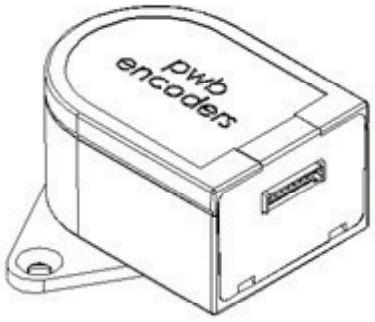
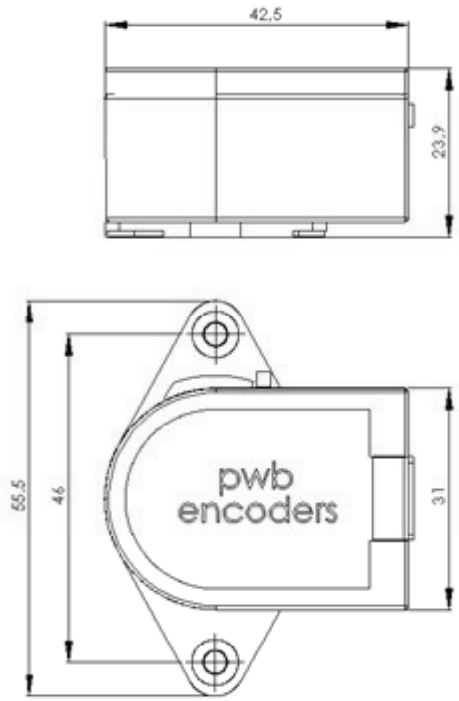
Description

The AE30-F is a reliable low cost optical hollow shaft encoder that can be fixed quickly and easily on different sizes of motor shafts.
The encoder provides two square wave outputs in quadrature (90 degrees phase shifted) and one optional index channel (one pulse per revolution).
The resolution of the encoder is determined by the number of counts per revolution (CPR).
Power supply and signals are provided by an 8 pin Molex connector.

Dimensions





Encoder Resolution (CPR)
100
200
256
360
400
500
512
1000
1024
2000
2048
2500
4000
4096
5000

Main characteristics

- Hollow shaft encoder
- High performance in compact size
- Robust plastic housing
- Quick and easy assembly
- Resolutions up to 1024 counts per revolution (CPR)
- Up to 100 kHz output frequency
- Two channel quadrature output (A / B)
- Two channel quadrature output with index pulse (A / B / I)
- TTL compatible outputs
- Output circuit : pull-up
- Operating temperature range: up -40 °C to 100 °C
- Several shaft diameter options
- No signal adjustment required
- Compliant EU-directive 2011/65/EU (RoHS)

Motor shaft Ø Diameter (mm)
A = 1.800
B = 2.000
C = 2.500
D = 3.000
E = 3.175 (1/8")
F = 3.969 (5/32")
G = 4.000
H = 4.763 (3/16")
I = 5.000
J = 6.000
K = 6.350 (1/4")
L = 8.000

Applications

- For high volume applications like factory and office automation
- Consumer electronics, white goods, automatic handlers, doors and windows controls

Absolute maximum ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Storage temperature [M1]	T_S	-40		100	°C	
Storage temperature [M2]	T_S	-40		85	°C	
Supply voltage	V_{cc}	-0.5		to 7.0	V_{DC}	
Output voltage	V_{out}	-0.5		to V_{cc}	V	
Output current	I_{out}	-1.0		5.0	mA	per Channel

Recommended operating conditions

Encoding characteristics over recommended operating range and recommended mounting tolerances unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Operating temperature [M1]	T_A	-40		100	°C	
Operating temperature [M2]	T_A	-40		85	°C	
Supply voltage	V_{cc}	4.5	5.0	5.5	V_{DC}	Ripple < 100 mV_{p-p}
Load capacitance	C_L			100	pF	internal pull-up 3.3 kΩ
Count frequency	f			100	kHz	up to 1024 CPR
				500		2000 - 2500 CPR
				1000		4000 - 5000 CPR

Electrical characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply current 2 channel	I_{cc}			40	mA	
Supply current 3 channel	I_{cc}			85	mA	
High level output voltage	V_{OH}	2.4			V	I_{OH} = -200 µA
Low level output voltage	V_{OL}			0.4	V	I_{OL} = 3.86 mA
Output waveform rise time	t_r		200		ns	C_L = 25 pF R_L = 1 MΩ V_{CC} = 5 V
Output waveform fall time	t_f		50		ns	
Ch. I rise after Ch. A or Ch. B fall	t_1	10	100	250	ns	
Ch. I fall after Ch. A or Ch. B rise	t_2	70	150	300	ns	

Note: Ch. A & Ch B. quadrature output + Ch. I index output

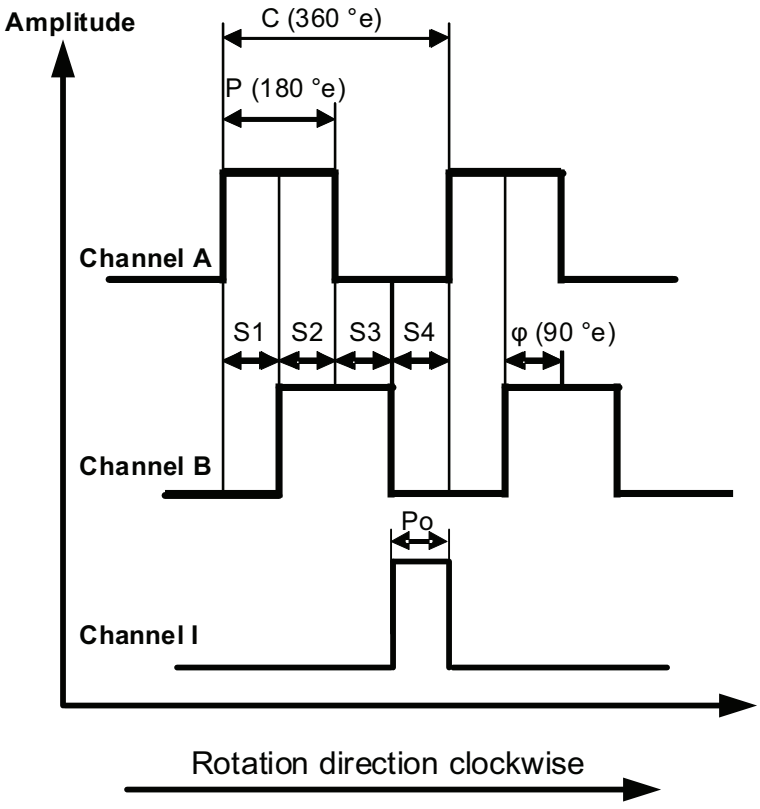
ESD Warning: Normal handling precautions should be taken to avoid static discharge damage to the sensor.

Encoder characteristic

Encoding characteristics over recommended operating range and recommended mounting tolerances unless otherwise specified.

	Parameter	Symbol	Min.	Typ.	Max.	Unit
2 channel + index[M1]	Pulse width error	ΔP		± 7	± 40	°e
	State width error	ΔS		± 5	± 40	°e
	Phase error	ΔΦ		± 2	± 25	°e
	Index pulse width	P_0	60	90	120	°e
2 channel[M2]	Pulse width error	ΔP		±7	± 45	°e
	State width error	ΔS		± 5	± 45	°e
	Phase error	ΔΦ		± 2	± 20	°e

Note: M1/M2: see ordering codes



Definitions

Count (N): The number of bar and window pairs or increments per revolution (CPR) of the code wheel.

One Cycle C: One period of the signal, related to 1 bar and 1 window. It is measured in electrical degrees, one cycle is 360 electrical degrees (°e)

Cycle Error (ΔC): The deviation in electrical degrees of the pulse width from its ideal value. It is an indication of cycle uniformity.

Pulse Width (P): The number of electrical degrees when an output is "HIGH" during one cycle, nominally 180 °e or half a cycle.

Pulse Width Error (ΔP): The deviation in electrical degrees of the pulse width from its ideal value of 180 °e.

State Width (S): The number of electrical degrees between a transition in the output of channel A and the neighbouring transition in the output of channel B. There are 4 states per cycle, each nominally 90 °e (S1 – S4).

State Width Error (ΔS): The deviation in electrical degrees of each state width from its ideal value of 90 °e.

Phase (ϕ): The number of electrical degrees between the centre of the high state on channel A and the centre of the high state on channel B. This value is nominally 90 °e (the signals A and B can be used for quadrature).

Phase Error (Δϕ): The deviation in electrical degrees of the phase from its ideal value of 90 °e.

Index pulse width (Po): The number of electrical degrees when the index is high during one full shaft revolution.

Connector output

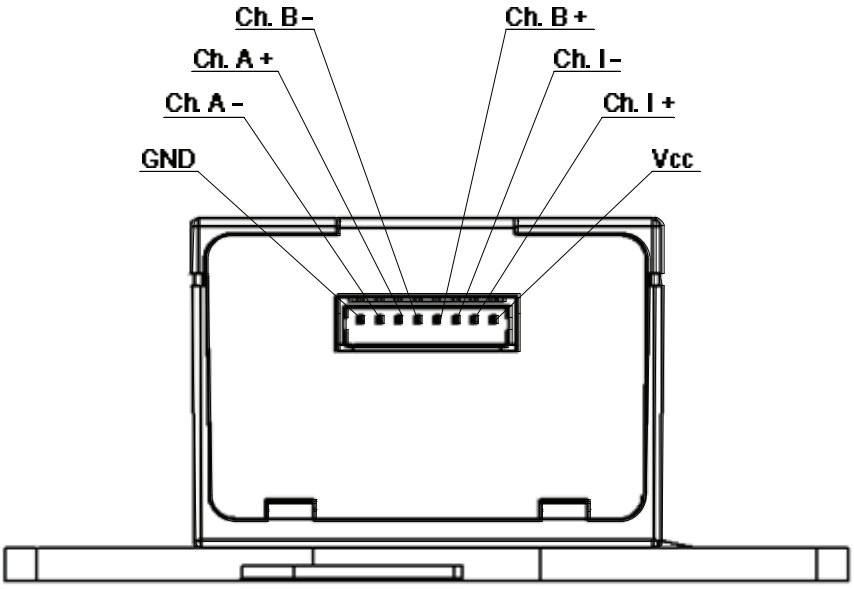
Encoder header connector: Wennmacher CX-W125R-8-DIP [M1]
Molex 53048-0810 [M2]

Housing connector: Wennmacher CX-H-125-8 with CX-T125F terminals [M1]
Molex 51021-0800 with 50079-8000 terminals [M2]

Pin-out description

Pin	Output pin	Description	Wire colors (UL 10002) [M1]	Wire colors (UL 1061) [M2]
1	Vcc	Power supply	red	red
2	I +	Index I+	green	green
3	I -	Not connected	blue	blue
4	B +	Channel B+	purple	purple
5	B -	Not connected	brown	brown
6	A +	Channel A+	yellow	yellow
7	A -	Not connected	white	orange
8	GND	Ground	black	black

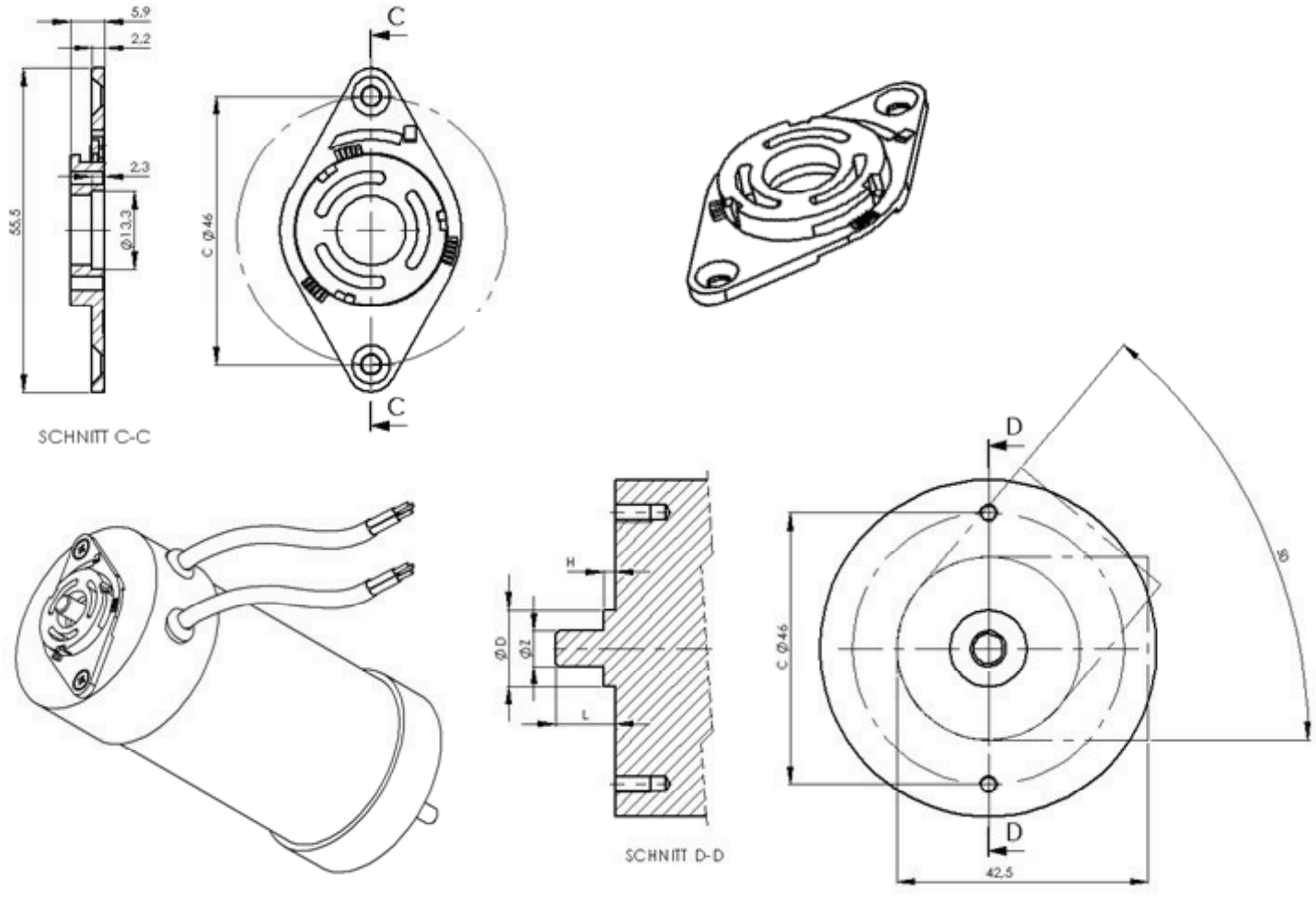
Note: M1/M2: see ordering codes & cable accessories



Mechanical characteristics and drawings

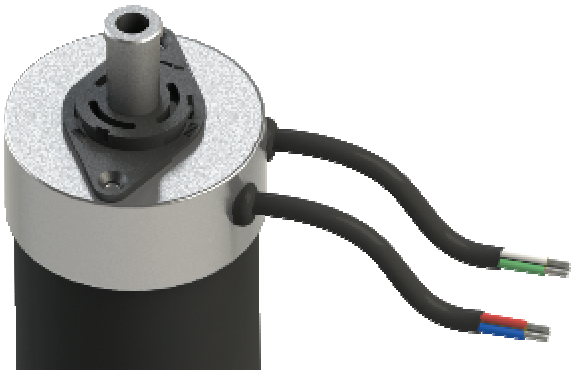
Parameter	Value	Tolerance	Unit
Dimensions	42.5 x 31.0 x 23.9 (refer to Page 2)		mm
Weight	17		g
Shaft diameters **ØZ**	1.8 / 2.0 / 2.3 / 2.5 / 3.0 / 3.175 / 3.969 / 4.0 / 4.763 / 5.0 / 6.0 / 6.35 / 8.0	± 0.01	mm
Motor shaft length protrusion **L**	9.5	+ 1.5	mm
Max. motor mounting boss diameter **ØD**	13.0		mm
Max. motor mounting boss height **H**	2.0		mm
Max. motor axial shaft play		± 0.25	mm
Max. motor shaft eccentricity + radial play	0.05 (eccentricity decreases signal performances)		mm
Screws for fixing	2 X M3 (DIN 965)		
Tightening torque of the screws	15	-5	Ncm
Pitch circle diameter **ØC**	46		mm
Protection grade	IP50 (according to DIN 40500)*		
Plastic material	PBT, 17% glass fibre reinforced UL 94 V-0		

Note: * When the encoder is properly assembled



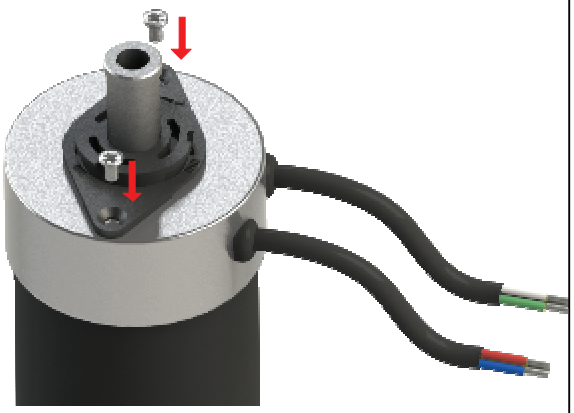
AE30-F MOUNTING INSTRUCTION

1



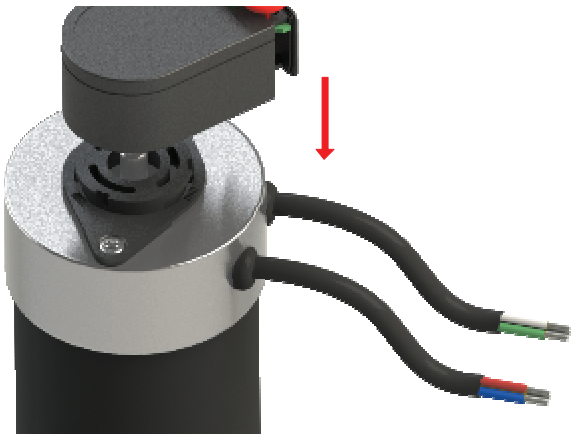
Align the base plate to the motor shaft
by using the centering gauge

2



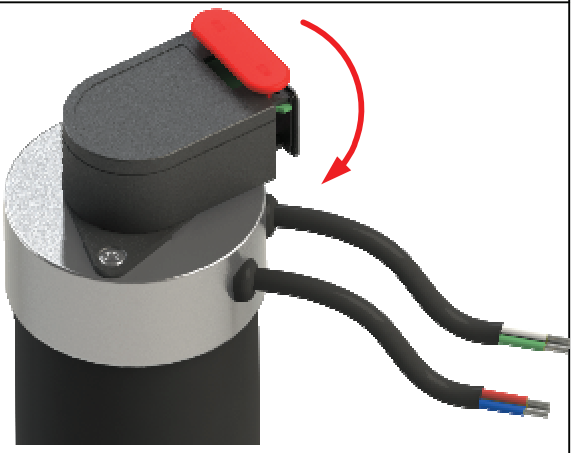
Afterwards fix the base plate to the motor flange using
two screws M3

3



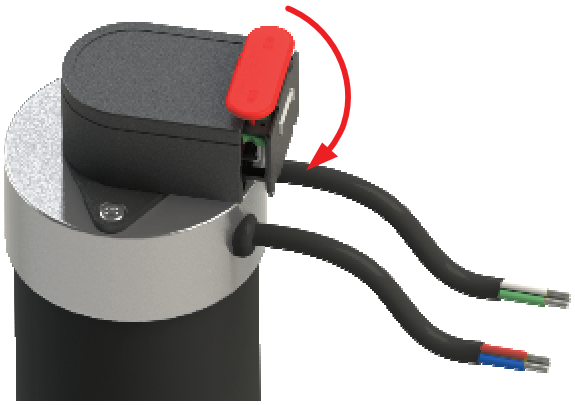
Align the hole of the hub to the motor shaft and
push the encoder until it will touch the flange

4



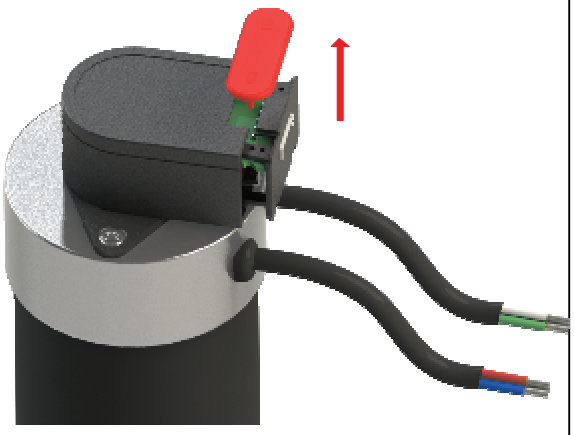
When the encoder fits totally onto the flange,
start to rotate the encoder clockwise…..……

5



…… until a stop point is reached

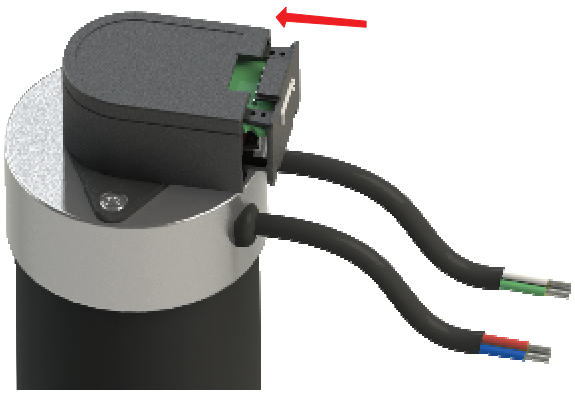
6



After assembling the encoder on the flange,
remove the stopper.

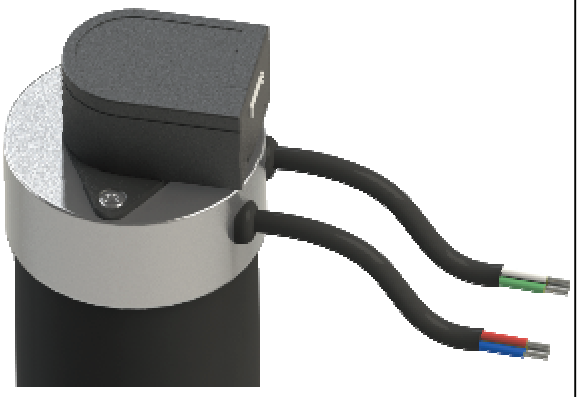
AE30-F MOUNTING INSTRUCTION

7



Push the wall into the housing into its final position.

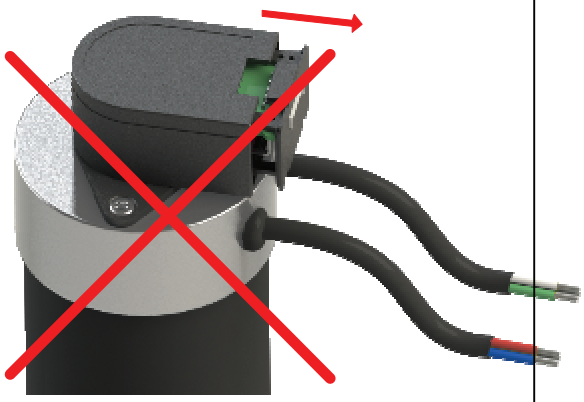
8



Now the encoder is ready for use.

WARNING

Do not rotate the encoder after assembly or when it is in operation.



Do not pull out the wall after assembly or when it is in operation.

ATTENTION!

The encoder is designed to be assembled only one time, otherwise the guarantee will be voided.

Note: see IMPORTANT NOTICE (page 11)