data sheet AE30

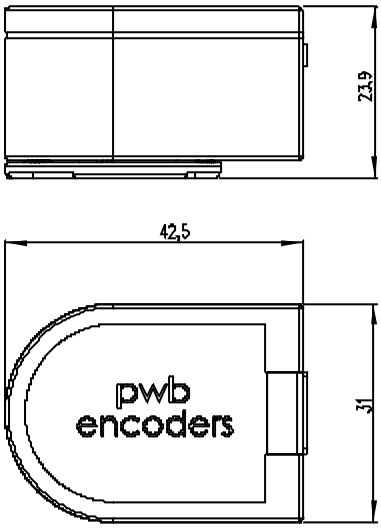
PWB encoders GmbH
Am Goldberg 2
D-99817 Eisenach
Germany
Phone: +49 3691 72580-0
Fax: +49 3691 72580-29

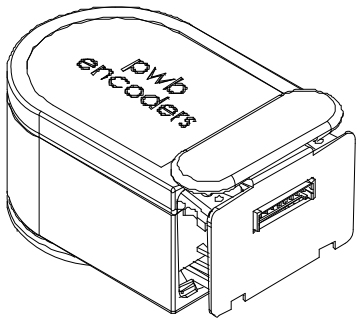
info@pwb-encoders.com
www.pwb-encoders.com

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 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 5000 counts per revolution (CPR)
- Two channel quadrature output (A / B)
- Two channel quadrature output with index pulse (A / B / I)
- TTL compatible outputs
- Output circuit: push-pull buffer
- Operating temperature range: up -40 °C to +85 °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	T_s	-40		85	°C	
Supply voltage	V_{cc}	- 0.5		6.5	V_{DC}	
Output voltage	V_{out}	-0.5		V_{cc}	V	
Output current	I_{out}	-50		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	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	
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}			105	mA	V_{CC} = 5.0 V_{DC}
Supply current 3 channel	I_{cc}			185	mA	
High level output voltage	V_{OH}	3.8			V	I_{OH}= -32mA
Low level output voltage	V_{OL}			0.55	V	I_{OL}= 32mA
Output waveform rise time	t_r		200		ns	R_L : 500 Ω
Output waveform fall time	t_f		50		ns	C_L : 50 pF

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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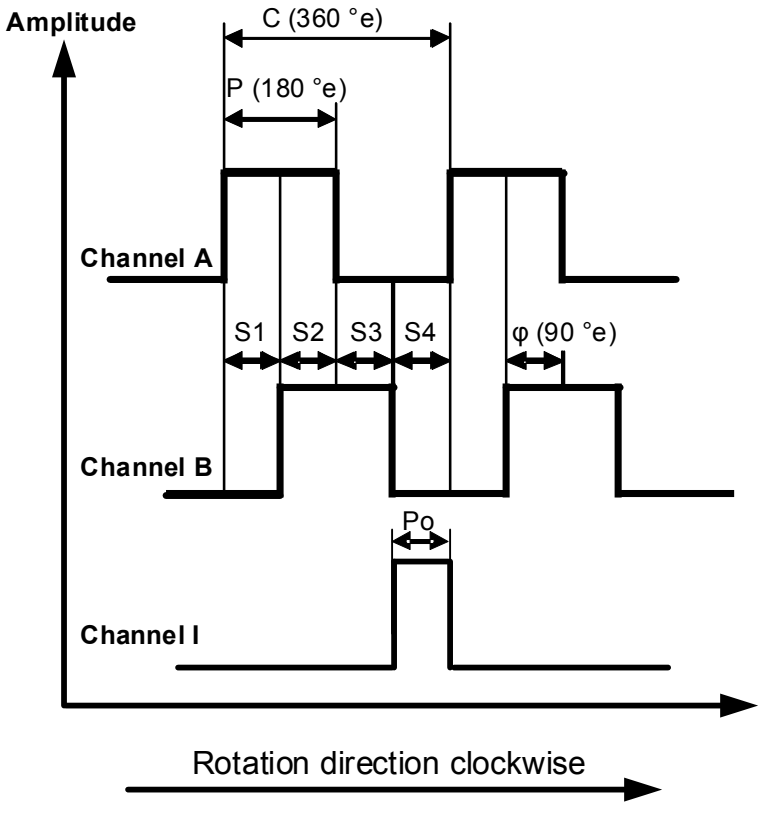
Encoder characteristic

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

	Parameter	Symbol	Min.	Typ.	Max.	Unit
2 channel + index	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	Pulse width error	ΔP		±7	± 45	°e
	State width error	ΔS		± 5	± 45	°e
	Phase error	ΔΦ		± 2	± 20	°e



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.

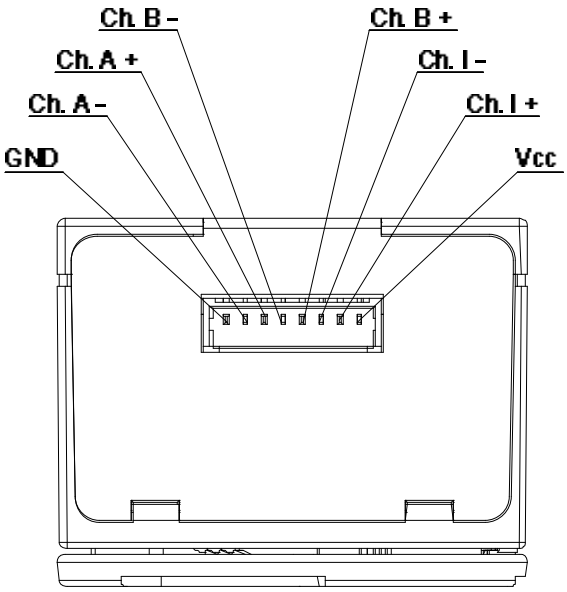
Index pulse width (Po): The number of electrical degrees when the index is high during one full shaft revolution.

Connector output

Encoder header connector: Molex 53048-0810
Housing connector: Molex 51021-0800 with 50079-8000 terminals

Pin-out description

Pin	Output pin	Description	Wire colors
1	Vcc	Power supply	red
2	I +	Index I+	green
3	I -	Not connected	blue
4	B +	Channel B+	purple
5	B -	Not connected	brown
6	A +	Channel A+	yellow
7	A -	Not connected	orange
8	GND	Ground	black



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 **Ø**	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 (see Fig.2 below)	± 0.01	mm
Motor shaft length protrusion **L**	9.5 (see Fig.2 below)	+ 1.5	mm
Max. motor mounting boss diameter **D**	13.0 (see Fig.2 below)		mm
Max. motor mounting boss height **H**	2.0 (see Fig.2 below)		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) 3 X M2 (DIN 7985)		
Tightening torque of the screws	15	-5	Ncm
Flange print	Refer to Fig.3 below		
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

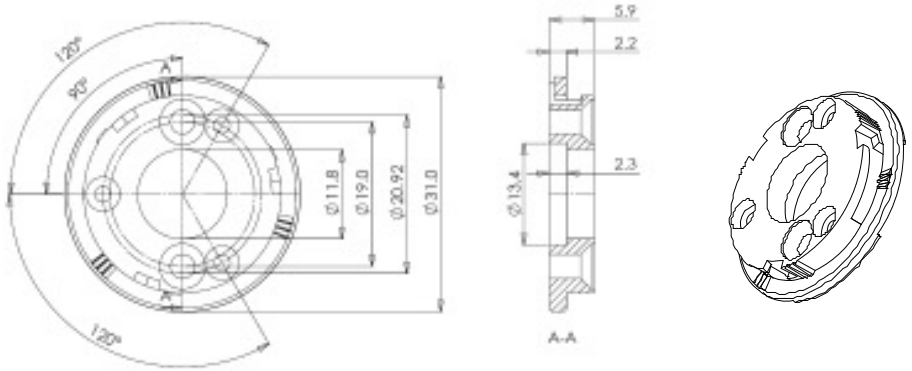


Fig. 1 Flange dimension

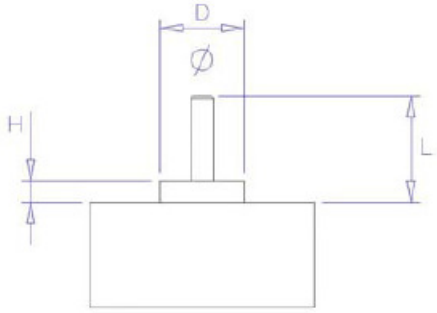


Fig. 2 Motor shaft tip

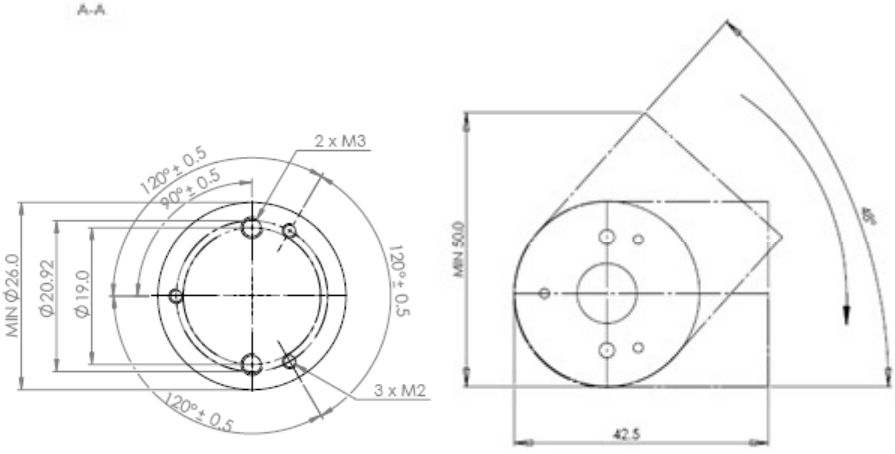


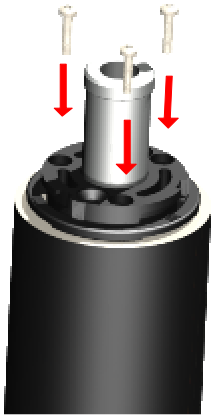
Fig. 3 Flange print

AE30 MOUNTING INSTRUCTION

1

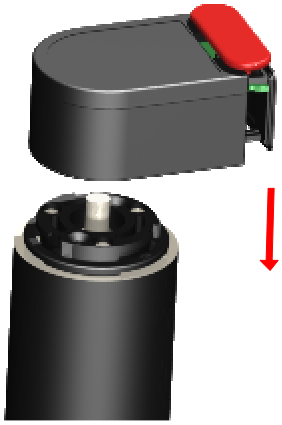
Align the base plate to the motor shaft
by using the centering gauge

2



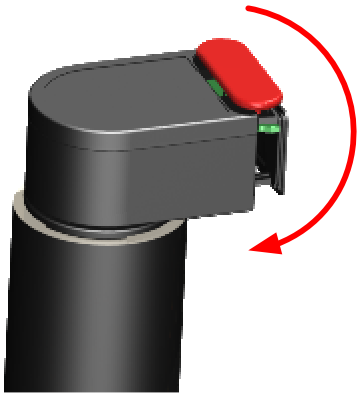
Afterwards fix the base plate to the motor flange using
two screws (M3) or three screws (M2)

3



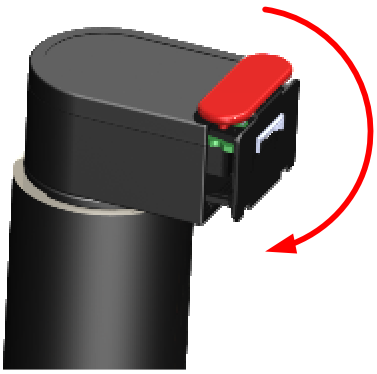
Align the hole of the hub to the motor shaft and
push the encoder until it will touch the flange

4



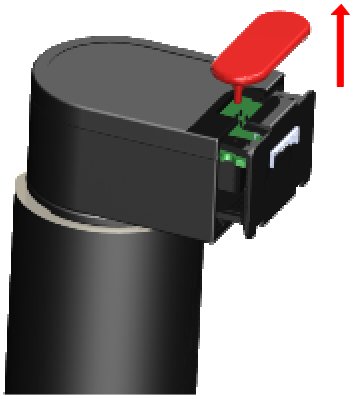
When the encoder fits totally onto the flange,
start to rotate the encoder clockwise…..……

5



…….. until a stop point is reached

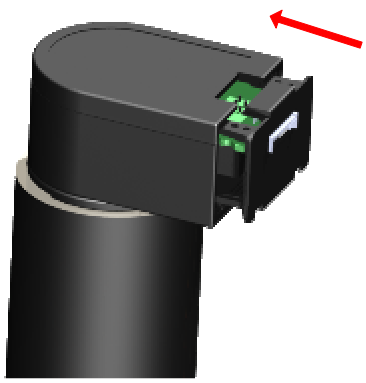
6



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

AE30 MOUNTING INSTRUCTION

7

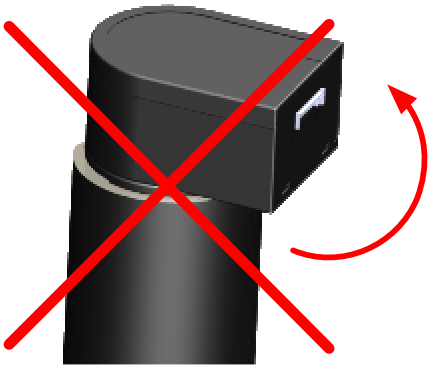


Push the wall into the housing into its final position.

8

Now the encoder is ready for use.

WARNING



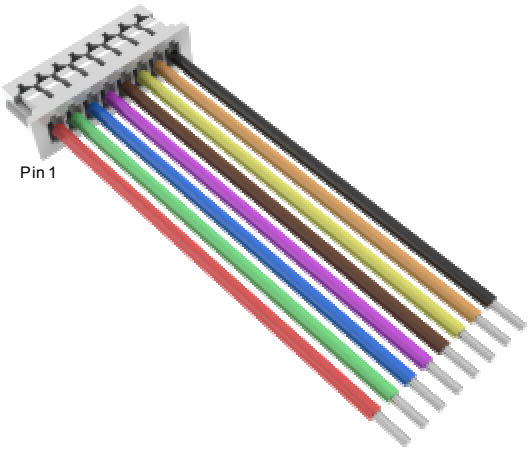
Do not rotate the encoder after assembly or when it is in operation.

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 12)

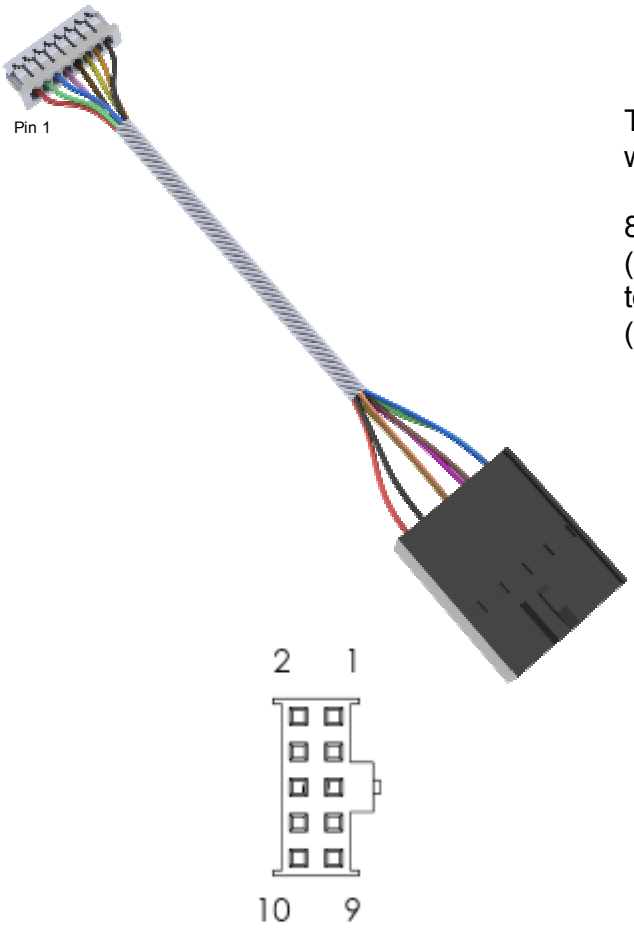
Available accessories

Standard cable



Cable 300 mm length UL1061 / AWG26
with female housing connector:
Molex 51021-0800 with 50079-8000 terminals

Adapter cable



Connector front view

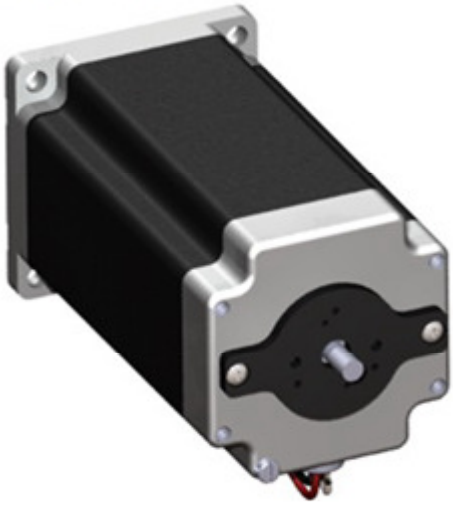
Twisted adapter cable 500 mm length UL1061 / AWG26
with female housing connector:

8-pin Molex connector
(Molex 51021-0800 with 50079-8000 terminals)
to a 10-pin Molex connector
(Molex 90142-0010 Housing with 90119-2121 terminals)

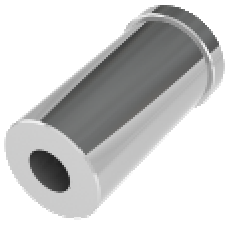
Pin-out description 10 pin connector side

Pin	Output pin	Description	Colors
1	N.C.	Not connected	
2	Vcc	Power supply	red
3	GND	Ground	black
4	N.C.	Not connected	
5	A -	Channel A-	orange / white *
6	A +	Channel A+	yellow
7	B -	Channel B-	brown
8	B +	Channel B+	purple
9	I -	Index I-	blue
10	I +	Index I+	green

Available accessories



Customized adapter plate



Centering gauge for different motor shafts

Screws 3 pcs DIN 7985 M2 X 8

Screws 2 pcs DIN 965 M3 X 8

Ordering codes

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

Channels	Resolution (CPR)	Supply voltage	Output type	Frequency range	Shaft diameter	Tenperature range	Connector version
2 : 2 Channels	**0100** : 100 CPR	**05** : V_{CC} = 5.0 V_{DC}	**PP** : push-pull	**100** : up to 100 kHz	**A** : 1.800 mm	**M2** : medium (-40°C to 85°C)	**S**: side connector w ith out cable
3 : 2 Channels + Index	**0200** : 200 CPR				**B** : 2.000 mm		**C**: side connector + standard cable **
	0256 : 256 CPR				**C** : 2.500 mm		**A**: side connector + adapter cable **
	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		
	2000 : 2000 CPR				**J** : 6.000 mm		
	2048 : 2048 CPR				**K** : 6.350 mm (1/4")		
	2500 : 2500 CPR				**L** : 8.000 mm		
	4000 : 4000 CPR						
	4096 : 4096 CPR						
	5000 : 5000 CPR						

Note:
** see page 9

Available accessories (no parts of standard delivery):
- standard cable 300 mm length
- adapter cable 500 mm length
- adapter plates for different motors
- centering gauge for different motor shafts (highly recommended for correct assembly)
- fastening screws 3pcs DIN 7985 M2 X 8
- fastening screws 2pcs DIN 965 M3 X 8

Patents: US: 7394219 DE:102004036903.8 EP: 1621854 JP: 2006038867

IMPORTANT NOTICE

The encoder is so designed that it may be assembled only one time, otherwise the guarantee will be voided.
The guarantee will be voided by misuse, accident, modification, unsuitable physical or operating environment, operation in other than the specified operating environment, or failure caused by a product for which ***PWB encoders GmbH*** is not responsible.

PWB encoders GmbH reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services also datasheets at any time.

PWB encoders GmbH Am Goldberg 2 D-99817 Eisenach Germany
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