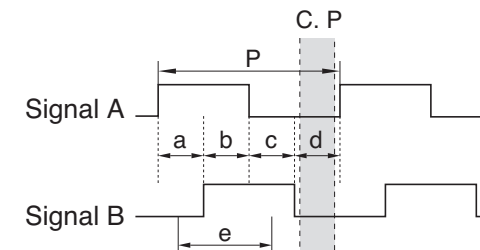
Electrical Spec

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(%)

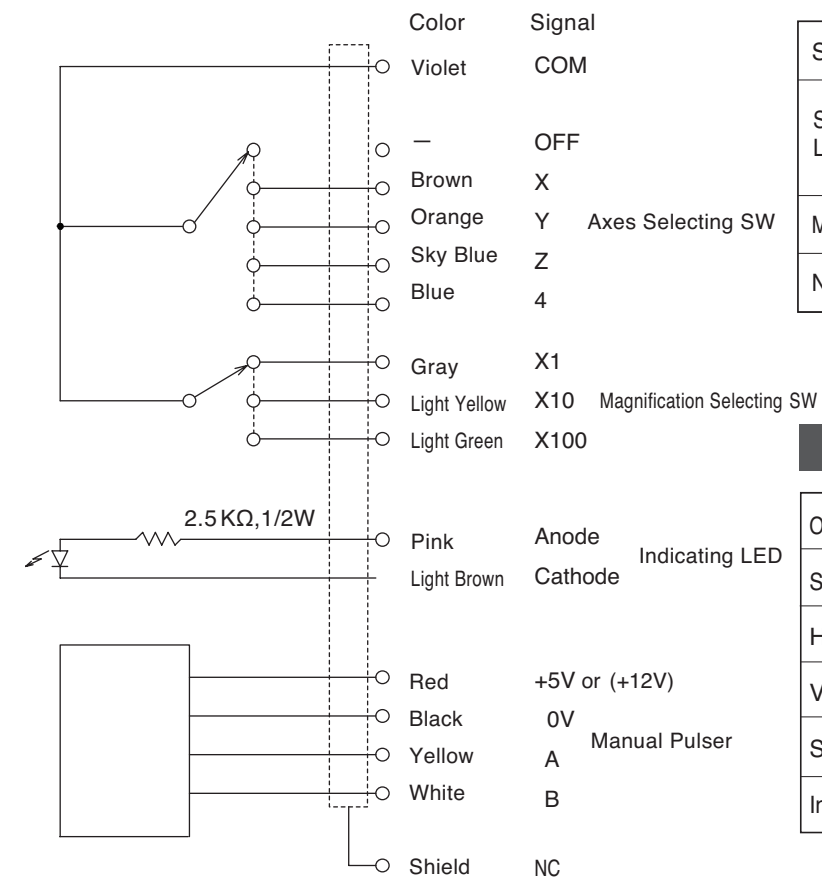
C. P = Click Point

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	6.9×10 ⁻³ N·m~2.9×10 ⁻² N·m	
Shaft Loading	Thrust	9.8N
	Radial	19.6N
Maximum Permissible Speed	200min ⁻¹	
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 ² , 11ms X, Y, Z Each 3 times
Ingress Protection	IP65(for Box)

Accessories · Sensors · Custom made

Accessories

Coupling (BC · GJ)	94
Extension cable for OD18mm type and OD38mm type	96

Sensors

PA-M12.....	97
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Development of Customized Encoder	98
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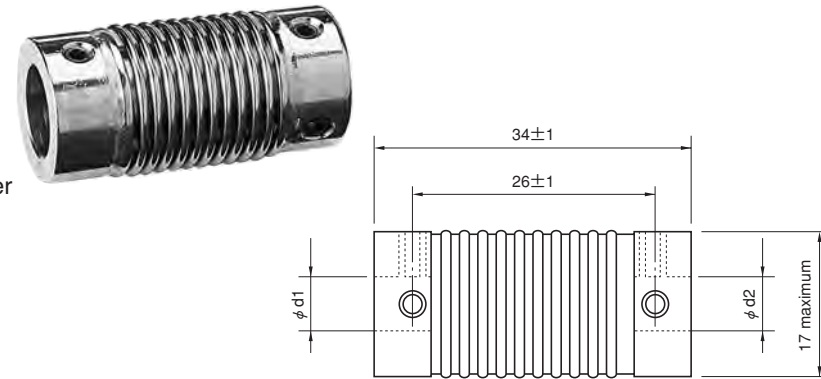
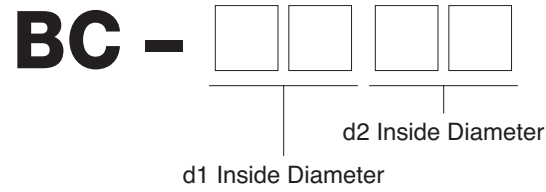
Output Circuit.....	99
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Bearing Life	100
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Warranty and Maintenance	101
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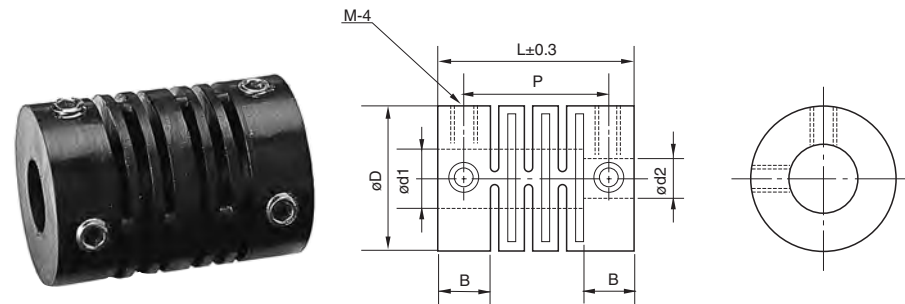
Coupling (Accessories)

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⁻¹ 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 ⁻¹)	Spring Constant (N·m/rad)	Eccentricity (mm)	Deviation angle (deg)	Allowable extension (mm)	Moment of inertia (kg·m ²)	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 ⁻⁸	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 ⁻⁸	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 ⁻⁸	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 ⁻⁸	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 ⁻⁸	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 ⁻⁸	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 ⁻⁷	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 ⁻⁷	7.3	
G2J	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 ⁻⁸	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 ⁻⁷	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 ⁻⁷	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 ⁻⁷	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 ⁻⁸	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.

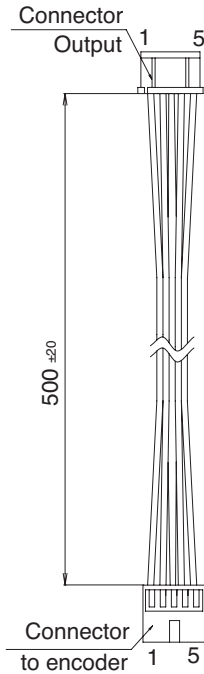
Extension cable for OD18mm type and OD38mm type

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

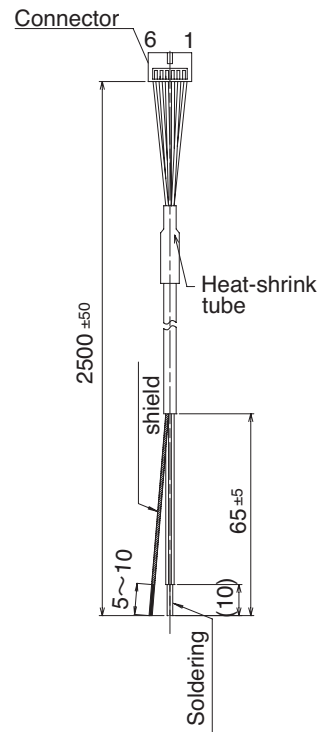


R-G41584-02

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

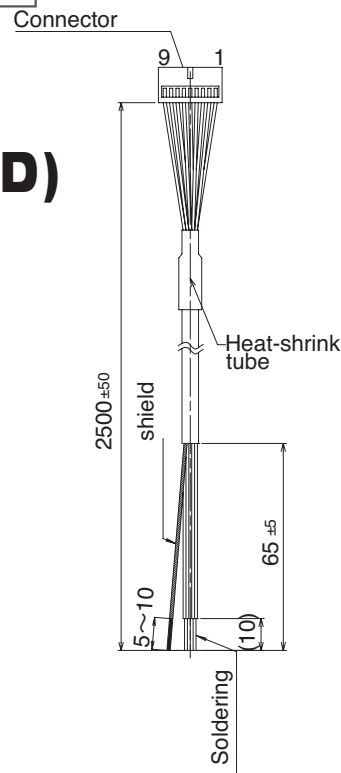


R-G41584-03

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



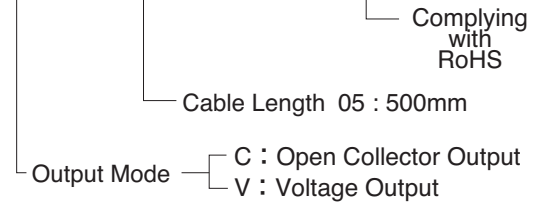
Gear Sensor

PA-M12



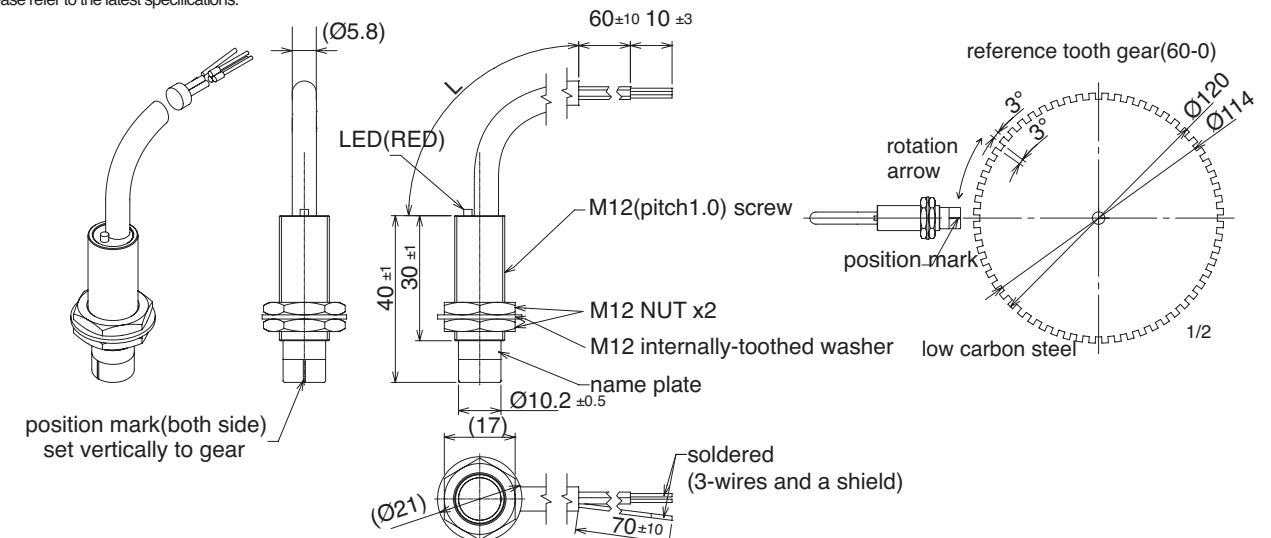
Model

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)				
	DC 5 to 30V (Ripple 10% or less(P-P))		Signal High : Dark lighting				
Voltage Output	DC 5 to 16V (Ripple 10% or less(P-P))	Checking LED(RED)	Signal Low : Bright lighting				
			VCC ON : Bright lighting(when non-rotating of gear)				
Current consumption(Unloaded)	DC30mA Max (without sink current)	Operating temperature	-20°C~+85°C				
Sink current	40mA Max	Storage temperature	-25°C~+85°C				
Output Voltage	[H] : (Vcc-1.1V)or more (unloaded, at 25°C)(Voltage Output only)	Humidity	RH 85% Max No Condensation				
	[L] : 0.4V or less (Vcc 16V, sink current 40mA, at 25°C)	Vibration	10~55Hz/1mm (X,Y,Z each 1.5 hours)				
Pull-up resistor	2.2kΩ±5%(*Voltage Output only)	Shock	490m/s ² ,11ms (X,Y,Z each 10 times)				
Response speed	12000P/Sec Max	Ingress Protection	IP67				
Output waveform	25~75%(H/(H+L)×100)Square wave						
Maximum output voltage	DC 30V						

* 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

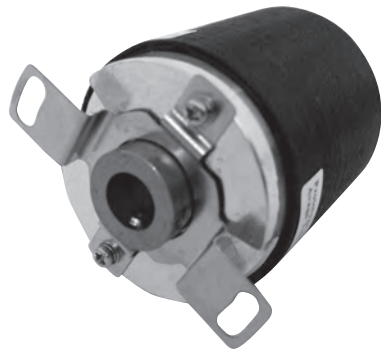
Shaft Type
Sine-Wave Output Encoder(A, B)



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

37HA-M Model

Battery Backup
Multi-turn Absolute Encoder



- Feature
- OD37mm absolute encoder (OD37mm x L35mm).
- Multi-turn data is sustained with a battery installed in outside of encoder.
- It supports 8 encoders through Bus-line connecting.
- The installed EEPROM supports read in and read out of data freely.

47H Model

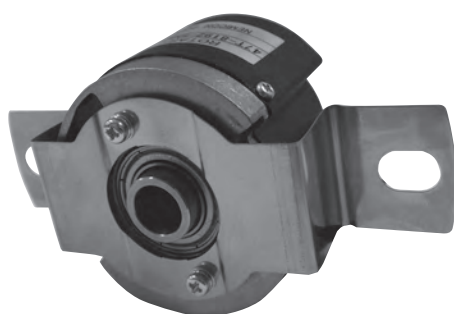
Hollow Shaft Type Encoder



- 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

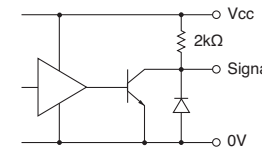


- Feature
- OD47mm Tepar shaft type encoder (OD47mm x L38.4mm).
- High resolution of 8192P/R.
- Output signal of 6 signals of ABZUVW with linedriver.
- Without interpolating technic, Signal flutter is reduced by 75% from out conventional encoder type.

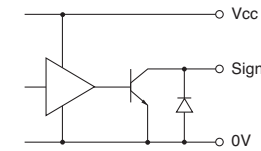
Output Circuit

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

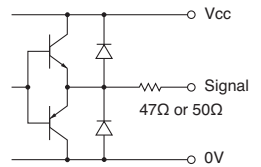
1) Voltage Output



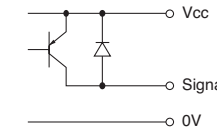
2)Open Collector output



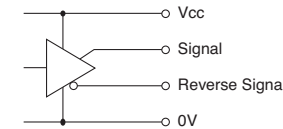
3)Push-Pull output



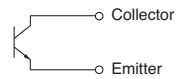
4)PNP Mode Open Collector Output



5)Line Driver Output



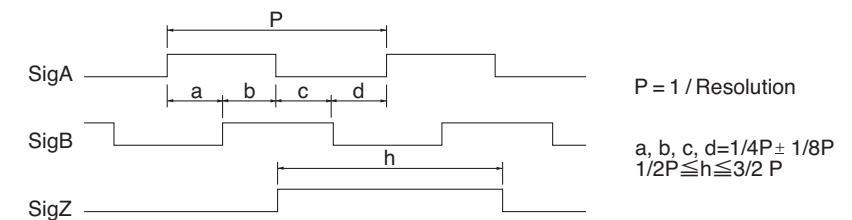
6)Sine Wave Signal Output



Output signal timing

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

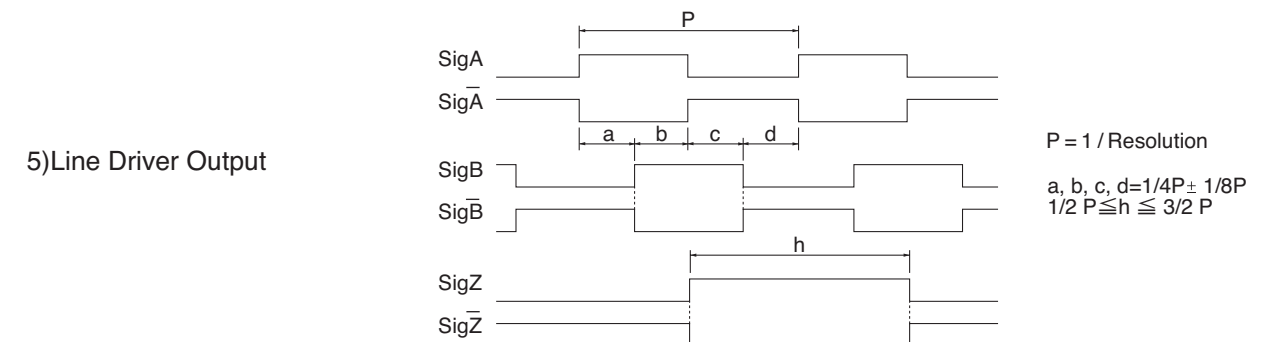
1)Voltage Output



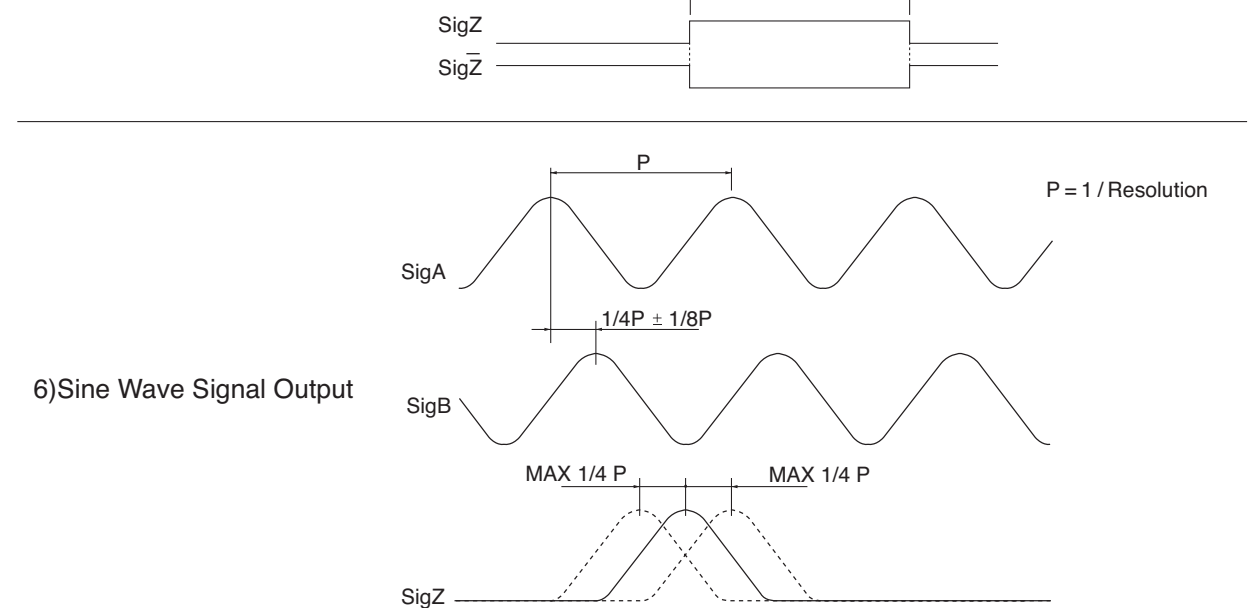
2)Open Collector Output

3)Push-Pull Output

4)PNP Mode Open Collector Output



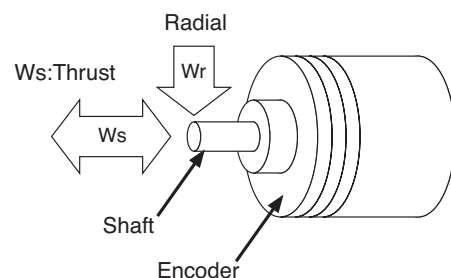
5)Line Driver Output



6)Sine Wave Signal Output

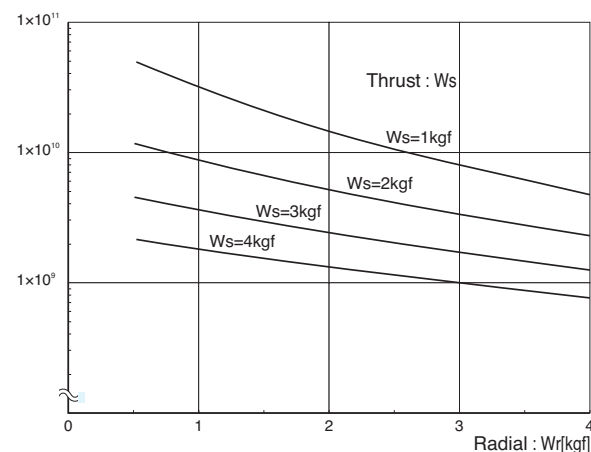
Bearing Life

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]

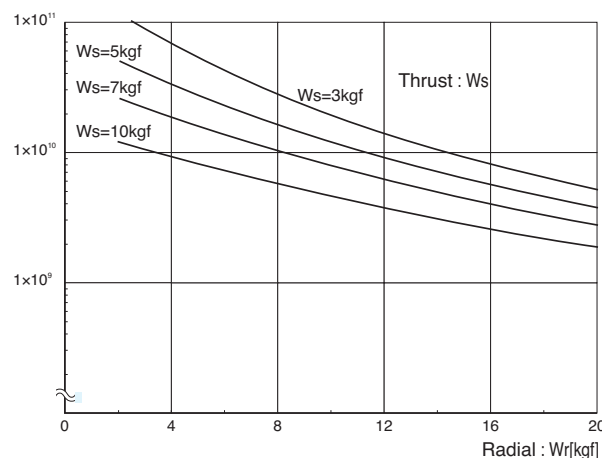


Table for Cable in Use

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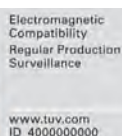
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