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*We reserve the right to change the information in this catalogue without prior notice

20080321ROE-E

DELTA ELECTRONICS, INC.

ROE

Delta Rotary Optical Encoders

www.delta.com.tw/industrialautomation

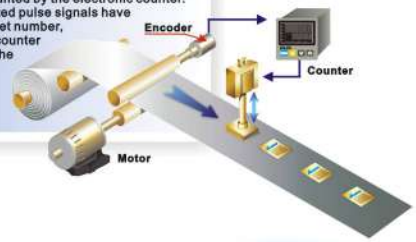
Rotary Optical Encoder

ROE

Various Applications

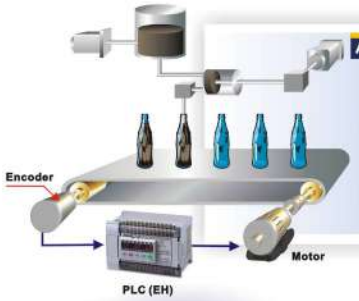
Label Printing Machine

When the motor starts to run, the motor rotation number will be converted to encoder pulse signals and counted by the electronic counter. Once the counted pulse signals have reached a preset number, the electronic counter will command the machine and activate the printing operation.



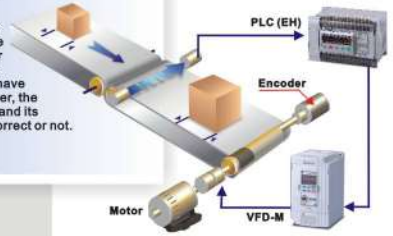
Auto Bottling Machine

The operation of filling bottles can be controlled by the encoder, programmable logic controller, and motor. The position of the bottles can be confirmed by the detected encoder feedback pulse signals.



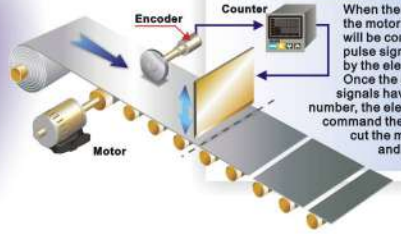
Detecting Machine

Use a sensor to generate pulse signals that is processed by the Rotary Optical Encoder for counting. When the counted pulse signals have reached a preset number, the object will be detected and its size will be verified if correct or not.



Fixed Length Cutting Machine

When the motor starts to run, the motor rotation number will be converted to encoder pulse signals and counted by the electronic counter. Once the counted pulse signals have reached a preset number, the electronic counter will command the cutting machine to cut the material in the same and fixed length.

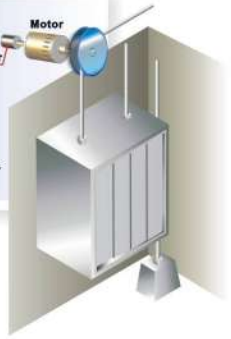


Rotary Optical Encoder is a sensor, which converts rotary motion or position to electronic pulse numbers for phase change, speed and position detection. It is also used to detect the speed, position, angle, distance and counts information relating to mechanical machine.

Major applications include main hoist of crane (crane control), elevator, industry sewing machine, textile machine, storage equipment, medical treatment related machine, and servo motor. Therefore, Rotary Optical Encoder is a very important device in industrial automation field.

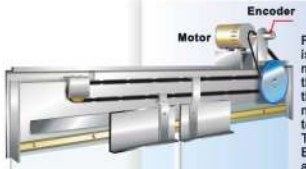
Elevator

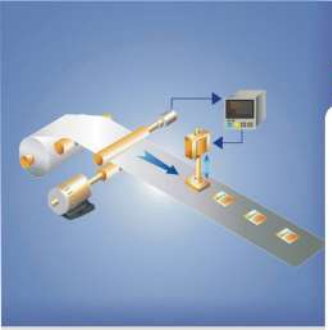
Rotary Optical Encoder is connected to the motor directly. When the elevator moves, the motor rotation numbers will be converted to encoder pulse signals. Then, the moving speed of the elevator can be known by the detected encoder feedback pulse signals.



Elevator Door

Rotary Optical Encoder is connected to the motor directly. When the motor starts to run, the motor rotation number will be converted to encoder pulse signals. The Rotary Optical Encoder is used to detect and confirm the position and speed of the elevator door.





Rotary Optical Encoder

Ordering Information

Model Name Explanation

ES5-05CN8942F is an incremental encoder, shaft type is solid shaft, outer diameter is 50mm, resolution can reach 500PPR, output form is open collector, signal output is A, B & Z (ungated), shaft/bore diameter is 8mm, input voltage is 7~24VDC and operation environment is IP40.
It means ES5-05CN8942F this product has protection against solid foreign objects of 1.0 mm in diameter and greater but does not have waterproof protection. Also, it is suitable for the use within -10°C ~ 70°C operating temperature. Besides, the cable length of ES5-05CN8942F is 2000mm and mechanism code is F (F: Flange).

E	S	5	-	0	5	C	N	8	9	4	2	F	← Example

1	2	3	-	4	5	6	7	8	9	10	11	← Code Order

1.Product Type

E: Incremental Encoder
A: Absolute Encoder
C: CNC Incremental Encoder
M: Incremental Encoder with commutation UVW (for Servo Motor)

2.Shaft Type

S: Solid Shaft
H: Hollow Shaft
T: Through Hole Shaft

3.Outer Diameter / Frame Size

3 : 36.6mm 4 : 38.7mm
5 : 50mm A : 100mm
7 : 68mm

4.Resolution

ES/EH/ET (PPR) :
01 : 100 ; 02 : 200 ; 0B : 256 ; 03 : 300 ;
0C : 360 ; 04 : 400 ; 05 : 500 ; 06 : 600 ;
10 : 1000 ; 11 : 1024 ; 12 : 1200 ; 20 : 2000 ;
25 : 2500 ; 36 : 3600 ; 50 : 5000

AS/AH (BIT) :
05 ; 06 ; 07 ; 08; 09 ; 10 ; 11; 12

MH/MT (PPR):
25 : 2500

CS(PPR):
11 : 1024

5.Output Form

V: Voltage Output C: Open Collector
L: Line Driver P: Push Pull

6.Signal Output

ES/EH/ET:
A: A (without Z signal output)
B: A & B (without Z signal output)
G: A, B & Z (Gated with A&B)
N: A, B & Z (Ungated)
U: A, B & Z (Ungated, active low)
V: A, B & Z (Gated with A&B, active low)

AS/AH:
B: Binary code G: Gray code

MH/MT:
F: 14 cores, A, B & Z and U, V, W output simultaneously
N: 8 cores, A, B & Z and U, V, W do not output simultaneously

7.Shaft/Bore Diameter

4: 4mm 5: 5mm 6: 6mm
8: 8mm M: 30mm Q: 1/4 inch
T: 9mm with Taper 1:10 R: 15mm

8.Input Voltage

5 : 5VDC; 8: 5~12VDC; 9 : 7~24VDC

9.Operating Environment

1 : IP40 & 60°C ; 4 : IP40 & 70°C ; 6 : IP65 & 70°C ;
C : IP30 & 85°C; H : IP55 & 70 °C

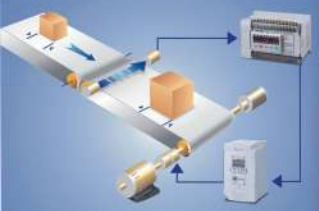
10.Cable Length

1 : 1000 mm ; 2 : 2000 mm ; 3 : 3000 mm ;
5 : 500 mm ; 7 : 170 mm ; A : 300 mm ;
M: Military Connector

11.Suffix Code

0: UVW 10 poles ; 4: UVW 4 poles ; 6: UVW 6 poles ;
8: UVW 8 poles ; F: Flange

IP (Ingress Protection) is a coding system which is used to indicate the environmental protection of enclosures around the electrical equipment. The environmental protection includes the degree of protection from ingress of solid foreign objects, ingress of water and mechanical impacts.
IP code normally has two numbers.
The first number indicates the degree of protection against solid foreign objects and the degree that persons are protected against hazardous parts or harmful deposit.
The second number indicates the degree of protection against water. The number is higher, the protection is better.
For example, IP Rating IP 65, 6 describes the level of protection from totally protected against dust and 5 describes the level of protection against low pressure jetting water from all directions.

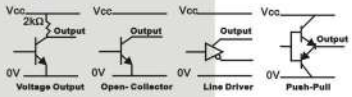


Specifications

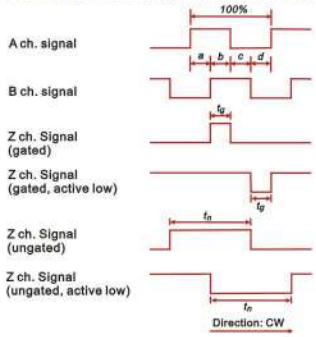
ES/EH/ET Series

Wire Color	Brown	Blue	Black	Black /Red	White	White /Red	Orange	Orange /Red
Function	Vcc	0V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
Voltage Output	○	○	○	–	○	–	○	–
Open Collector	○	○	○	–	○	–	○	–
Line Driver	○	○	○	○	○	○	○	○
Push Pull	○	○	○	–	○	–	○	–

Output Circuit



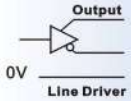
Output Waveform (View from shaft end)



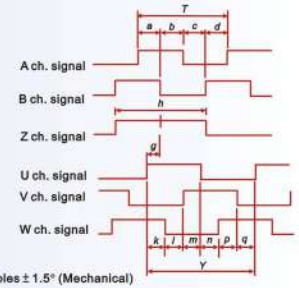
MH4/MT4 Series

Wire Color	Function	Wire Color	Function
Black	A	Yellow	U
Black/Red	$\overline{A}$	Yellow/Red	$\overline{U}$
White	B	Green	V
White/Red	$\overline{B}$	Green/Red	$\overline{V}$
Orange	Z	Pink	W
Orange/Red	$\overline{Z}$	Pink/Red	$\overline{W}$
Brown	DC+5V	Blue	0V

Output Circuit



Output Waveform (CCW rotation, view from shaft end)



T = 360° /2500

a, b, c, d = T/4 ± T/8

h= T ± T/2

k, l, m, n, p, q = 120°/poles ± 1.5° (Mechanical)

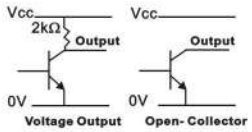
r= 720° /poles ± 1.5° (Mechanical)

g= ± 1° (Between Zch center and Uch rise)

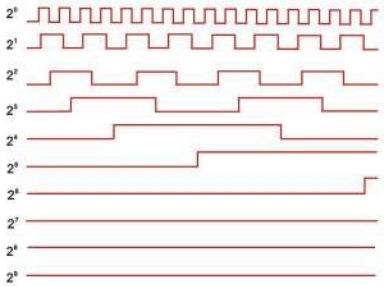
AS/AH Series

Wire Color	Function	Wire Color	Function
Red	Vcc	Blue	2^4
Black	0V	Purple	2^5
Brown	2^0	Gray	2^6
Orange	2^1	White	2^7
Yellow	2^2	Pink	2^8
Green	2^3	Light Blue	2^9

Output Circuit



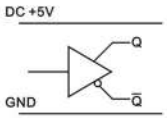
Output Waveform (View from shaft end)



CS Series

Function	PIN	Function	PIN
Vcc	H	0V	K
A	A	$\overline{A}$	N
B	C	$\overline{B}$	R
Z	B	$\overline{Z}$	P
Shielding	T		

Output Circuit

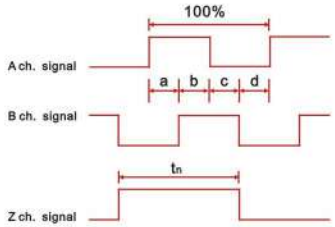


26LS31 or Equivalent

Q = A, B, Z

$\overline{Q}$ = $\overline{A}$, $\overline{B}$, $\overline{Z}$

Output Waveform (CW rotation, view from shaft end)



12.5% ≦ a,b,c,d ≦ 37.5%; 50% ≦ tn ≦ 150%

Incremental Encoder

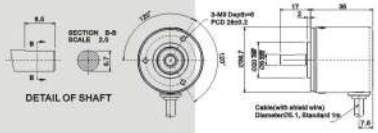
Solid Shaft Outer Diameter 36.6mm

ES3

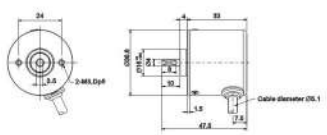
Series		ES3 Series			
Model Name		ES3...5XX	ES3...8XX		ES3...9XX
Electrical Specifications	Rated Voltage	5±5%V	5-5%~12+5%V		7-5%~24+5%V
	Output Type	Open Collector	Voltage Output	Push Pull	Line Driver
	Sink Current	20 mA	--	20 mA	20mA 26C31or equivalent
	Source Current	--	--	20 mA	
	Max. Load Power Voltage	DC30V	--		
	Output Signal	A,B,Z			A,$\bar{A}$,B,$\bar{B}$,Z,$\bar{Z}$
	Output Voltage VH	>(V_{in}-2V)	≧(Vcc-2V)		
	Output Voltage VL	≦500mV			
	Encoder Resolution: 100 to 2500 (PPR) Current Consumption: 100mA Max. Max. Response Frequency: 300kHz Max. Cable Diameter: 5.1mm Output Phase Difference: Output phase difference 90° + zero point signal Cable Length: 500 / 1000 / 2000±20mm Cross Sectional Area: 0.18mm² Signal Characteristic: Rise Time 1μs Typ. ; Fall Time 1μs Typ.				
Mechanical Specifications	Max. Speed of Main Shaft: 6000rpm Starting Torque: 2.0 N-mm Typ. / 5.0 N-mm Typ. (IP65) Moment of Inertia: 0.3 kg · mm² Typ. Outer Diameter: 36.6mm Height: 33mm (S4) / 35mm(S6) / 50.2mm(IP65) Weight: <70g / <120g (IP65) Shaft Diameter: 4mm / 6mm Max. Shaft Load: Thrust: 15 N / Radial: 30N (10 mm from mounting surface) Wire Color: Vcc: Brown, 0V: Blue, A: Black, $\bar{A}$: Black / Red, B: White, $\bar{B}$: White / Red, Z: Orange, $\bar{Z}$: Orange / Red				
Environmental Specifications	Operating Temperature: -10°C~70°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~85°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP40 / IP65				

Dimensions

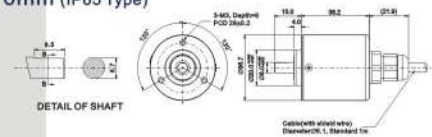
Shaft Diameter 6mm



Shaft Diameter 4mm



Shaft Diameter 6mm (IP65 Type)



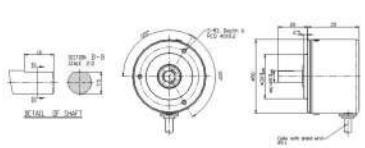
Solid Shaft Outer Diameter 50mm

ES5

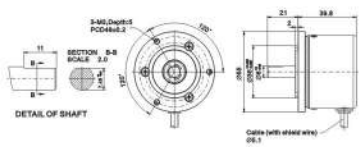
Series		ES5 series			
Model Name		ES5...5XX	ES5...8XX		ES5...9XX
Electrical Specifications	Rated Voltage	5±5%V	5-5%~12+5%V		7-5%~24+5%V
	Output Type	Open Collector	Voltage Output	Push Pull	Line Driver
	Sink Current	20 mA	--	20 mA	20mA 26C31or equivalent
	Source Current	--	--	20 mA	
	Max. Load Power Voltage	DC30V	--		
	Output Signal	A,B,Z			A,$\bar{A}$,B,$\bar{B}$,Z,$\bar{Z}$
	Output Voltage VH	>(V_{in}-2V)	≧(Vcc-2V)		
	Output Voltage VL	≦500mV			
	Encoder Resolution: 100 to 2500 (PPR) Current Consumption: 100mA Max. Max. Response Frequency: 300kHz Max. Cable Diameter: 5.1mm Output Phase Difference: Output phase difference 90° + zero point signal Cable Length: 500/1000/2000±20mm Cross Sectional Area: 0.18mm² Signal Characteristic: Rise Time 1μs Typ. ; Fall Time 1μs Typ.				
Mechanical Specifications	Max. Speed of Main Shaft: 6000rpm Starting Torque: 4.0 N-mm Typ. / 6.0 N-mm Typ. (IP65) Moment of Inertia: 0.8 kg · mm² Typ. Outer Diameter: 50mm Height: 35mm / 57mm(IP65) Weight: <130g / <145g (IP65)(All provided without Flange) Shaft Diameter: 5mm / 6mm / 8mm Max. Shaft Load: Thrust: 30N / Radial: 50N (10 mm from mounting surface) Wire Color: Vcc: Brown, 0V: Blue, A: Black, $\bar{A}$: Black / Red, B: White, $\bar{B}$: White / Red, Z: Orange, $\bar{Z}$: Orange / Red				
Environmental Specifications	Operating Temperature: -10°C~70°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~85°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP40 / IP65				

Dimensions

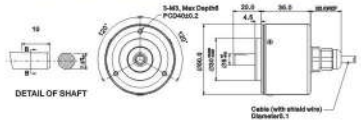
Shaft Diameter 6mm / 8mm



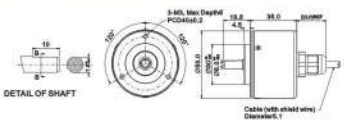
Shaft Diameter 8mm (Flange Type)



Shaft Diameter 8mm (IP65 Type)



Shaft Diameter 6mm (IP65 Type)



Incremental Encoder

ROE

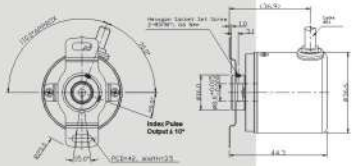
Hollow Shaft Outer Diameter 36.6mm

EH3

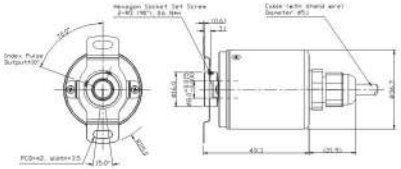
Series		EH3 Series			
Model Name		EH3...5XX	EH3...8XX		EH3...9XX
Electrical Specifications	Rated Voltage	5±5%V	5-5%~12+5%V		7-5%~24+5%V
	Output Type	Open Collector	Voltage Output	Push Pull	Line Driver
	Sink Current	20 mA	--	20 mA	20mA 26C31or equivalent
	Source Current	--	--	20 mA	
	Max. Load Power Voltage	DC30V	--		
	Output Signal	A,B,Z			A,$\bar{A}$,B,$\bar{B}$,Z,$\bar{Z}$
	Output Voltage VH	>(V_{in}-2V)	≧(Vcc-2V)		
	Output Voltage VL	≦500mV			
	Encoder Resolution: 100 to 2500 (PPR) Current Consumption: 100mA Max. Max. Response Frequency: 300kHz Max. Cable Diameter: 5.1mm Output Phase Difference: Output phase difference 90° + zero point signal Cable Length : 500/1000/2000±20mm Cross Sectional Area : 0.18mm² Signal Characteristic : Rise Time 1μs Typ. ; Fall Time 1μs Typ.				
Mechanical Specifications	Max. Speed of Main Shaft: 6000rpm Starting Torque: 4.0 N-mm Typ. / 6.0 N-mm Typ. (IP65) Moment of Inertia: 1.5 kg · mm² Typ. Outer Diameter: 36.6mm Height: 44.3mm / 70.2mm(IP65) Weight: <85g / <130g (IP65) Bore Diameter: 8mm Max. Shaft Load: Thrust: 15N / Radial: 30N (10 mm from shaft end) Wire Color: Vcc: Brown, 0V: Blue, A: Black, $\bar{A}$: Black / Red, B: White, $\bar{B}$: White / Red, Z: Orange, $\bar{Z}$: Orange / Red				
Environmental Specifications	Operating Temperature: -10°C~70°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~85°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP40 / IP65				

Dimensions

Bore Diameter 8mm



Bore Diameter 8mm (IP65 Type)



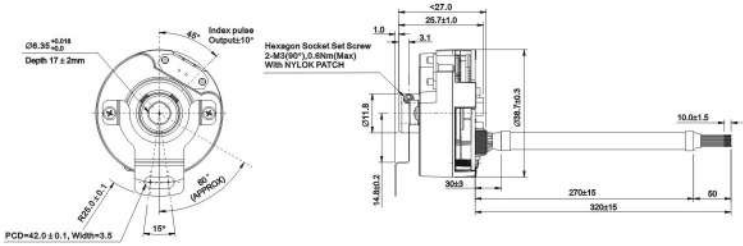
Hollow Shaft Outer Diameter 38.7mm

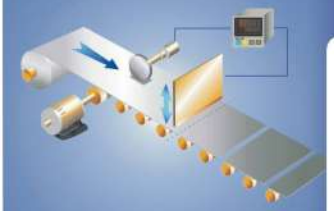
EH4

Series		EH4 Series			
Model Name		EH4...5XX	EH4...8XX		EH4...9XX
Electrical Specifications	Rated Voltage	5±5%V	5-5%~12+5%V		7-5%~24+5%V
	Output Type	Open Collector	Voltage Output	Push Pull	Line Driver
	Sink Current	20 mA	--	20 mA	20mA 26C31or equivalent
	Source Current	--	--	20 mA	
	Max. Load Power Voltage	DC30V	--		
	Output Signal	A,B,Z			A,$\bar{A}$,B,$\bar{B}$,Z,$\bar{Z}$
	Output Voltage VH	>(V_{in}-2V)	≧(Vcc-2V)		
	Output Voltage VL	≦500mV			
	Encoder Resolution: 100 to 2500 (PPR) Current Consumption: 100mA Max. Max. Response Frequency: 300kHz Max. Cable Diameter: 5.8mm Output Phase Difference: Output phase difference 90° + zero point signal Cable Length: 320±15mm Cross Sectional Area: 0.18mm² Signal Characteristic: Rise Time 1μs Typ. ; Fall Time 1μs Typ.				
Mechanical Specifications	Max. Speed of Main Shaft: 6000rpm Starting Torque: 4.0 N-mm Typ . Moment of Inertia: 1.2 kg · mm² Typ. Outer Diameter: 38.7mm Height: 26.7mm Weight: <85g Bore Diameter: 6.35mm Max. Shaft Load: Thrust: 30N / Radial: 50N (10 mm from shaft end) Wire Color: Vcc: Brown, 0V: Blue, A: Black, $\bar{A}$: Black / Red, B: White, $\bar{B}$: White / Red, Z: Orange, $\bar{Z}$: Orange / Red				
Environmental Specifications	Operating Temperature: -10°C~85°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~100°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP30				

Dimensions

Bore Diameter 6.35mm





Incremental Encoder

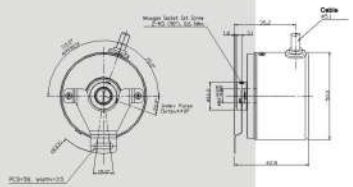
Hollow Shaft Outer Diameter 50mm

EH5

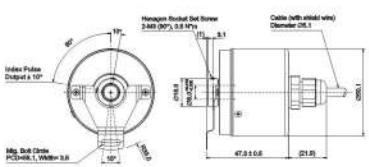
Series			EH5 Series			
Model Name			EH5...5XX	EH5...8XX		EH5...9XX
Electrical Specifications	Rated Voltage		5±5%V	5-5%~12+5%V		7-5%~24+5%V
	Output Type		Open Collector	Voltage Output	Push Pull	Line Driver
	Sink Current		20 mA	--	20 mA	20mA 26C31or equivalent
	Source Current		--	--	20 mA	
	Max. Load Power Voltage		DC30V	--		
	Output Signal		A,B,Z			A,$\bar{A}$,B,$\bar{B}$,Z,$\bar{Z}$
	Output Voltage	VH	>(V_{in}-2V)	≧(Vcc-2V)		
		VL	≦500mV			
Mechanical Specifications	Encoder Resolution: 100 to 2500 (PPR) Current Consumption: 100mA Max. Max. Response Frequency: 300kHz Max. Cable Diameter: 5.1mm Output Phase Difference: Output phase difference 90° + zero point signal Cable Length: 500/1000/2000±20mm Cross Sectional Area: 0.18mm² Signal Characteristic: Rise Time 1μs Typ. ; Fall Time 1μs Typ.					
	Max. Speed of Main Shaft: 6000rpm Starting Torque: 4.0 N-mm Typ. / 6.0 N-mm Typ. (IP65) Moment of Inertia: 0.8 kg · mm² Typ. Outer Diameter: 50mm Height: 42.8mm / 69.2mm(IP65) Weight: <135g / <150g (IP65) Bore Diameter: 8mm Max. Shaft Load: Thrust: 30N / Radial: 50N (10 mm from shaft end) Wire Color: Vcc: Brown, 0V: Blue, A: Black, $\bar{A}$: Black / Red, B: White, $\bar{B}$: White / Red, Z: Orange, $\bar{Z}$: Orange / Red					
Environmental Specifications	Operating Temperature: -10°C~70°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~85°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP40 / IP65					

Dimensions

Bore Diameter 8mm



Bore Diameter 8mm (IP65 Type)



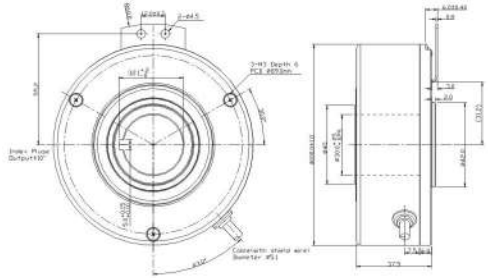
Through Hole Shaft Outer Diameter 100mm

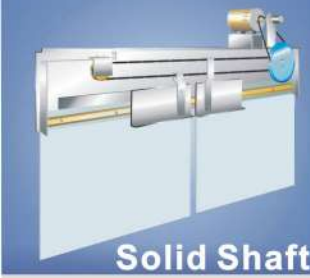
ETA

Series			ETA Series			
Model Name			ETA...5XX	ETA...8XX		ETA...9XX
Electrical Specifications	Rated Voltage		5±5%V	5-5%~12+5%V		7-5%~24+5%V
	Output Type		Open Collector	Voltage Output	Push Pull	Line Driver
	Sink Current		20 mA	--	20 mA	20mA 26C31or equivalent
	Source Current		--	--	20 mA	
	Max. Load Power Voltage		DC30V	--		
	Output Signal		A,B,Z			A,$\bar{A}$,B,$\bar{B}$,Z,$\bar{Z}$
	Output Voltage	VH	>(V_{in}-2V)	≧(Vcc-2V)		
		VL	≦500mV			
Mechanical Specifications	Encoder Resolution: 1024 (PPR) Current Consumption: 100mA Max. Max. Response Frequency: 300kHz Max. Cable Diameter: 5.1mm Output Phase Difference: Output phase difference 90° + zero point signal Cable Length: 500/1000/2000±20mm Cross Sectional Area: 0.18mm² Signal Characteristic: Rise Time 1μs Typ. ; Fall Time 1μs Typ.					
	Max. Speed of Main Shaft: 3000rpm Starting Torque: 60 N-mm Typ. Moment of Inertia: 1.6 kg · mm² Typ. Outer Diameter: 100mm Height: 37.5mm Weight: <1000g Bore Diameter: 30mm Max. Shaft Load: Thrust: 30N / Radial: 50N (10 mm from mounting surface) Wire Color: Vcc: Brown, 0V: Blue, A: Black, $\bar{A}$: Black / Red, B: White, $\bar{B}$: White / Red, Z: Orange, $\bar{Z}$:Orange / Red					
Environmental Specifications	Operating Temperature: -10°C~70°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~85°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP40					

Dimensions

Bore Diameter 30mm





Absolute Encoder

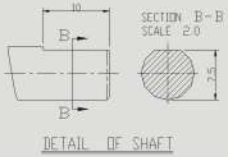
Solid Shaft Outer Diameter 50mm

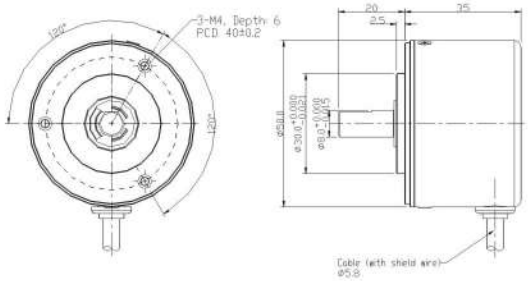
AS5

Series		AS5 Series	
Model Name		AS5...5XX	AS5...8XX
Electrical Specifications	Rated Voltage	5±5%V	5-5%~12+5%V
	Output Type	Open Collector	Voltage Output
	Sink Current	20 mA	--
	Source Current	--	--
	Max. Load Power Voltage	DC15V	--
	Output Signal	Gray Code	
	Output Voltage VH	>(V_{in}-2V)	≧(Vcc-2V)
	Output Voltage VL	≦500mV	
	Encoder Resolution: 5bit to 10bit Current Consumption: 200mA Max. Max. Response Frequency: 20kHz Max. Cable Diameter: 5.8mm Cable Length: 1000±20mm Cross Sectional Area: 0.18mm² Signal Characteristic: Rise Time 1μs Typ. ; Fall Time 1μs Typ.		
Mechanical Specifications	Max. Speed of Main Shaft: 3000rpm Starting Torque: 4.0 N-mm Typ. Moment of Inertia: 0.8 kg · mm² Typ. Outer Diameter: 50mm Height: 35mm Weight: <130g Shaft Diameter: 8mm Max. Shaft Load: Thrust: 30N / Radial: 50N (10 mm from mounting surface) Wire Color: Vcc: Red, 0V: Black , 2^0: Brown, 2^1: Orange, 2^2: Yellow, 2^3: Green, 2^4: Blue, 2^5: Purple, 2^6: Gray, 2^7: White, 2^8: Pink, 2^9: Light Blue		
Environmental Specifications	Operating Temperature: -10°C~60°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~75°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP40		

Dimensions

Shaft Diameter 8mm





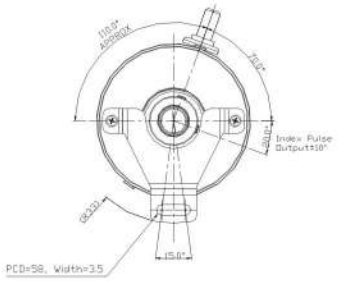
Hollow Shaft Outer Diameter 50mm

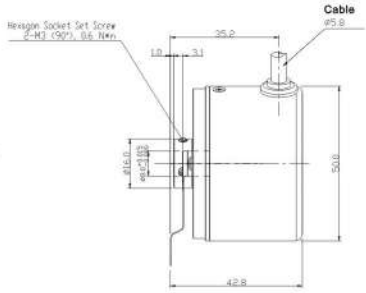
AH5

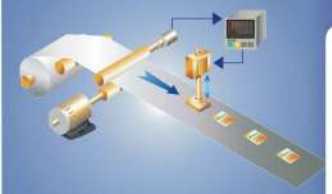
Series		AH5 Series	
Model Name		AH5...5XX	AH5...8XX
Electrical Specifications	Rated Voltage	5±5%V	5-5%~12+5%V
	Output Type	Open Collector	Voltage Output
	Sink Current	20 mA	--
	Source Current	--	--
	Max. Load Power Voltage	DC15V	--
	Output Signal	Gray Code	
	Output Voltage VH	>(V_{in}-2V)	≧(Vcc-2V)
	Output Voltage VL	≦500mV	
	Encoder Resolution: 5bit to 10bit Current Consumption: 200mA Max. Max. Response Frequency: 20kHz Max. Cable Diameter : 5.8mm Cable Length: 1000±20mm Cross Sectional Area: 0.18mm² Signal Characteristic: Rise Time 1μs Typ. ; Fall Time 1μs Typ.		
Mechanical Specifications	Max. Speed of Main Shaft: 3000rpm Starting Torque: 4.0 N-mm Typ. Moment of Inertia: 0.8 kg · mm² Typ. Outer Diameter: 50mm Height: 35mm Weight: <135g Bore Diameter: 8mm Max. Shaft Load: Thrust: 30N / Radial: 50N (10 mm from mounting surface) Wire Color: Vcc: Red, 0V: Black , 2^0: Brown, 2^1: Orange, 2^2: Yellow, 2^3: Green, 2^4: Blue, 2^5: Purple, 2^6: Gray, 2^7: White, 2^8: Pink, 2^9: Light Blue		
Environmental Specifications	Operating Temperature: -10°C~60°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~75°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP40		

Dimensions

Bore Diameter 8mm







Commutation Encoder (For Servo Motor)

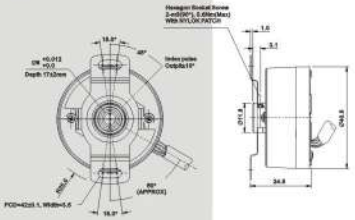
Hollow Shaft Outer Diameter 40.9mm

MH4

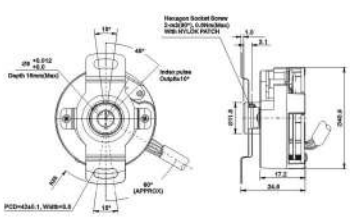
Series		MH4 Series	
Model Name		MH4...5xx	MH4...8xx
Electrical Specifications	Rated Voltage	5±5%V	5-5%~12+5%V
	Output Type	Line Driver	
	Sink Current	20mA 26C31or equivalent	
	Source Current		
	Output Signal	A,$\bar{A}$,B,$\bar{B}$,Z,$\bar{Z}$(U,$\bar{U}$,V,$\bar{V}$,W,$\bar{W}$)	
	Output Voltage VH	≧(Vcc-2V)	
	Output Voltage VL	≦500mV	
	Encoder Resolution: 2500 (PPR) Current Consumption: 100mA Max. Max. Response Frequency: 300kHz Max. Cable Diameter: 6.8mm Output Phase Difference: Output phase difference 90° + zero point signal Cable Length: 1000±20mm Cross Sectional Area: 0.18mm² Signal Characteristic: Rise Time 100ns Max. ; Fall Time 100ns Max.		
Mechanical Specifications	Max. Speed of Main Shaft: 6000rpm Starting Torque: 4.0 N-mm Typ. Moment of Inertia: 1.2 kg · mm² Typ. Outer Diameter: 40.9mm Height: 26.7mm Weight: <85g Bore Diameter: 6mm / 8mm Max. Shaft Load: Thrust: 15N / Radial: 30N (10 mm from mounting surface) Wire Color: DC +5V: Brown, 0V: Blue, A: Black, $\bar{A}$: Black / Red, B: White, $\bar{B}$: White / Red, Z: Orange, $\bar{Z}$: Orange / Red, U: Yellow, $\bar{U}$: Yellow / Red, V: Green, $\bar{V}$: Green / Red , W: Pink, $\bar{W}$: Pink / Red		
Environmental Specifications	Operating Temperature: -10°C~85°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~100°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP30		

Dimensions

Bore Diameter 6mm



Bore Diameter 8mm



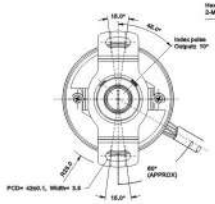
Through Hole Shaft Outer Diameter 40.9mm

MT4

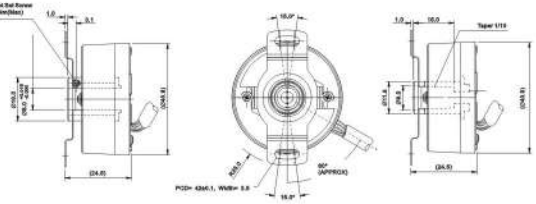
Series		MT4 Series	
Model Name		MT4...5xx	MT4...8xx
Electrical Specifications	Rated Voltage	5±5%V	5-5%~12+5%V
	Output Type	Line Driver	
	Sink Current	20mA 26C31or equivalent	
	Source Current		
	Output Signal	A,$\bar{A}$,B,$\bar{B}$,Z,$\bar{Z}$(U,$\bar{U}$,V,$\bar{V}$,W,$\bar{W}$)	
	Output Voltage VH	≧(Vcc-2V)	
	Output Voltage VL	≦500mV	
	Encoder Resolution: 2500 (PPR) Current Consumption: 100mA Max. Max. Response Frequency: 300kHz Max. Cable Diameter: 6.8mm Output Phase Difference: Output phase difference 90° + zero point signal Cable Length: 1000±20mm Cross Sectional Area: 0.18mm² Signal Characteristic: Rise Time 100ns Max. ; Fall Time 100ns Max.		
Mechanical Specifications	Max. Speed of Main Shaft: 6000rpm Starting Torque: 4.0 N-mm Typ. Moment of Inertia: 1.2 kg · mm² Typ. Outer Diameter: 40.9mm Height: 26.7mm Weight: <85g Bore Diameter: 8mm / 9mm (Taper 1/10) Max. Shaft Load: Thrust: 15N / Radial: 30N (10 mm from mounting surface) Wire Color: DC +5V: Brown, 0V: Blue, A: Black, $\bar{A}$: Black / Red, B: White, $\bar{B}$: White / Red, Z: Orange, $\bar{Z}$: Orange / Red, U: Yellow, $\bar{U}$: Yellow / Red, V: Green, $\bar{V}$: Green / Red , W: Pink, $\bar{W}$: Pink / Red		
Environmental Specifications	Operating Temperature: -10°C~85°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~100°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP30		

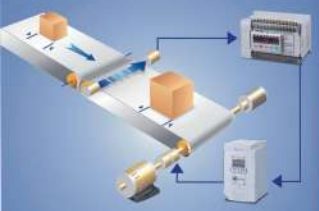
Dimensions

Bore Diameter 8mm



Bore Diameter 9mm(Taper)





Commutation Encoder (For Servo Motor)

Incremental Encoder (For Spindle Applications)

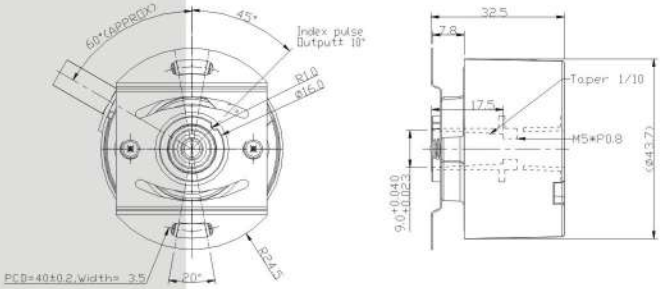
Through Hole Shaft Outer Diameter 43.7mm

MT4

Series		MT4 Series
Electric Spec.	Rated Voltage	5V±5%
	Resolution	2500 PPR
	Output Form	Line Driver
	Consumption Current	100 mA Max.
	Sink Current	20mA
	Output Signal	A,$\bar{A}$,B,$\bar{B}$,Z,$\bar{Z}$(U,$\bar{U}$,V,$\bar{V}$,W,$\bar{W}$)
	Output Voltage VH	≧(Vin-2V)
	Output Voltage VL	≦500mV
	Encoder Resolution: 2500 (PPR) Current Consumption: 100mA Max. Max. Response Frequency: 300kHz Max. Cable Diameter: 6.8mm Output Phase Difference: Output phase difference 90° + zero point signal Cable Length: 1000±20mm Signal Characteristic: Rise Time 100ns Max. ; Fall Time 100ns Max.	
Mechanical Specifications		Max. Speed of Main Shaft: 6000rpm Starting Torque: < 5.0 N-mm Typ. Moment of Inertia: < 1.2kg · mm² Typ. Outer Diameter: 43.7mm Height: 32.5mm Weight: <85g Bore Diameter: 8/9 mm Max. Shaft Load: Thrust: 15N / Radial: 30N (10 mm from mounting surface)
Environmental Specifications		Operating Temperature: -20°C~85°C, 95%RH without condensation Storage Temperature: -25°C~100°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: IP40

Dimensions

Bore Diameter 9mm (Taper)



Solid Shaft Frame Size 68mm

CS

Series		CS Series	
Model Name		CS7...5xx	CS7...9xx
Electrical Specifications	Rated Voltage	5±5%V	5-5%~12+5%V
	Output Type	Line Driver	
	Sink Current	20mA	
	Source Current		
	Output Signal	A,$\bar{A}$,B,$\bar{B}$,Z,$\bar{Z}$	
	Output Voltage VH	≧(Vcc-2V)	
	Output Voltage VL	≦500mV	
	Encoder Resolution: 1024 (PPR) Current Consumption: 100mA Max. Max. Response Frequency: 300kHz Max. Output Phase Difference: Output phase difference 90° + zero point signal Signal Characteristic: Rise Time 500ns Typ. ; Fall Time 500ns Typ.		
Mechanical Specifications		Max. Speed of Main Shaft: 8000rpm Starting Torque: 23 N-mm Typ. Moment of Inertia: 4.1kg · mm² Typ. Frame size: 68mm Height: 102.8mm Weight: <420g Shaft Diameter: 15mm Max. Shaft Load: Thrust: 50N / Radial: 85N (10 mm from mounting surface) Pin Definition: Vcc: H, 0V: K, A: A, $\bar{A}$: N, B:C, $\bar{B}$: R, Z: B, $\bar{Z}$: P, Shielding: T	
Environmental Specifications		Operating Temperature: -10°C~70°C, 95%RH (Non-condensing, Non-freezing) Storage Temperature: -25°C~85°C (Non-condensing, Non-freezing) Shock: 100G's at 6ms Vibration: 10 to 200Hz at 5G's Protection Degree: Ip55	

Dimensions

Shaft Diameter 15mm