

## ABSOLUTE MAGNETIC ROTARY ENCODER ANALOG



High-resolution absolute encoder based on magnetic technology. Singleturn sensing based on 360° Hall effect technology. Multiturn sensing based on magnetic pulse counter. No batteries used.

### Main Features

- Compact Industrial Design
- Interface: Analog – Current, Voltage
- Housing: 36,5 mm Ø
- Shaft: 6 mm Ø
- Blind Hollow / Hub Shaft: 6 mm Ø
- 12 Bit Total Resolution
- Max Turns (Default) : 16 Turns (0 To 5760°)
- Inputs for User Defined Measuring Range
- Over Range and Under Range Deadband
- EMC: EN 61000-6-2, EN 61000-6-4

### Mechanical Structure

- Aluminum Flange
- Coated Steel Housing
- Stainless Steel Shaft
- Precision Ball Bearings

### Suitable for Applications Requiring:

- Sensing of Angles or Distances of Rotating Shafts
- Straightforward Communication
- Potentiometer Replacement
- Robustness with High IP Rating
- Minimum Wiring

### Electrical Features

- Reverse Voltage Protection
- Over-Voltage Protection
- Programmable Measurement Range

## ABSOLUTE MAGNETIC ROTARY ENCODER ANALOG

### Technical Data

#### Electrical Data

##### Interface Specific

Current Options	4-20 mA	0-20 mA
Load Resistance	$R_L < 500 \Omega$ with 15V DC	
Linearity / Accuracy	0.15% / Accuracy at 4mA = $\pm 10 \mu\text{A}$ ; at 20mA = $\pm 50 \mu\text{A}$	
Supply Voltage*	15-30 V DC (absolute maximum ratings)	
Supply Voltage Cutoff/ Output Value	14.8 V / 3.6 mA	14.8 V / 0 mA
Settling Time	80 ms	
Current Consumption	Typical 40 mA	

\* Supply voltage according to EN 50 178 (safety extra-low voltage)

Voltage Options	0-5 V	0.5-4.5V	0-10 V	0.5-9.5V
Load Resistance	$R_L > 10 \text{ k}\Omega$ with 12V DC			
Linearity / Accuracy	0.15% / Accuracy at 5V = $\pm 15\text{mV}$ ; at 10V = $\pm 25\text{mV}$			
Supply Voltage*	12-30 V DC (absolute maximum ratings)			
Supply Voltage Cutoff/ Output Value	11.8 V / 0 V	11.8 V / 0.25 V	11.8 V / 0V	11.8 V / 0.25 V
Settling Time	80 ms			
Current Consumption	Typical 15 mA			

\* Supply voltage according to EN 50 178 (safety extra-low voltage)

##### General Data

Turn On Time	< 1 s
Electrical Lifetime	> $10^5$ h
EMC	Emitted interference: EN 61000-6-4
	Noise immunity: EN 61000-6-2 (500V surge test)
Connection	Cable exit or M12 Connector

## ABSOLUTE MAGNETIC ROTARY ENCODER ANALOG

### Sensor Data

Singleturn Technology	Magnetic 2 axis Hall sensor
Resolution of Output*	Max 12 bits over entire measuring range
Minimum Measurement Range	0 to 22.5 °
Singleturn Accuracy	Calibrated $\pm 0.35^\circ$
Multiturn Technology	Self supplied magnetic pulse counter
Multiturn Range	16 turns (default setting) User can use the scaling functionality to measure up to 65,536 turns
Signal Sense (Default)	Counterclockwise shaft movement (front view on shaft) means increasing output value

\* Fractional Turns - Resolution decreases less than 12 bits when measurement range is less than 90 degrees

### Mechanical Data

Housing	Coated steel housing
Flange	Aluminum
Shaft	Stainless steel
Lifetime	Dependent on shaft version and shaft load – refer to table
Max. Shaft Load	Axial 20 N (4.5 lbs), radial 80 N (18 lbs)
Inertia of Rotor	$\leq 20 \text{ gcm}^2$ (0.11 oz-in <sup>2</sup> )
Friction Torque at +25°C	$\leq 2 \text{ Ncm}$ (2.8 oz-in)
RPM (Continuous Operation)	Max. 12,000 RPM
Shock	
EN 60068-2-27	$\leq 100 \text{ g}$ ( half sine, 6 ms XYZ )
MIL-STD-810C	$\leq 200 \text{ g}$ ( half sine, 3 ms XYZ )
Permanent Shock	
EN 60028-2-29	$\leq 10 \text{ g}$ ( half sine, 16 ms XYZ )
MIL-STD-810C	$\leq 30 \text{ g}$ ( half sine, 11 ms XYZ )
Vibration	
EN 60068-2-6	$\leq 10 \text{ g}$ ( 10 Hz ... 1,000 Hz, XYZ )
MIL-STD-810C	$\leq 4.2 \text{ g}$ ( 5 Hz ... 500 Hz XYZ )
Weight (Standard Version)	$\approx 150 \text{ g}$ (0.33 lbs), including cable

Flange	Synchro (S)	Hub shaft (B)
Shaft Diameter	6 mm (~0.236 in)	6 mm (~0.236 in)
Shaft Length	11,5 mm (~0.453 in)	*

\* Mating Shaft: min: 8 mm (~0.315 in) / max: 18 mm (~0.709 in)

## ABSOLUTE MAGNETIC ROTARY ENCODER ANALOG

### Minimum Mechanical Lifetime

Flange	Lifetime in 10 <sup>8</sup> Revolutions with ( F <sub>a</sub> /F <sub>r</sub> )					
S6 Synchro Flange (MCD-...-S060-...)	224	( 20N/20N )	28	( 20N/40N )	3	( 20N/80N )
C100 Clamp Flange (MCD-...-C100-...)	247	( 40N/60N )	104	( 40N/80N )	40	( 40N/110N )

### Environmental Conditions

Operating Temperature: Sensor *	- 40 ... + 85°C (-40...+185 °F)
Storage Temperature	- 40 ... + 85 °C (-40...+185 °F)
Humidity	98 % (without liquid state)
Protection Class (EN 60529)**	IP 54 ( molded : MCD-...-CAW and MCD-...-CRW )
Casing Side	IP 65 (other types: MCD-...-PAM and MCD-...-GAW)
Protection Class (EN 60529)**	IP 65 (clamp flange: MCD-...-C100-..)
Shaft Side	IP 54 (other types: MCD-...-S060-... and MCD-...-B060-...)

\* Higher temperatures (up to 125°C (257 °F) for Singleturn) possible on request. See Operating Temperature: Cables

\*\* Higher IP ratings (up to 69K) on request.

### Cable (\*)

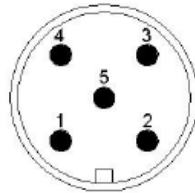
Operating Temperature Cable	Flexing -5°C to +70°C (+23 ... +158 °F) Static -30°C to +70°C ( -22 ... +158 °F)
Minimum Bend Radius	Flexing 10x cable diameter Static 5x cable diameter
Cable	Approx 6 mm (~0.236 in) Ø / type : LIYCY 4x2x0.14 (~AWG 26)

(\*) Valid for types: MCD-...-CAW, MCD-...-GAW, MCD-...-CRW

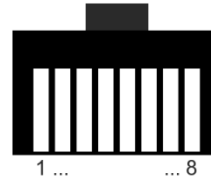
## ABSOLUTE MAGNETIC ROTARY ENCODER ANALOG

### Interface

#### Electrical Connection (Front View)



5 Pin M12 (male)



Pinning RJ45

Function	Wire end	Connector Pin-No. RJ45	Connector Pin-No. M12
GND (Supply)	Yellow	4	3
+ Ub Supply Voltage	Red	8	2
Current/Voltage Output	Green	3	1
Set 1	Brown	2	5
Set 2	White	1	4
Shielding	Shielding	-	Housing

#### Scaling Functionality

Using the Set 1 and Set 2 Input Signals the measuring range (min range of 22.5°) with the analog output range can be scaled

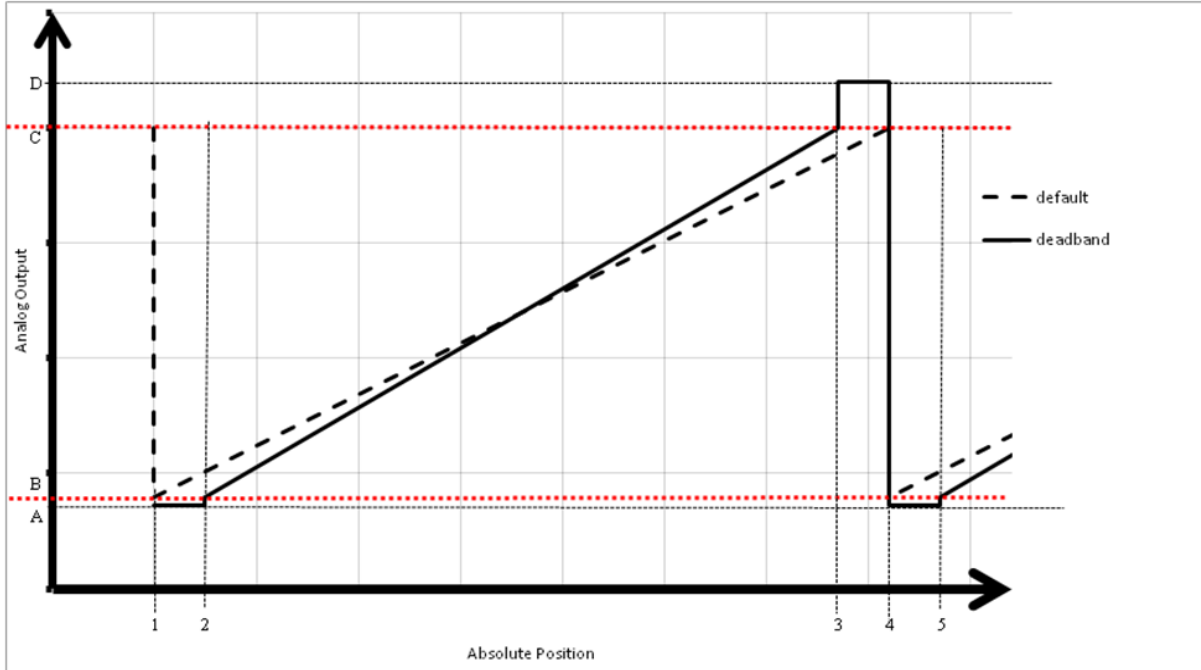
- Turn the shaft to the min position (One end of the measuring range)
- Connect Set 1 signal to high level for 1 second.
- Turn the encoder shaft to the max position (Other end of the measuring range)
- Connect Set 2 signal to high level for 1 second.
- Analog Output is scaled to the new measuring range.

Set 2 (White)	Set 1 (Brown)	Function
0 (Input = N.C. or GND)	0 (Input = N.C. or GND)	Normal Operation
0 (Input = N.C. or GND)	1 (Input $\geq 12V$ / Input $\leq U_b$ )	Preset Zero Point
1 (Input $\geq 12V$ / Input $\leq U_b$ )	0 (Input = N.C. or GND)	Preset Max Point
1 (Input $\geq 12V$ / Input $\leq U_b$ )	1 (Input $\geq 12V$ / Input $\leq U_b$ )	Set Midpoint of Default Scale*

\*The default measuring range is restored. Output value corresponds to midpoint of scale (e.g. 2.5V for ...-AV003-..and..-AV001-..; 5V for ...-AV002-..and..-AV004-..., 12mA for ...-AC005-..and 10mA for ...-AC006-..)

## ABSOLUTE MAGNETIC ROTARY ENCODER ANALOG

### Output Characteristics



Encoder Type*	Absolute Position in Degrees				
	1	2	3	4	5
MCD-AX00X-0012-...	0	-	-	360° or 0°	-
User Scaled..-0012-..	0	Preset Zero	Preset Max	360° or 0°	Preset Zero
MCD-AX00X-0412-...	0	-	-	2 <sup>4</sup> * 360° or 0°	-
User Scaled..-0412-..	0	Preset Zero	Preset Max	2 <sup>n</sup> * 360° or 0°	Preset Zero

n is any integer between 0 and 16

\* Refer to "Models / Ordering Description" for detailed information

Encoder Output Type	Analog Output Value in mA or V			
	A	B	C	D
4-20 mA (..-AC005-.)	3.6	4	20	22
0-20 mA (..-AC006-.)	-	0	20	-
0-5 V (..-AV001-.)	-	0	5	-
0.5-4.5 V (..-AV003-.)	0.25	0.5	4.5	4.75
0-10 V (..-AV002-.)	-	0	10	-
0.5-9.5 V (..-AV004-.)	0.25	0.5	9.5	9.75

Shanghai Kind Electronic Co.,Ltd  
Germany FRABA/POSITAL officially authorized general agent (China)

Tel: +021-5268 2679 / 5268 8060 / 5268 8820 / 5268 8821

Fax: +021-5268 2869      Email: posital@kindele.com

Web: www.kindele.com

## ABSOLUTE MAGNETIC ROTARY ENCODER ANALOG

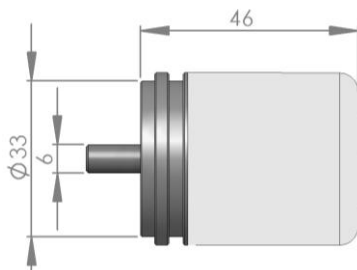
### Mechanical Models

For detailed drawings please refer our [website](#) or directly contact us. Also available as IGES Drawing and STEP 3D Model.

#### Flange Types

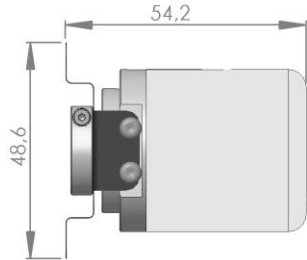
Synchro Flange.

MCD-XXXX-XXXX-S060-XXX



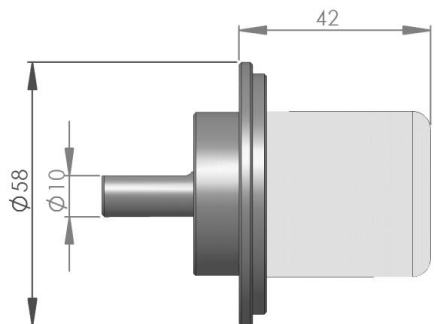
Blind Hollow Shaft / Hub Shaft

MCD-XXXX-XXXX-B060-XXX



Clamp Flange

MCD-XXXX-XXXX-C100-XXX



All units measured in [mm]

#### Housing and Connector Types

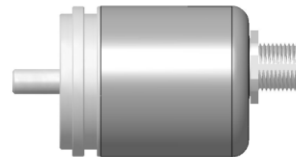
Axial Cable Exit

MCD-XXXX-XXXX-XXXX-CAW



M12 Connector

MCD-XXXX-XXXX-XXXX-PAM



Axial Cable Exit with Gland

MCD-XXXX-XXXX-XXXX-GAW



Radial Cable Exit

MCD-XXXX-XXXX-XXXX-CRW



ABSOLUTE MAGNETIC ROTARY ENCODER  
ANALOG

**Models / Ordering Description**

Description	Type key				
Interface*	Current	<b>AC</b>			
	Voltage	<b>AV</b>			
Version			<b>00</b>		
Code	AV = 0-5V		<b>1</b>		
	AV = 0-10V		<b>2</b>		
	AV = 0.5-4.5V		<b>3</b>		
	AV = 0.5-9.5V		<b>4</b>		
	AC = 4-20 mA		<b>5</b>		
	AC = 0-20 mA		<b>6</b>		
Bits Corresponding to Number of Turns	16 turns		<b>04</b>		
	1 turns		<b>00</b>		
Bits for Max Single Resolution **	Turn 4096			<b>12</b>	
Flange	Synchro flange		<b>S</b>	<b>06</b>	
	Blind hollow shaft		<b>B</b>	<b>06</b>	
	Clamp Flange		<b>C</b>	<b>10</b>	
Shaft Diameter					
Mechanical Options	Without				<b>0</b>
Connection	Cable exit, axial 1m molded				<b>CAW</b>
	Cable exit, radial 1m molded				<b>CRW</b>
	Cable exit, axial 1m, with cable gland				<b>GAW</b>
	1x 5 pin M12 connector male				<b>PAM</b>

\* PWM interface available on Request

\*\* Would be less for a multiturn encoder. The total resolution of 12 bits shall be spread over the entire measuring range.

**Standard = bold**, further models on request

**Disclaimer**

© FRABA AG, all rights reserved. We do not assume responsibility for technical inaccuracies or omissions. Specifications are subject to change without notice.