

## HEAVY DUTY ABSOLUTE 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. Combined with the sturdy ball bearings (for high shaft loads up to 300N) this sensor is an ideal choice for reliable measurement under extreme environmental conditions and outdoor applications requiring a high protection class of IP69K.

### Main Features

- Heavy Duty Design
- IP69K Protection Class (EN 60529)
- 300 N Shaft Load
- Shock resistance: 300 g (EN 60068-2-27)
- Interface: Analog – Current, Voltage
- Max Turns (Default) : 16 Turns (0 To 5760°)
- Inputs for User Defined Measuring Range
- Over Range and Under Range Deadband

### Mechanical Structure

- Stainless Steel flange
- Stainless Steel housing
- Stainless steel shaft
- Sturdy ball bearings

### Applications

- Construction Machinery
- Cranes
- Trucks
- Elevators
- Offshore and Marine Equipment

### 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	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)

## 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	Stainless Steel
Flange	Stainless steel
Shaft	Stainless Steel
Lifetime	Dependent on shaft version and shaft loading – refer to table
Max. shaft loading	axial 300 N, radial 300 N
Friction torque at + 25°C	$\leq 3$ Ncm ( 2.8 oz-in )
RPM (continuous operation)	max. 12.000 RPM
Shock	
EN 60068-2-27	$\leq 300$ g ( half sine, 6 ms XYZ)
MIL-STD-810C	$\leq 200$ g ( half sine, 3 ms XYZ)
Permanent shock	
EN 60028-2-29	$\leq 30$ g ( half sine, 16 ms XYZ)
MIL-STD-810C	$\leq 30$ g ( half sine, 11 ms XYZ)
Vibration	
EN 60068-2-6	$\leq 30$ g (10 Hz ... 1,000 Hz, XYZ)
MIL-STD-810	$\leq 4.2$ g ( 5 Hz ... 500 Hz XYZ)
Weight (standard version)	$\approx 350$ g ( 0.77 lbs )

### Minimum (mechanical) lifetime

Flange	Lifetime in $10^8$ revolutions with ( $F_a/F_r$ )		
S10 Synchro flange (MCD-...-S10G-...)	7.6 ( 300N/300N )	10 ( 270N/270N )	200 ( 100N/100N )

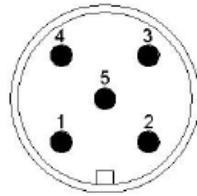
**ABSOLUTE MAGNETIC ROTARY ENCODER  
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Operating temperature sensor	- 30 ... + 85 °C ( -22 ...+185 °F )
Storage temperature	- 30 ... + 85 °C ( -22 ...+185 °F )
Humidity	98 % ( without liquid state )
Protection Class (EN 60529)	IP 69 K

## ABSOLUTE MAGNETIC ROTARY ENCODER ANALOG

### Interface

#### Electrical Connection (Front View)



5 Pin M12 (male)

Function	Connector Pin-No. M12
GND (Supply)	3
+ Ub Supply Voltage	2
Current/Voltage Output	1
Set 1	5
Set 2	4
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

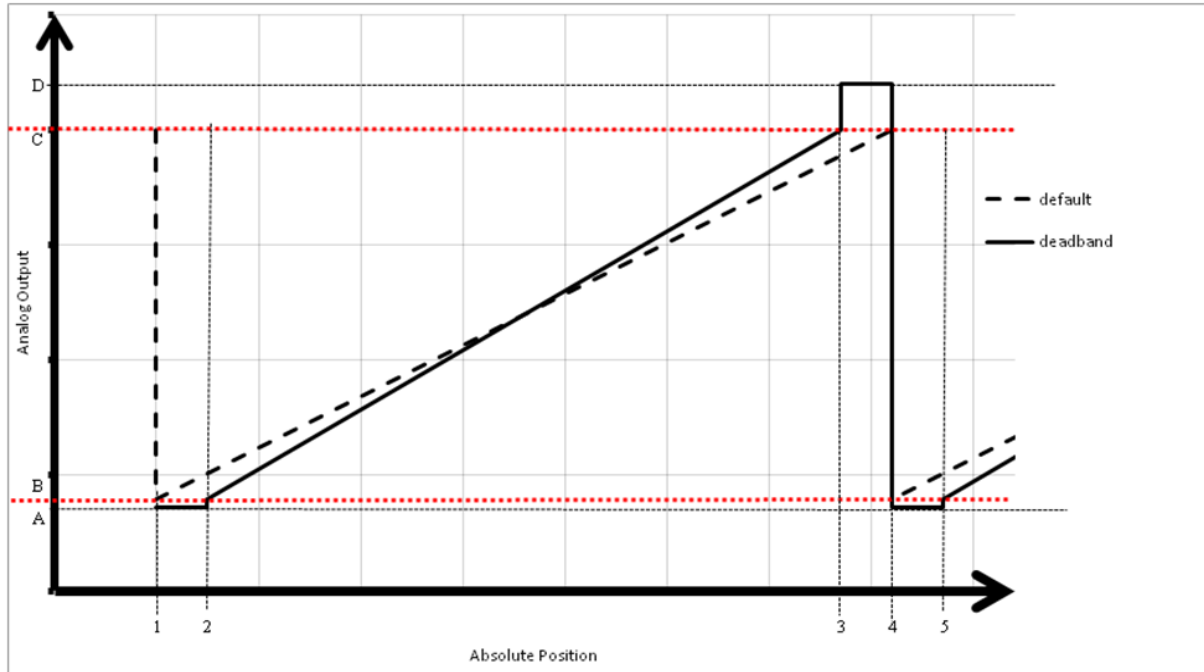
- Turn the shaft to the min position (One end of the measuring range)
- Connect Set 1 signal to high level for 1 second.
- Turn the encoder shaft to the max position (Other end of the measuring range)
- Connect Set 2 signal to high level for 1 second.
- Analog Output is scaled to the new measuring range.

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-..)

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### 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

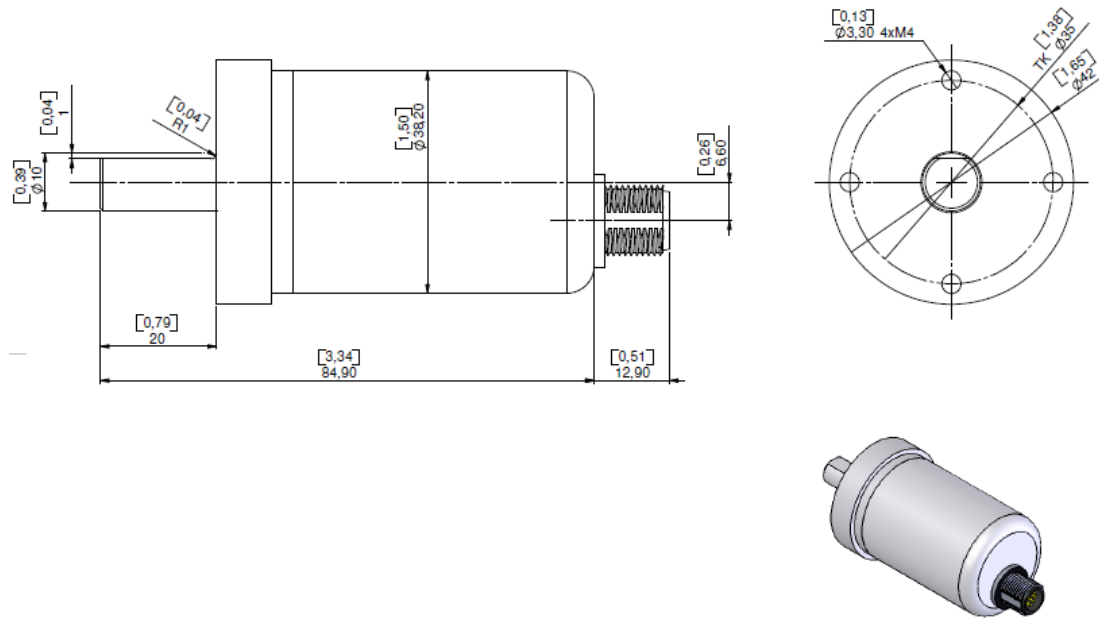
Encoder Output Type	Analog Output Value in mA or V			
	A	B	C	D
4-20 mA (.-AC005-.)	3.6	4	20	22
0-20 mA (.-AC006-.)	-	0	20	-
0-5 V (.-AV001-.)	-	0	5	-
0.5-4.5 V (.-AV003-.)	0.25	0.5	4.5	4.75
0-10 V (.-AV002-.)	-	0	10	-
0.5-9.5 V (.-AV004-.)	0.25	0.5	9.5	9.75

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**Mechanical Models**

Synchro Flange

MCD-XXXX-XXXX-S10G-XXX



all dimensions mm [inch]

For IGES Drawing and STEP 3D Model please refer our website under [mechanical drawings](#) or contact us.

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**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	16 turns		<b>04</b>		
Number of Turns	1 turns		<b>00</b>		
Bits for Max Single Turn	4096			<b>12</b>	
Resolution **					
Flange	Synchro flange (10 mm shaft diameter)		<b>S</b>	<b>10</b>	
Shaft Diameter					
Mechanical Options	Heavy duty / stainless steel				<b>G</b>
Connection	1x 5 pin M12 connector male				<b>PAM</b>

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

**Disclaimer**

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