A2K Absolute Optical Encoder: Kit Version

RoHS COMPLIANT

Description

The A2K 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 A2K 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 A2K 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 A2K 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 comes on a CD with each product shipped or can also be down loaded from US Digital's website here. 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).

Analog output (A-option) is available for each of the above versions. It can stand alone (it does not need to connect to a PC), providing an analog voltage proportional to the angular position, with 12-bit resolution. The A-option is fully functional with the SEI bus, but is limited to one device instead of 15 devices.

Features

- Installs onto shafts up to 10mm dia.
- 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

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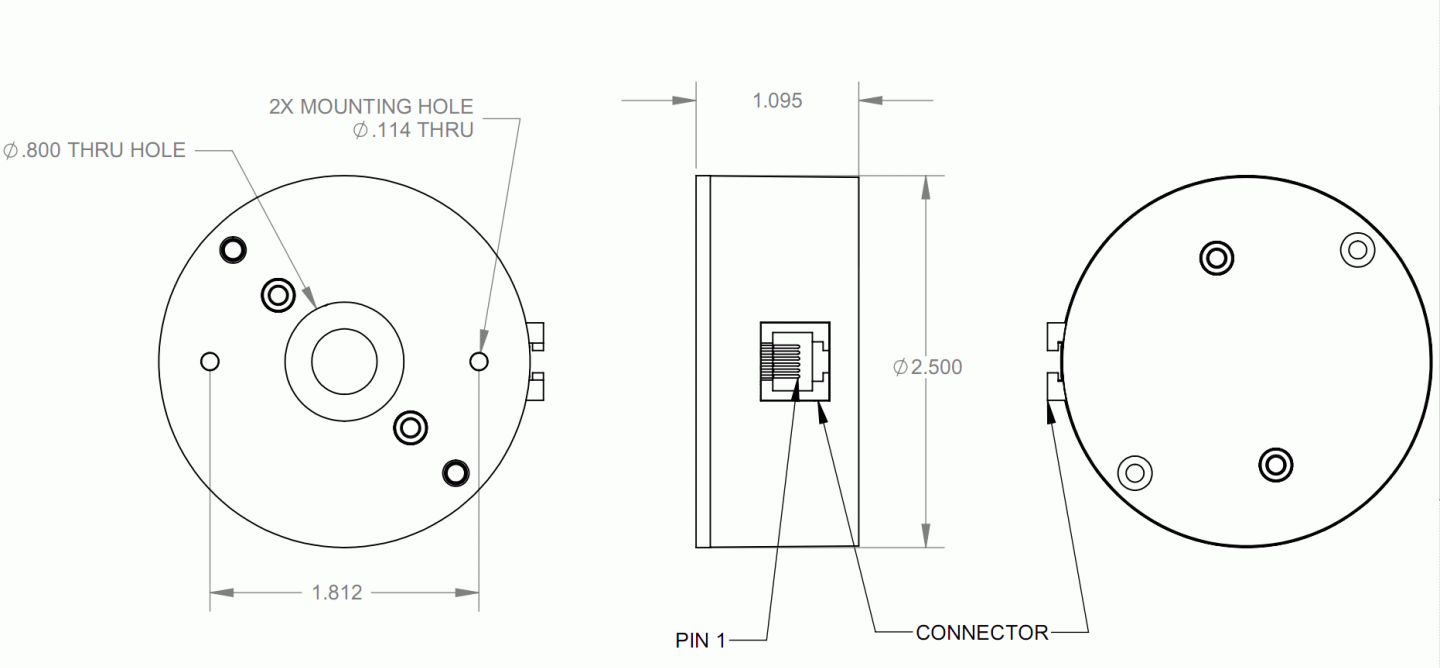
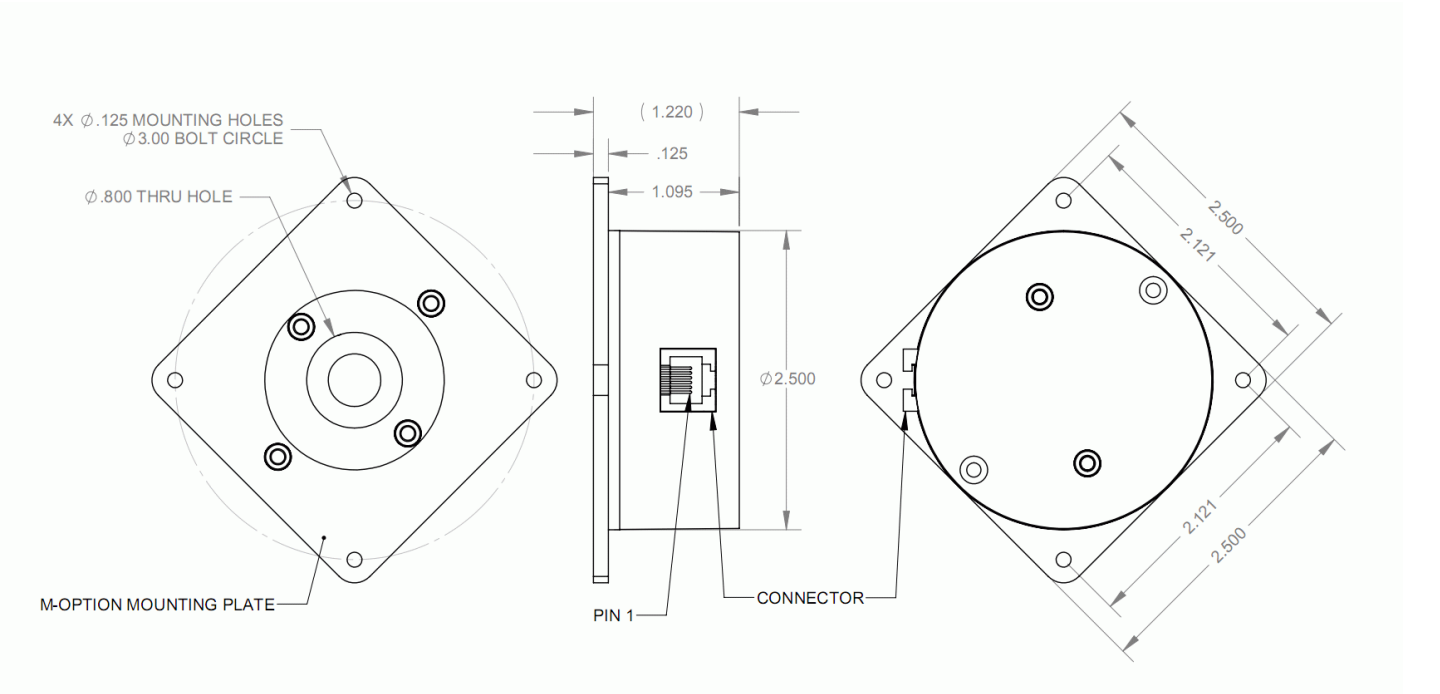
Rev. 130731113102

D-option Mechanical



M-option Mechanical



Environmental

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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	Value
Max. Shaft Axial Play	±0.010 in.
Max. Shaft Eccentricity Plus Radial Play (1)	0.010 in.
Max. Acceleration	100000 rad/sec²
Weight	2.5 oz.
Moment of Inertia	0.0001 oz-in-s²
Max. Shaft Length	0.60 to .80 in. from mounting surface
Technical Bulletin TB1001 - Shaft and Bore Tolerances	Download

(1) Any non-zero shaft radial play will result in angular errors beyond the specified limits.

Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at Vcc = 12V and 25C.

Parameter	Min.	Typ.	Max.	Units
Supply Voltage	5.5	12	16	V
Supply Current Active Sleep		14	18.5 1.5	mA
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 Multi-turn mode			 3600 1800	rpm

Position Update Rate (1)	7	msec.

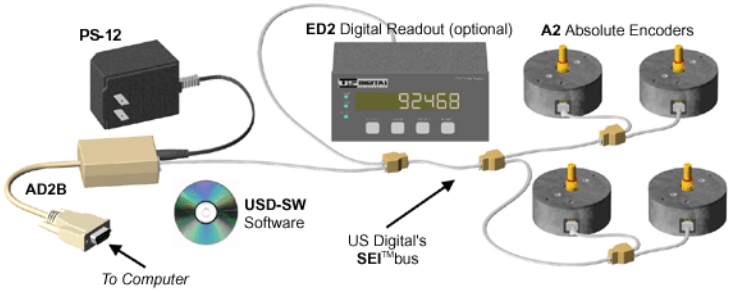
(1) The internal microcontroller takes a snapshot of the disk every 7 msec. and stores the position in memory. It responds immediately to a "report position request" by sending this value which is always the most current position.

Default Settings

Parameter	Default value	Volatile?
SEI address	2	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 **A2K** 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 millivolt 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. The default resolution is 3600 codes per revolution which yields 1 count per tenth of a degree. This makes the DAC output equal to 1 millivolt 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 theSEI-USB or the AD2B adapter are needed to interface the **A2K** 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
6	DataH

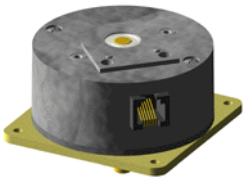
Options

H-option

The **H**-option adds a hole in the housing allowing the shaft to pass through the encoder.

M-option

With the **M**-option adapter plate the 4 holes in the plate will mount to a 3" diameter bolt circle.



Included Accessories

Each **A2K** is shipped with all encoder components, centering tool, hex wrench, two #4-40 x 3/16" base mounting screws and two #4-40 x 1" cover screws. The following part numbers are provided if spares are needed.

1. Centering Tool

Part #: CTOOL - (Shaft Diameter)
Description: This reusable tool provides a simple method for accurately centering the**A2K** base onto the shaft.

Instructions: When mounting encoder base, slide centering tool down shaft until it slips into centering hole of encoder base. Tighten mounting screws, then remove centering tool.

2. Hex Tool

Part #: HEXD-050
Description: Hex driver, 0.050" flat-to-flat for #3-48 or #4-48 set screws.

Part #: HEXW-050
Description: Hex wrench, .050" flat-to-flat for #3-48 or #4-48 set screws.

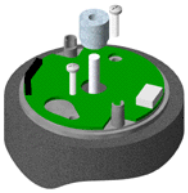
3. Spacer Tool

Part #: SPACER-13

Assembly Instructions

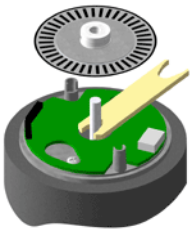
1. Base Mounting

Secure base by inserting screws through holes on the 1.812" bolt circle. Holes in base are designed for #4 screws. Use the centering tool to align base with existing shaft.



2. Spacer Installation

Place spacer tool on circuit board as shown. Position hub/disk assembly above shaft as shown. Slip over shaft and press down until hub and spacer tool bottom out against base.



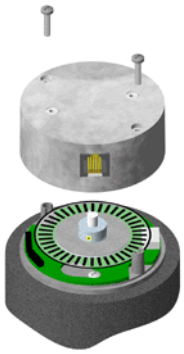
3. Tightening Set Screw

Press the hub disk against the spacer tool and tighten the set screw with the hex wrench provided. The set screw should be snug, but do not overtighten. Remove the spacer tool.

4. Cover Installation

Important: Cover must be oriented as shown. Because cover plugs into the base, use caution during installation. The posts on the base

are two different lengths. Match the cover to mate with the proper post. Connector pins can be damaged if not lined up properly. Secure with two 4-40 X 1" pan head screws provided.



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Ordering Information

A2K - [ ] - [ ] - [ ] - [ ]

Interface	Bore	Cover	Base	Notes
S =*Default - SEI Bus*	079 = *2mm*	D =*Default*	D =*Default*	‣ Cables and connectors are not included and must be ordered separately.
A =*Analog Voltage / SEI Bus*	118 = *3mm*	H =*Hole in the cover*	M =*4-Hole mounting plate*	‣ US Digital warrants its products against defects in materials and workmanship for two years. See complete warranty for details.
	125 =*1/8"*			
	156 = *5/32"*			
	157 = *4mm*			
	188 = *3/16"*			
	197 = *5mm*			
	236 = *6mm*			
	250 =*1/4"*			
	313 = *5/16"*			
	315 = *8mm*			
	375 =*3/8"*			
	394 = *10mm*			

Base Pricing

Quantity	Price
1	$303.50
10	$272.00

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 $7.00 per unit for **Base** of 4-Hole mounting plate

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