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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 ∅
- Shaft: 6 mm ∅
- Blind Hollow / Hub Shaft: 6 mm ∅
- 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

Suitable for Applications Requiring:

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

Mechanical Structure

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

Electrical Features

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

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Technical Data

Electrical Data

Interface Specific

Current Options	4-20 mA	0-20 mA
Load Resistance	R_L < 500 Ω with 15V DC	
Linearity / Accuracy	0.15% / Accuracy at 4mA = ±10µA; at 20mA = ± 50 µA	
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 kΩ with 12V DC			
Linearity / Accuracy	0.15% / Accuracy at 5V = ±15mV: at 10V = ± 25mV			
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	

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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 º
Singleturn Accuracy	Calibrated ± 0.35°
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	≤ 20 gcm^2 (0.11 $oz\text{-}in^2$)
Friction Torque at +25°C	≤ 2 Ncm (2.8 oz-in)
RPM (Continuous Operation)	Max. 12,000 RPM
Shock	
EN 60068-2-27	≤ 100 g (half sine, 6 ms XYZ)
MIL-STD-810C	≤ 200 g (half sine, 3 ms XYZ)
Permanent Shock	
EN 60028-2-29	≤ 10 g (half sine, 16 ms XYZ)
MIL-STD-810C	≤ 30 g (half sine, 11 ms XYZ)
Vibration	
EN 60068-2-6	≤ 10 g (10 Hz ... 1,000 Hz, XYZ)
MIL-STD-810C	≤ 4.2 g (5 Hz … 500 Hz XYZ)
Weight (Standard Version)	≈ 150 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)

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Minimum Mechanical Lifetime

Flange	Lifetime in 10^8 Revolutions with (F_a/F_r)		
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)** Casing Side	IP 54 (molded : *MCD-…-CAW* and *MCD-…-CRW*) IP 65 (other types: *MCD-…-PAM* and *MCD-…-GAW*)
Protection Class (EN 60529)** Shaft Side	IP 65 (clamp flange: *MCD-…-C100-..*) 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) ∅ / type : LIYCY 4x2x0.14 (~AWG 26)

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

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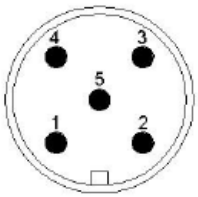
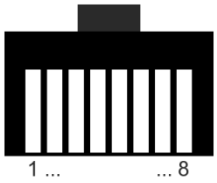
Interface

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 22.5º) 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 ≥ 12V / Input ≤ U_b)	Preset Zero Point
1 (Input ≥ 12V / Input ≤ U_b)	0 (Input = N.C. or GND)	Preset Max Point
1 (Input ≥ 12V / Input ≤ U_b)	1 (Input ≥ 12V / Input ≤ 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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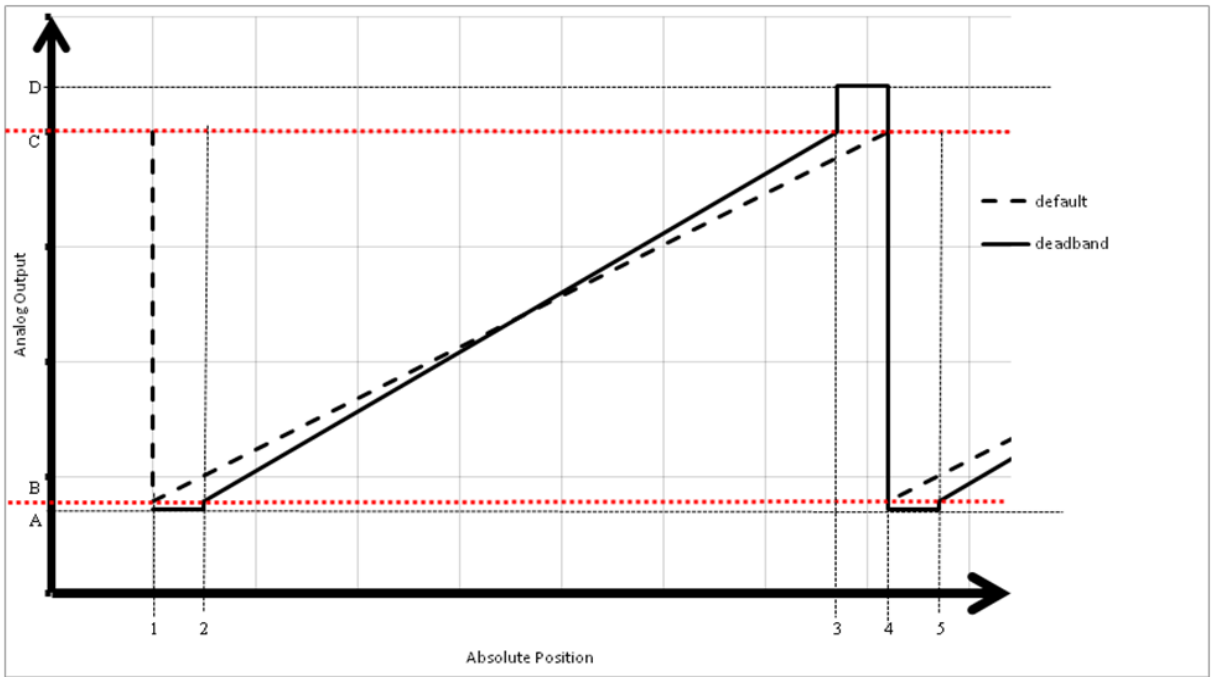
Output Characteristics



Encoder Type*	Absolute Position in Degrees				
	1	2	3	4	5
*MCD-AX00X-**00**12-…*	0	-	-	360º or 0º	-
User Scaled..***-00**12**-..***	0	Preset Zero	Preset Max	360º or 0º	Preset Zero
*MCD-AX00X-**04**12-…*	0	-	-	2^4 * 360º or 0º	-
User Scaled..***-04**12**-..***	0	Preset Zero	Preset Max	2^n * 360º or 0º	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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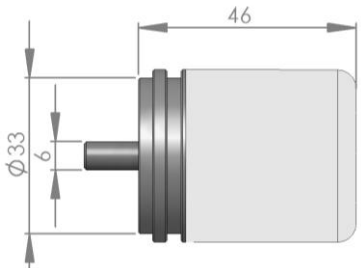
Mechanical Models

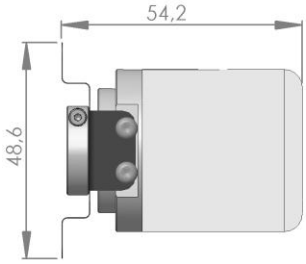
For detailed drawings please refer our website or directly contact us. Also available as IGES Drawing and STEP 3D Model.

Flange Types

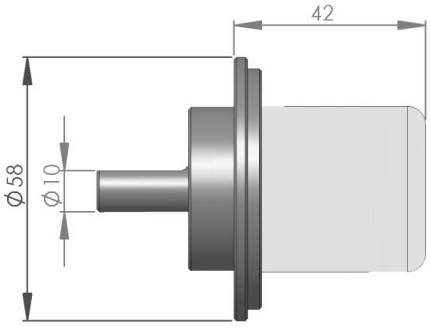
Synchro Flange.
MCD-XXXX-XXXX-S060-XXX



Blind Hollow Shaft / Hub Shaft
MCD-XXXX-XXXX-B060-XXX



Clamp Flange
MCD-XXXX-XXXX-C100-XXX

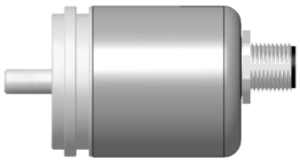


All units measured in [mm]

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

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Models / Ordering Description

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

* 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

Ordering Example:

MCD-AC005-0412-S060-CAW

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Other POSITAL Products:

Draw Wire Sensor to Measure Linear Displacements

To measure linear movements or linear displacements, an absolute magnetic rotary encoder can be combined with a draw wire sensor. The contact-free measuring sensor stage of the MCD Sensor didn't have any abrasion. The Sensor can directly connected to digital control units via SSI- or CANopen or Analog Interface
website

Heavy Duty Magnetic Encoder Line for Toughest Environments

Its stainless steel housing and high protection class of IP69K makes the MCD Heavy Duty rotary encoder resistant against active chemical cleaning, high-pressure water and corrosion. 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.
website

Tilt Sensors to Measure Inclinations up to 360°

ACS is developed on advanced MEMS technology based capacitance measurement. The sensor is a pre-calibrated device which can be put into immediate operation, upon simple and easy installation with a three point mount and setting of preset. Its compact design, installation "anywhere" and other versatile features makes it an ideal choice for very genuine and accurate measurement.
website