

### *Magnetic Coupled, Selectable Output Ranges*

#### FEATURES

- Magnetic Coupling for Mechanical Isolation
- Eliminates Mechanical loading by Angle Sensor
- Tolerates Axial and Radial Misalignment
- Enables “Through-Wall” Angle Sensing
- Analog Output Proportional to Angle
- Four User Selectable Angle Ranges up to 360 degrees
- Angle Resolution to 10 bits (0.1%) of Full scale
- Electronic Setting of Zero Angle



#### DESCRIPTION

The Ametes 360ASMC-01 Configurable Angle Sensor Module integrates the Sentron 2SA-10 Two-Axis Hall IC with a Cypress PSoC processor for non-contact, absolute angle measurement. The 360ASMC-01 provides an analog output signal which is proportional to the mechanical angle of a magnet with a resolution of 10 bits for each angle range. There are four “full scale output” ranges available that can be selected by the user with 2 “configuration” pins.. In addition to the absolute angle position output, the 360ASMC-01 detects when the field strength of the magnet is too low and sets the output voltage to 0V. The electrical “Zero Angle” position for each range can be set to correlate to any mechanical position within 360 degrees.

#### Selectable Angle Ranges

- 1 - 0 to 360 deg
- 2 - 0 to 30 deg
- 3 - 0 to 90 deg
- 4 - 0 ± 90 deg

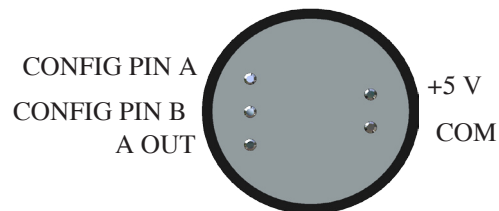
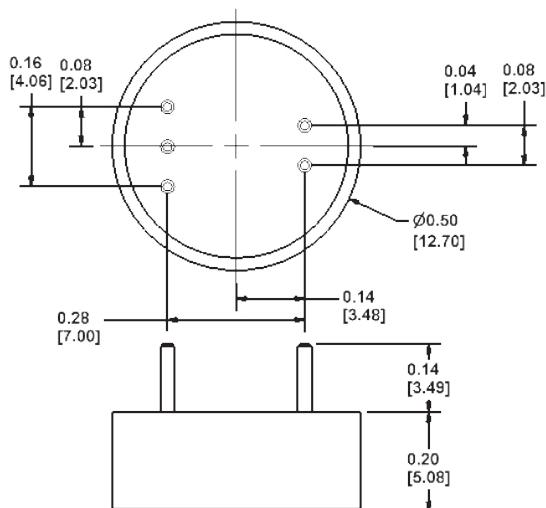


Fig. 1 Bottom View of Module

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### SPECIFICATIONS

#### Absolute Maximum Ratings

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remarks
T <sub>STG</sub>	Storage Temperature	-55		100	°C	
T <sub>A</sub>	Ambient Temperature	-40		85	°C	With power applied
V <sub>SUP</sub>	Supply Voltage	-0.5		+6.0	V	
ESD	Electro Static Discharge	2000			V	Human Body Model ESD
B	Magnetic Field			1	Tesla	

#### Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remarks
V <sub>SUP</sub>	Supply Voltage	4.75	5.0	5.25	V	
I <sub>SUP</sub>	Supply Current		28	35	mA	

#### Electrical Characteristics

Operating Conditions: V<sub>SUP</sub> = 5.0 V and T<sub>A</sub> = 25° C

Note (1): Outputs are ratiometric to the supply voltage V<sub>SUP</sub>

Outputs	Selectable Range	Config Pin A	Config Pin B	Output Voltage Range	Remarks
Analog Output Voltage Ranges	1	COM	COM	0.5 V to 4.5V <sup>(1)</sup>	0 to 360 deg-See output plot (p3)
	2	COM	V <sub>SUP</sub>	0.5 V to 4.5V <sup>(1)</sup>	0 to 30 deg-See output plot (p3)
	3	V <sub>SUP</sub>	COM	0.5 V to 4.5V <sup>(1)</sup>	0 to 90 deg-See output plot (p3)
	4	V <sub>SUP</sub>	V <sub>SUP</sub>	2.5 V ± 2.0V <sup>(1)</sup>	0 ± 90 deg-See output plot (p3)
	All ranges			≤ 50mV	When magnet out of range
Analog output current				± 1mA max	
<b>Inputs</b>					
Zero Angle Set		Active High	>4.75 V prior to V <sub>SUP</sub> application	Max voltage not to exceed 6V	
“Zero Angle Set” output level		360ASMC-01	0.50 V±0.01 V <sup>(1)</sup>	Ranges 1, 2 & 3	
		360ASMC-01	2.50 V±0.01 V <sup>(1)</sup>	Range 4	
Response time		≈ 17mS	Time required to sample inputs and update output		
Resolution		10 bits			
Accuracy		0-360 Deg	± 1 deg		Selectable Range 1
		0-30 Deg	± 0.1 deg		Selectable Range 2
		0-90Deg	± 0.25 deg		Selectable Range 3
		0 +/- 90 Deg	± 0.5 deg		Selectable Range 4
<b>Magnetic Specifications</b>					
Max horizontal field		50 mT (500G)	At surface of module		
Min horizontal field		6 mT (60G)	Below 6 mT, Magnet “Out of Range” will be activated		

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### FUNCTIONAL OPERATION

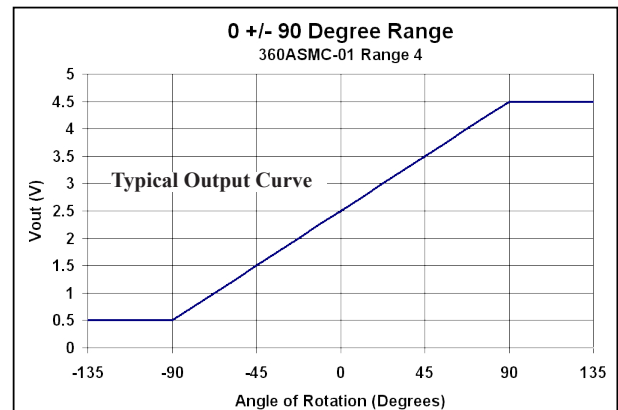
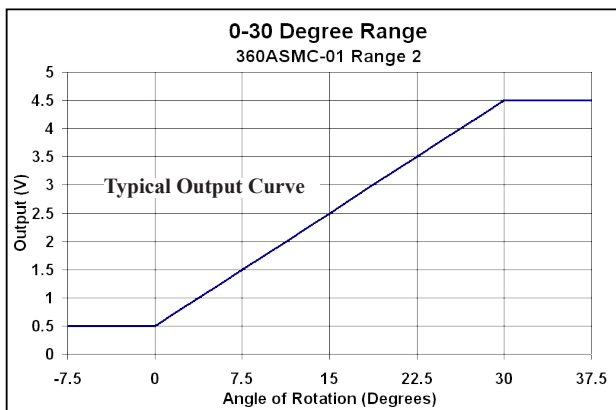
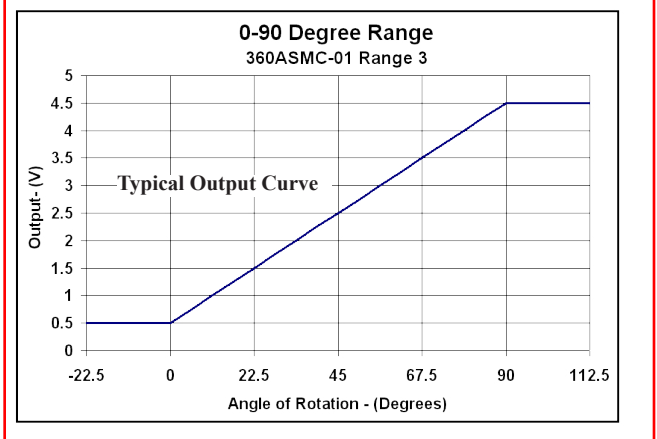
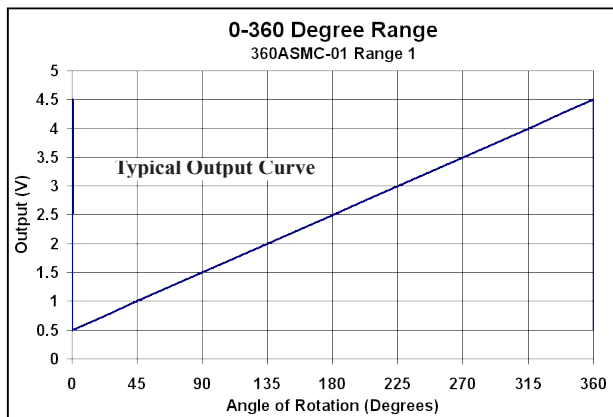
**Zero Angle Set command** - The electrical output of the module for the zero angle position can be set to match any mechanical position of the magnet within the 360 degree rotation. This feature eliminates the need to mechanically align the position of the sensor output to the mechanical position of the rotating target. The Zero Angle Set function is initiated by providing a momentary connection between the Analog Output pin and the 5V supply pin prior to applying power to the module. Once power is on for more than 100 ms, the momentary connection is removed and a 100 ms “Zero Angle” calculation is initiated. At the end of the 100 ms time, the 360ASMC-01 is operational and the Analog Output will be set to 0.5V for the 360ASMC-01 modules (ranges 1, 2 & 3) and to 2.5V for the 360ASMC-01 (range 4). The Zero Angle Set point is permanently stored into flash memory and remains there until a new Zero Angle Set command is initiated. The maximum number of changes to this set point is 50,000

#### Caution:

*The output Pin must not be exposed to voltages larger than the maximum specified voltage of 6.0V or damage to the module may occur*

**Magnet “Out of Range” Fault Detection**- When the magnetic field strength at the surface of the module drops to approximately 6 mT. The Analog output voltage will default to less than 50 mV, which is well below the 0.5V to 4.5V active range.

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### APPLICATION HINTS

**Power supply noise-** The sensor's output is ratiometric with the power supply, therefore any noise on the supply will be transferred to the output signal. The 360ASMC-01 incorporates some internal filtering, however it is best to keep the supply voltage clean of noise and transients.

**Output Loads -** For normal operation, do not connect the Analog output to an active high load. If the Analog output is held high during the power on, the "Zero Angle Set" routine may be initiated. Output load should be referenced to Common.

**Magnet Targets -** The Ametes 360ASMC-01 angle sensing module can work with many different magnet shapes and sizes as shown in following illustrations. The module senses field vectors that are parallel with the top surface of the module. The direction of the field vector is converted to angle output as an analog voltage signal. The distance between the magnet and the surface of the module is referred to as the "Air Gap" and this distance is dependant on the size and strength of the magnet. The maximum strength of the horizontal field should not exceed 50 mT (500 Gauss) at the surface of the module nor should the field strength at the surface drop below 6 mT (60 Gauss). For example a GMW P/N 55B0082, SmCo 24 magnet, 6 mm in diameter and 4 mm thick, shown in the diagram to the right, will allow a minimum air gap of approximately 2.5 mm and a maximum air gap of approximately 6 mm.

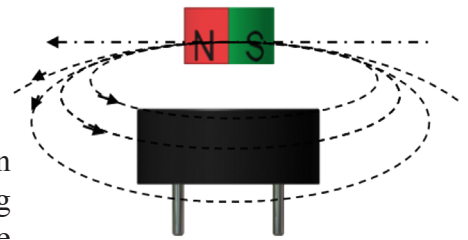
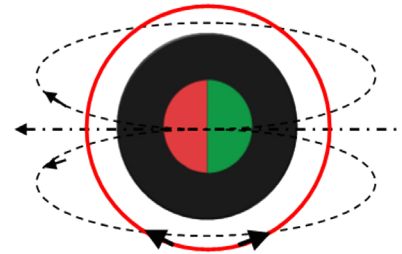


Fig. 5 Disc Magnet

**Motor Control -** The Ametes 360ASMC-01 is not recommended for motor control or high speed applications because the response time of 17 ms is too long for most motor RPM speed requirements.

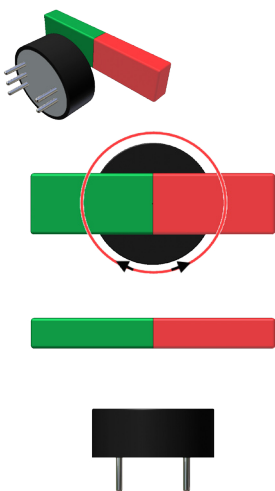


Fig. 6 Bar

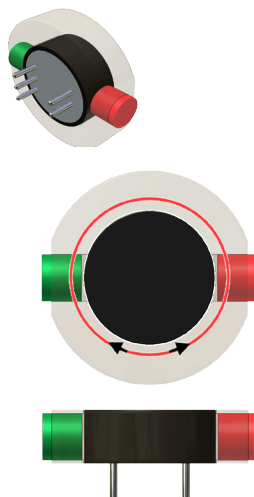


Fig. 7 Radii

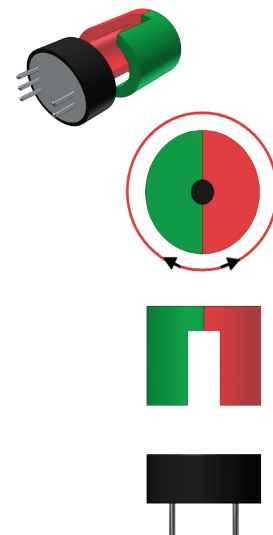


Fig. 8 Holding

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