

Data Sheet AE30 2/3-Channels medium temperature range line-driver



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The World of Motion Control

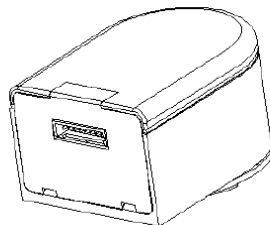
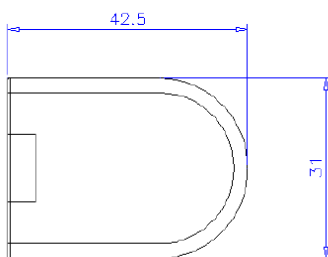
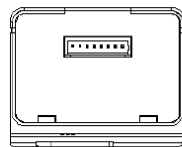
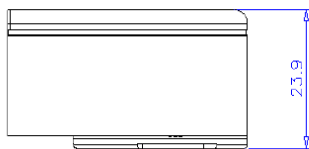
Description

The AE30 is a reliable low cost optical hollow shaft encoder that can be fixed quickly and easily on different sizes of motor shafts.

The AE 30 encoder with differential line driver (DS9638CM) provides up to three differential output signals A / \bar{A} ; B / \bar{B} (in quadrature 90 degrees phase shifted) and one optional index channel I / \bar{I} .

The resolution of the encoder is determined by the number of Counts Per Rotation (CPR). Power supply and signals are provided by an 8 pin Molex connector or with Flat cable with AMP connector.

Dimensions



Encoder Counts Per Rotation (CPR)
100
200
256
360
400
500
512
1000
1024

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 differential line driver output (A , \bar{A} / B , \bar{B})
- Three channel differential line driver output (A , \bar{A} / B , \bar{B} / I , \bar{I})
- max. 50 mA output drive capability for 50 Ω transmission lines
- Operating temperature range -40 °C to +85 °C
- Several shaft diameter options
- No signal adjustment required
- Compliant EU-directive 2002/95/EG (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

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Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Storage Temperature	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 _{DC}	
Output Current	I _{out}			±50	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		85	°C	
Operating Temperature ^{M2}	T _A	-20		75	°C	
Supply Voltage	V _{CC}	4.5	5.0	5.5	V _{DC}	Ripple < 100 mV _{p-p}
Supply Current	I _{CC}			250	mA	
Load Capacitance	C _L			100	pF	
Count Frequency	f			100	kHz	rpm x CPR / 60

Note:

M1/M2: see ordering codes

The Encoder performance is guaranteed up to 100 kHz, higher frequencies are allowed (for details please contact our customer support)

Electrical characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
High Level Output Voltage	V _{oH}	2.5			V _{DC}	
High Level Output Current	I _{oH}			-50	mA	
Low Level Output Voltage	V _{oL}			0.8	V _{DC}	
Low Level Output Current	I _{oL}			50	mA	
Propagation Time				10	ns	
Rise Time	t _r			20	ns	
Fall Time	t _f			20	ns	

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

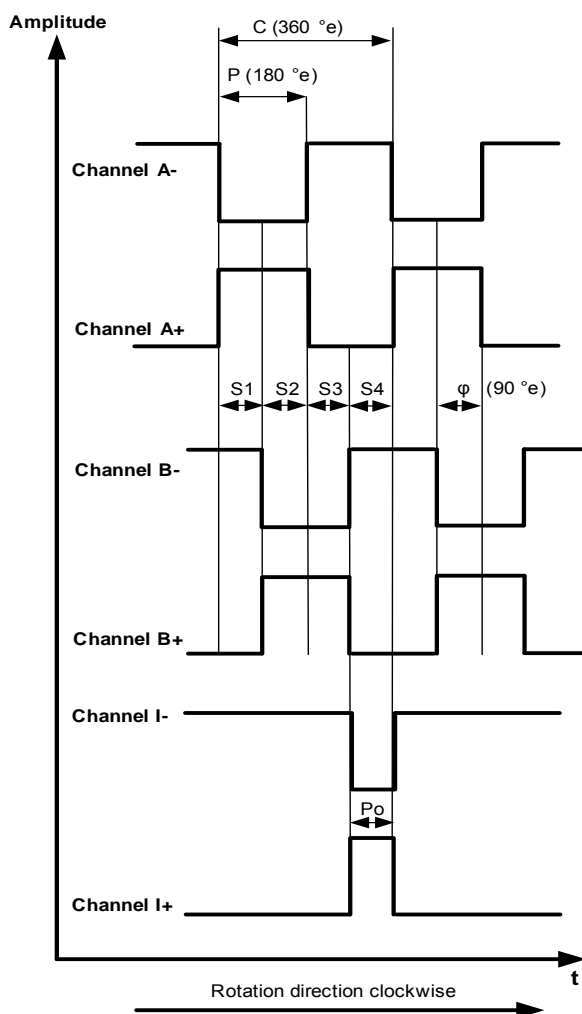
ESD Warning: Normal handling precautions should be taken to avoid static discharge damage to the sensor.

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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	± 30	$^{\circ}e$
	State width error	ΔS		± 5	± 30	$^{\circ}e$
	Phase error	$\Delta \Phi$		± 2	± 15	$^{\circ}e$
	Index pulse width	P_0	60	90	120	$^{\circ}e$
2 channel ^{M2}	Pulse width error	ΔP		± 7	± 45	$^{\circ}e$
	State width error	ΔS		± 5	± 45	$^{\circ}e$
	Phase error	$\Delta \Phi$		± 2	± 20	$^{\circ}e$



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 ($^{\circ}e$).

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 $^{\circ}e$ or half a cycle.

Pulse Width Error (ΔP): the deviation in electrical degrees of the pulse width from its ideal value of 180 $^{\circ}e$.

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 $^{\circ}e$ (S1 – S4).

State Width Error (ΔS): The deviation in electrical degrees of each state width from its ideal value of 90 $^{\circ}e$.

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 $^{\circ}e$ (the signals A and B can be used for quadrature).

Phase Error ($\Delta \phi$): the deviation in electrical degrees of the phase from its ideal value of 90 $^{\circ}e$.

Index pulse width (P_0): the number of electrical degrees when the index is high during one full shaft rotation.

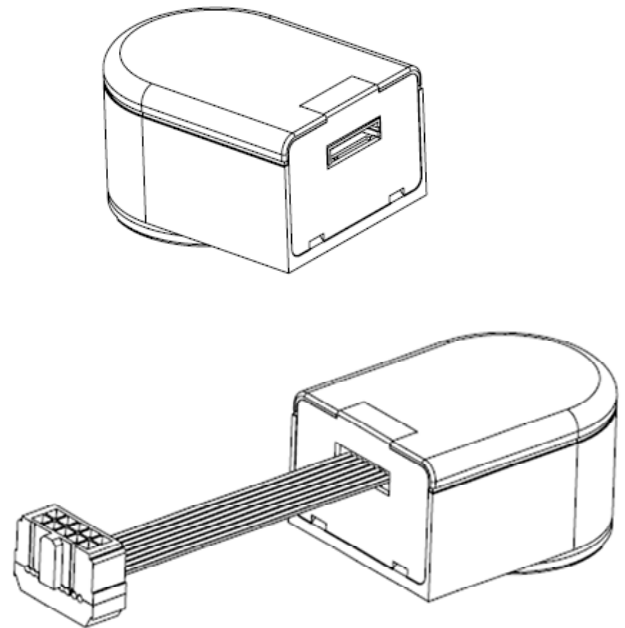
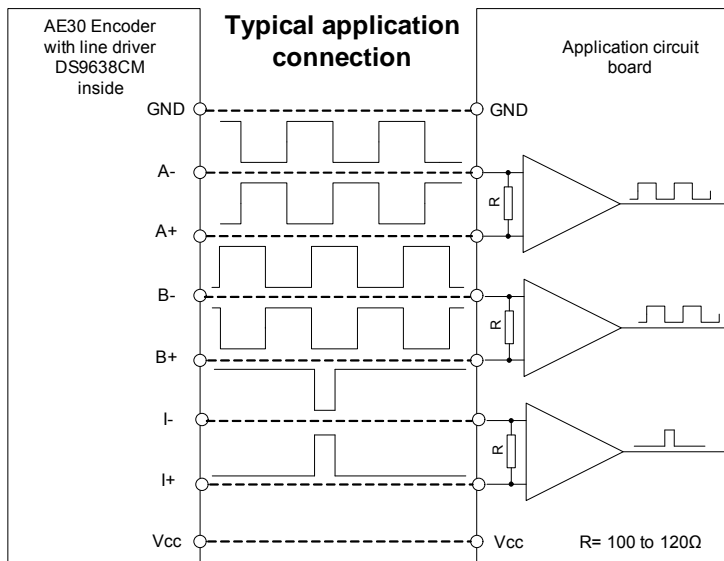
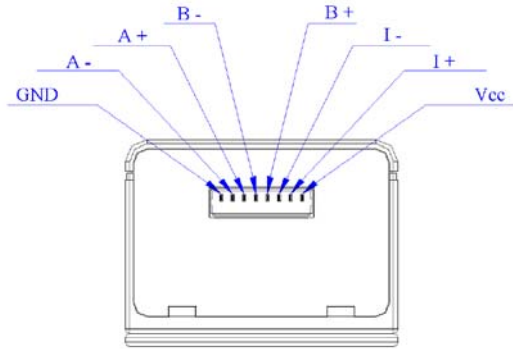
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Pin-out description

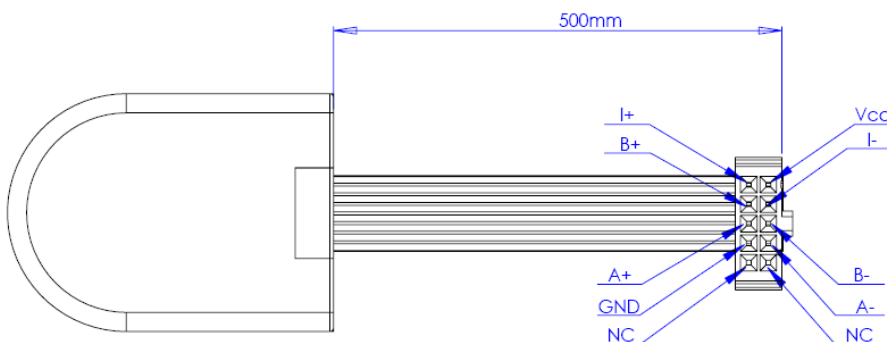
Encoder Header connector: Molex 53048-0810

Housing connector: Molex 51021-0800 with 50079-8100 Terminals

Output pin	Description
GND	Ground
A-	Channel A-
A+	Channel A+
B-	Channel B-
B+	Channel B+
I-	Index I-
I+	Index I+
V_{cc}	Power supply



Flat cable: UL Style 2651 / AWG 28
 Connector: AMP 746285 -1 (IDC Type – 2.54 X 2.54 Pitch)



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Mechanical characteristics and drawings

Parameter		Value
Dimensions		42.5 x 31 x 23.9 mm (refer to Page 2)
Weight		17 g
Hollow shaft diameters	Ø	1.8 mm; 2.0 mm; 2.5 mm; 3.0 mm; 3.175mm (1/8"); 3.969mm (5/32"); 4.0 mm; 4.763mm (3/16"); 5.0 mm; 6.0 mm; 6.35mm (1/4"); 8.0 mm
Motor shaft length protrusion	L	Min. 9.5 mm; max. 11 mm (see Fig.2 below)
Max. motor mounting boss diameter	D	13 mm (see Fig.2 below)
Max. motor mounting boss height	H	2.0 mm (see Fig.2 below)
Max. motor axial shaft play		± 0.25 mm
Max. motor shaft eccentricity + radial play		0.05 mm (eccentricity decreases signal performances)
Flange print		Refer to Fig.3 below
Screws for fixing		2 x M3 flathead screw (max. head diameter 5 mm) or 3 x M2 flat fillister head screw (max head diameter 4 mm)
Screws tightening torque		15 Ncm max, 10 Ncm min.
Protection grade		IP50 (according to DIN 40500)*
Plastic material		PBT, 17% glass fibre reinforced UL 94 V-0

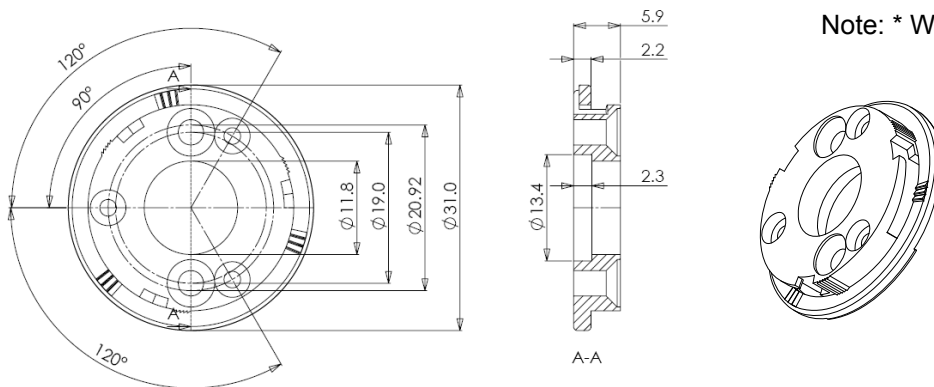


Fig. 1 Flange dimension

Note: * When the encoder is properly assembled

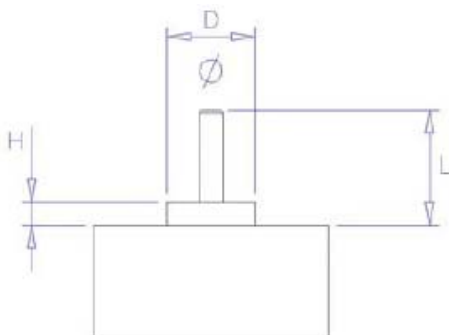


Fig. 2 Motor shaft tip

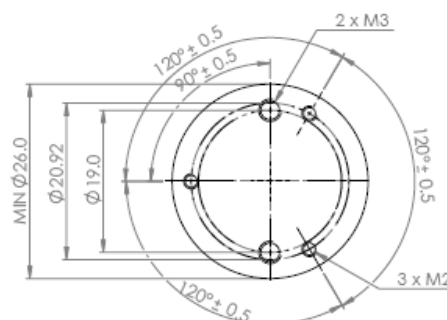
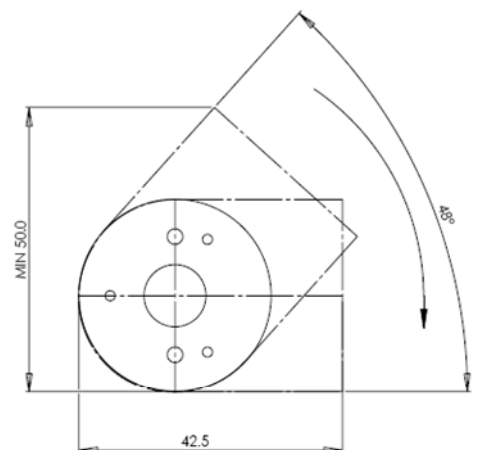


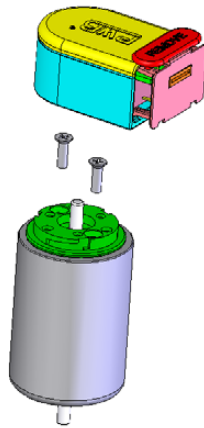
Fig. 3 Flange print



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Assembly instruction

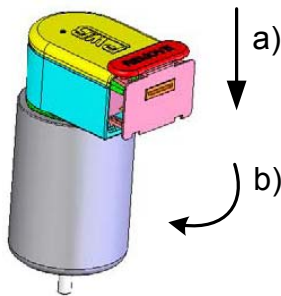
Step 1



The flange is placed onto the motor and fixed by the screws. A centering gauge is available for the correct assembling of the flange.

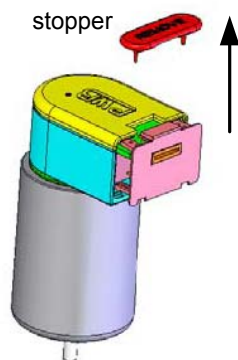
Note: proper centering of the flange is important for the optimal performance of the encoder.

Step 2



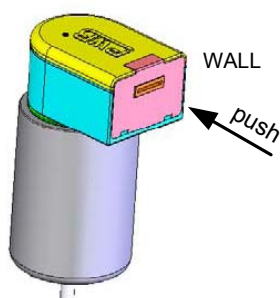
Align the hole of the hub on the motor shaft (a). When the encoder fits totally onto the flange, start to rotate clockwise until a stop point is reached (b).

Step 3



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

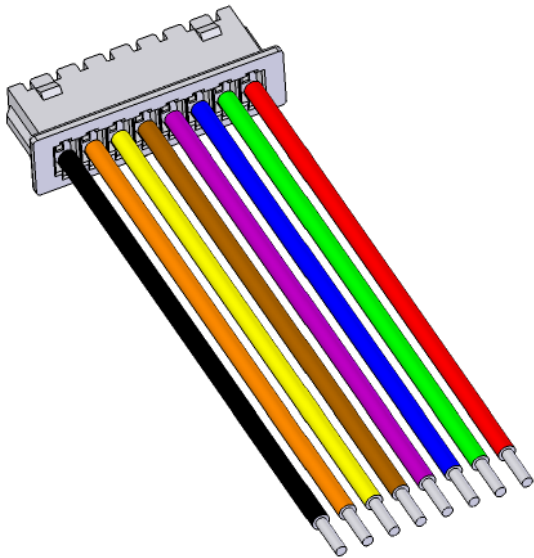
Step 4



Push the wall into the housing into its final position. Now the encoder is ready for use.

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Available accessories



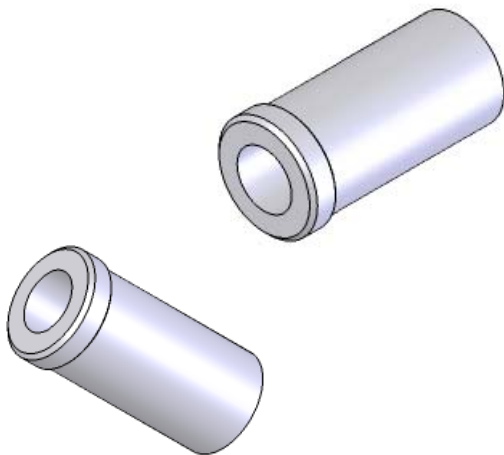
Standard cable 300 mm length with female connector
(UL1061 / AWG26)



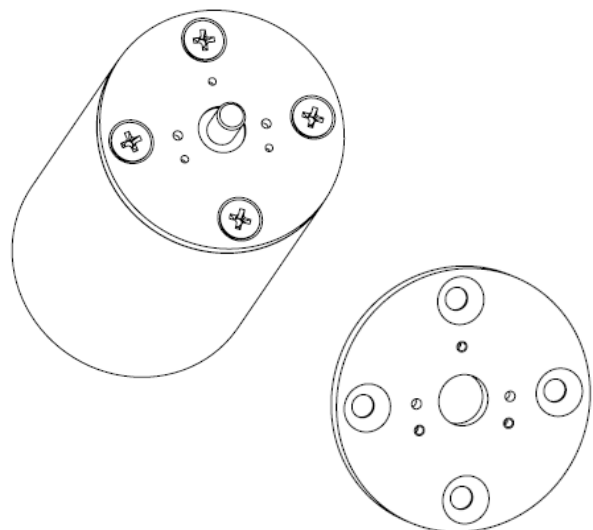
screws 3pcs Din 7985 M2 X 8



screws 2pcs Din 965 M3 X 8



Centering gauge for different motor shafts



Customized adapter plate

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Ordering codes

AE30 - X-XXXX -XX - X XX - XXX - X - XX -X

CHANNEL No.	RESOLUTION CPR No.	SUPPLY voltage	OUTPUT		FREQUENCY range	SHAFT diameter	TEMPERATURE range	CONNECTOR version
			current	type				
2 : 2 Channels	0100 : 100 CPR	05 : $V_{CC} = 5.0 V_{DC}$	H : up to 50 mA	LD : Line Driver	100 : up to 100 kHz	A : 1800 mm	M1 : medium (-40°C + +85°C)	F : flat cable
3 : 2 Channels + Index	0200 : 200 CPR					B : 2.000 mm		
	0256 : 256 CPR					C : 2.500 mm		S : side connector
	0360 : 360 CPR					D : 3.000 mm		
	0400 : 400 CPR					E : 3.175 mm (1/8")		
	0500 : 500 CPR					F : 3.969 mm (5/32")		
	0512 : 512 CPR					G : 4.000 mm		
	1000 : 1000 CPR*					H : 4.763 mm (3/16")		
	1024 : 1024 CPR*					I : 5.000 mm		
						J : 6.000 mm		
		K : 6.350 mm (1/4")						
		L : 8.000 mm						

* only as 2-channel version available

Available accessories (no parts of standard delivery):

- cable 300 mm length (UL1061 / AWG26) with female connector
- adapter plates for different motors
- centering gauge for different motor shafts
- fastening screws 3pcs Din 7985 M2 X 8
- fastening screws 2pcs Din 965 M3 X 8

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