

Description

The A2 absolute encoder is a non-contacting optical rotary position sensor which reports the shaft angle within a 360 deg. range. As opposed to incremental encoders, the A2 reports the absolute position rather than the change in position. When powered up, it does not require a home cycle, even if the shaft was rotated while the power was off. In multi-turn mode, it tracks the position in a 32-bit counter as long as the power supply is maintained. Internally, an infrared LED flashes through a circular bar code onto a linear array sensor. The microcontroller decodes the image into a unique position. All user programmable parameters such as resolution, origin, direction and mode are permanently stored in an internal EEPROM.

The interface of the A2 utilizes our SEI (Serial Encoder Interface) bus. The SEI bus is a simple, quick, convenient network of devices interfacing to an RS-232 serial port or USB port. The SEI bus supports 1 to 15 devices on a single, 6-wire telephone-type cable up to 1000 feet long (similar to RS-485).

US Digital offers two SEI interfaces: the AD2B adapter for interface to an RS-232 port and the SEI-USB for interface to a USB port. One of these products is required in order to interface the A2 to a PC via our SEI bus. The wall-mount PS-12 power supply furnishes the power for all devices on the SEI bus.

US Digital provides software free of charge for all products which require software for operation. The software can be used as is or it can serve as an example for creating your own custom application. The absolute encoder software utilizes our SEI Explorer software to configure and communicate with the product from a PC platform.

Our absolute encoders may be used in many stand alone applications that do not require a PC interface. For these applications we provide detailed communications protocols for all of our absolute products (see the SEI Absolute Encoder Communications Protocol page).

An analog voltage output (A-option) is available for the A2. An A2 with the analog option can stand alone (does not need to connect to a PC), providing an analog voltage (0 to +4.095 volts maximum) that is proportional to the angular position, with 12-bit resolution. A2 encoders with the A-option can still be communicated with on the SEI bus, but only one device can be on the bus at a time instead of up to 15 devices.



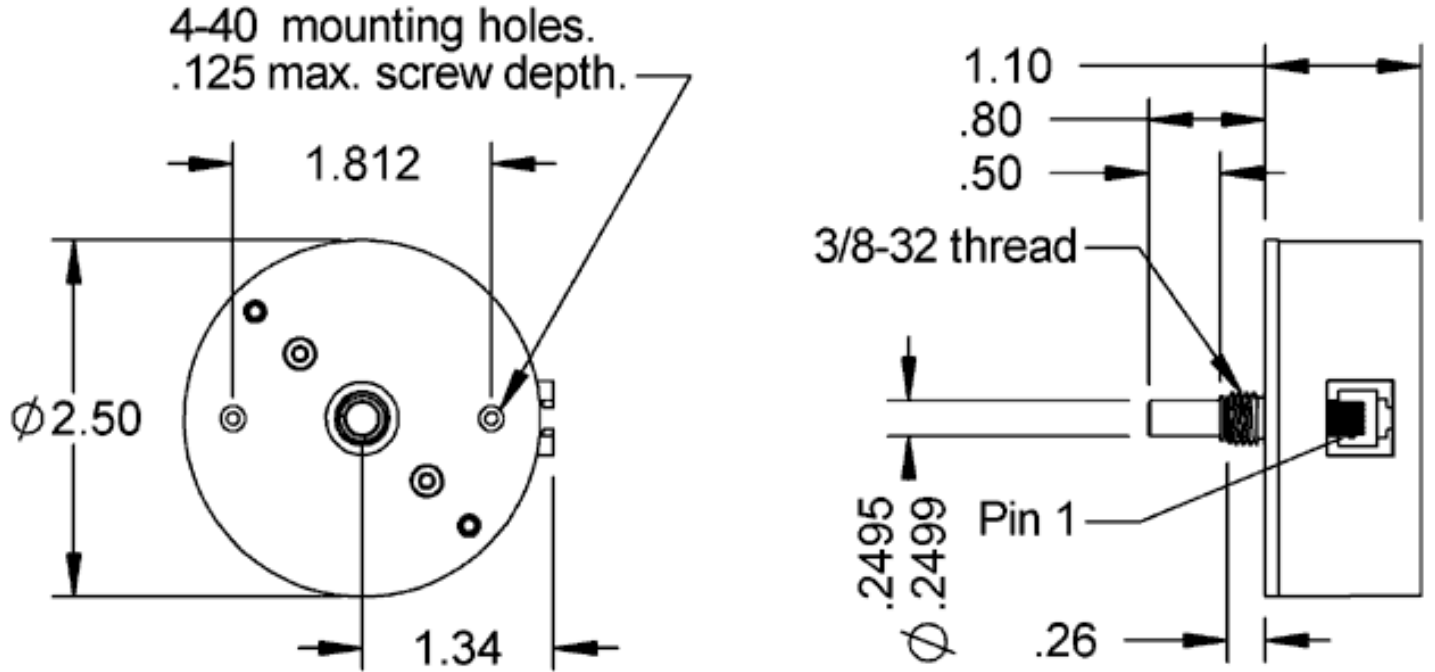
Features

- ▶ Sleeve bushing or ball bearing versions
- ▶ 12-bit resolution and resolution field programmable from 2 to 4096 codes per revolution (3600 factory default)
- ▶ Full 360 degrees range and position update rate is 250 times per second
- ▶ Low power drain of 18.5 mA max., and 1.5 mA in sleep mode
- ▶ Field programmable parameters such as setting zero position point (free demo software provided)
- ▶ EEPROM stores downloadable parameters
- ▶ 9600 baud default data rate adjustable up to 115K baud
- ▶ 12-bit analog voltage output option (0 to +3.599 volts factory default setting. Field programmable up to 0 to +4.095 volts)
- ▶ Multi-turn mode (note: power must be maintained to prevent reset to zero)
- ▶ -25 to 70 degrees C. operating temperature

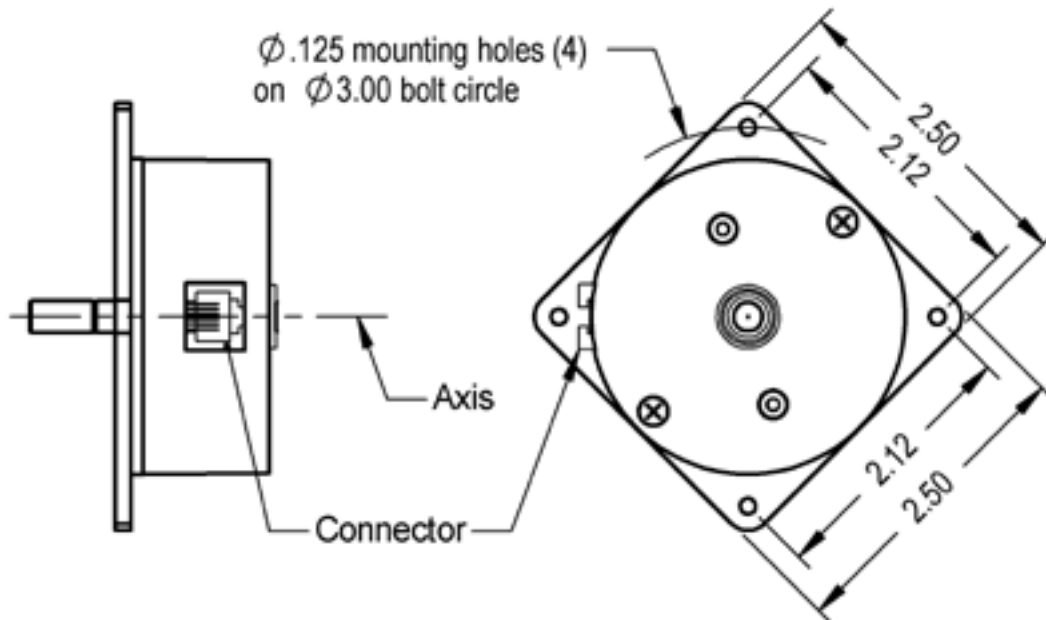
 **Software**

- ▶ www.usdigital.com/support/software/sei
- ▶ www.usdigital.com/assets/USDProducts.zip (.zip file with installer)

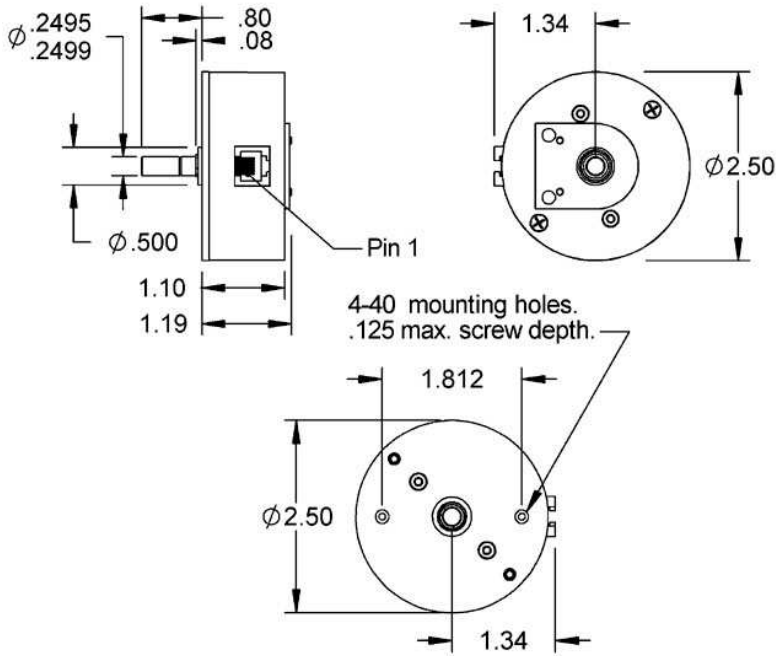
 **Sleeve Bushing**



M Option Mechanical Specs



 **Ball Bearing**



 **Environmental**

Parameter	Value	Units
Operating Temperature	-25 to 70	C
Storage Temperature	-40 to 100	C
Humidity, Non-condensing	0 to 95	%
Vibration (5Hz to 2kHz)	20	G
Electrostatic Discharge, Human Body Model	± 4	kV

 **Mechanical**

Parameter	Sleeve Bushing	Ball Bearing
Max. Acceleration	100000 rad/sec ²	100000 rad/sec ²
Max. Shaft Speed	100 rpm	10000 rpm
Max. Shaft Torque	0.5 ± 0.2 in-oz (S -option) 0.3 in-oz (N -option)	0.05 in-oz
Max. Shaft Loading	2 lb. dynamic 20 lb. static	2 lb.

Parameter	Sleeve Bushing	Ball Bearing
Bearing Life	> 1000000 revolutions	$L_{10} = (90/F_r)^3 *$ Where L_{10} = bearing life in millions of revs, and F_r = radial shaft loading in pounds
Weight	2.9 oz.	2.9 oz.
Max. Shaft Total Indicated Runout	0.0015 in.	0.0015 in.
Max. Panel Nut Tightening Torque	20 in-lbs	n/a
Technical Bulletin TB1001 - Shaft and Bore Tolerances		Download

* only valid with negligible axial shaft loading.

Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at $V_{cc} = 12V$ and $25C$.

Parameter	Min.	Typ.	Max.	Units
Supply Voltage	7.5	12	16	V
Supply Current @ 12V supply				
Active		14	18.5	mA
Sleep		2.5		
Analog Output Impedance	950	1000	1050	Ohms
Zero Scale Analog Voltage	0	0.0005	0.003	V
Full Scale Analog Voltage	4.079	4.095	4.111	V
Output Noise (Analog version)		10		mVrms
Differential Nonlinearity	-1.0		1.0	LSB
Absolute Accuracy (SEI interface version)		0.18	0.25	Degrees
Angle tracking speed				
Single-turn mode			3600	rpm
Multi-turn mode			1800	
Position Update Rate (1)			7	msec.

(1) The internal microcontroller takes a snapshot of the disk every 7 msec. and stores the position in memory. It responds immediately to a "report position request" by sending this value which is always the most current position.

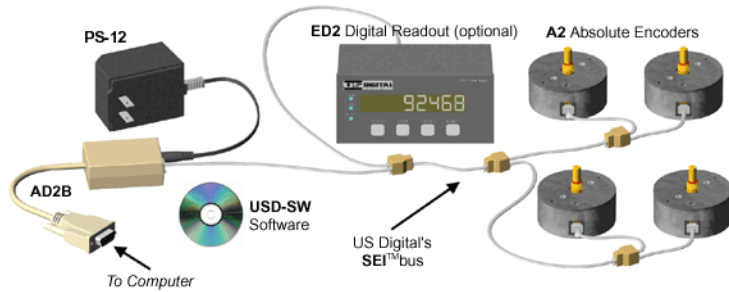
Default Settings

Parameter	Default value	Volatile?
SEI address	0	Non-volatile
Resolution	3600	Non-volatile
Origin offset	0	Non-volatile

Baud rate	9600	Volatile
Mode	0	(1)

(1) Mode is always restored from non-volatile EEPROM on power-up; however, there are separate SEI commands for setting the RAM copy only, or both the RAM copy and the non-volatile EEPROM copy.

SEI Network



Analog Output

The analog version of the **A2** has a 12-bit DAC on the output which feeds to 2 lines that are otherwise used for the BUSY handshaking pair. This DAC has a full range of 0 to 4.095 volts which is 1 milli-volt per bit. The value which the internal microcontroller sends to that DAC is the same as the digital value that it sends to the host. Since the resolution (which represents the number of codes per revolution) is field programmable, the range of the DAC will also follow that setup. Our default resolution is 3600 codes per revolution which yields 1 count per tenth of a degree. This makes the DAC output equal to 1 milli-volt per tenth of a degree or 0 to 3.599 volts. When the DAC needs to have the full range to 4.095 volts, the single turn resolution should be set to 4096. This is easily done with the available software which runs on a PC. Cable CA-MD6A-SS-MD6-6FT and either the SEI-USB or the AD2B adapter are needed to interface the **A2** analog version to a USB port or RS-232 serial COM port.

Please Note: The BUSY handshaking lines are replaced by the analog output option. This means that only one device will be able to be connected to the SEI bus when using the analog output option.

Pin-Outs

Pin	Description
1	Ground
2	Busy+ Analog+
3	Busy- Analog-
4	Power
5	DataL

Pin	Description
6	DataH

 **Product Change Notifications**

Title	Date	Description	Download
EOL Sealed Housing Option - PCN 1021	4/11/2013	<p>This PCN is a formal notification that US Digital is discontinuing the Sealed Housing option for the following products:</p> <ul style="list-style-type: none"> ▸ A2 Absolute Optical Encoder ▸ A2T Absolute Optical Inclinator ▸ H1 Ball Bearing Optical Shaft Encoder ▸ H3 Ball Bearing Optical Shaft Encoder ▸ S1 Optical Shaft Encoder ▸ S2 Optical Kit Encoder <p>The Sealed Housing option provides the encoder with low level capability of surviving in moisture environments, however the encoder is NOT water proof or intended to be used in applications where this is required.</p>	<p>Download</p>

Ordering Information

<p>A2 - <input type="text"/> - <input type="text"/> - <input type="text"/> - <input type="text"/> - <input type="text"/></p> <p>Interface</p> <p>S =Default - SEI Bus A =Analog Voltage / SEI Bus</p>	<p>Torque</p> <p>S =Default - Sleeve bushing with drag B =Ball Bearing N =Sleeve bushing with light static drag</p>	<p>Cover</p> <p>D =Default E =Rear shaft extension</p>	<p>Base</p> <p>D =Default M =4-hole mounting plate</p>	<p>Housing</p> <p>D =Default</p>
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Rules

- ▶ Cover must be equal to D when Torque is equal to S or N

Notes

- ▶ Cables and connectors are not included and must be ordered separately.
- ▶ US Digital warrants its products against defects in materials and workmanship for two years. See complete warranty for details.

Base Pricing

Quantity	Price
1	\$283.50
10	\$252.00

For volume discounts, please contact us at sales@usdigital.com or 800.736.0194.

- ▶ Add \$20.00 per unit for **Interface** of Analog Voltage / SEI Bus
- ▶ Add \$10.00 per unit for **Torque** of Ball Bearing
- ▶ Add \$25.00 per unit for **Cover** of Rear shaft extension
- ▶ Add \$7.00 per unit for **Base** of 4-hole mounting plate