HD25A Absolute Industrial Rugged Metal Optical Encoder

Description:

The **HD25A** is a rugged absolute encoder designed for heavy duty industrial use. This absolute encoder is a non-contacting optical rotary position sensor which reports the shaft angle within a 360° range. The **HD25A** can be used for automation, motion control and robotic applications. As opposed to incremental encoders, the **HD25A** reports the absolute position rather than just the change in position. The **HD25A** is a true absolute encoder over one revolution, and also has a multi-turn mode. 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. See the **SEI-UPS** uninterruptable power supply data sheet for information on retaining the muti-turn position after a power failure. 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 **HD25A** has 2 separate outputs, one utilizes our digital **SEI** (Serial Encoder Interface) bus and the other is an analog output. The **SEI** bus is a simple, quick, convenient network of devices interfacing to a RS232 serial port. The **SEI** bus supports 1 to 15 devices on a single cable up to 1000 feet long (RS-485 like). The **analog** output provides an analog voltage proportional to the angular position, with 12-bit resolution.

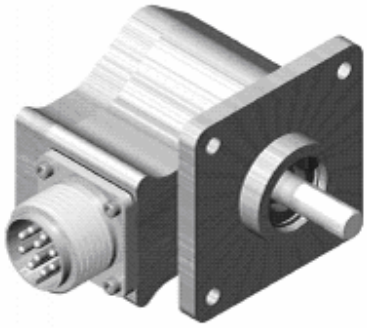
For access to both the **SEI** bus and analog signal outputs, the **AD7** adapter is recommended. The **AD2-B** adapter is available to interface to a standard 9-pin RS232 port; see the **AD2-B** data sheet for more information. One of these products is required in order to interface the **HD25A** to a PC via our **SEI** bus. The wall-mount **PS-12** power supply furnishes the power for all devices on the **SEI** bus.

Several versions are available:

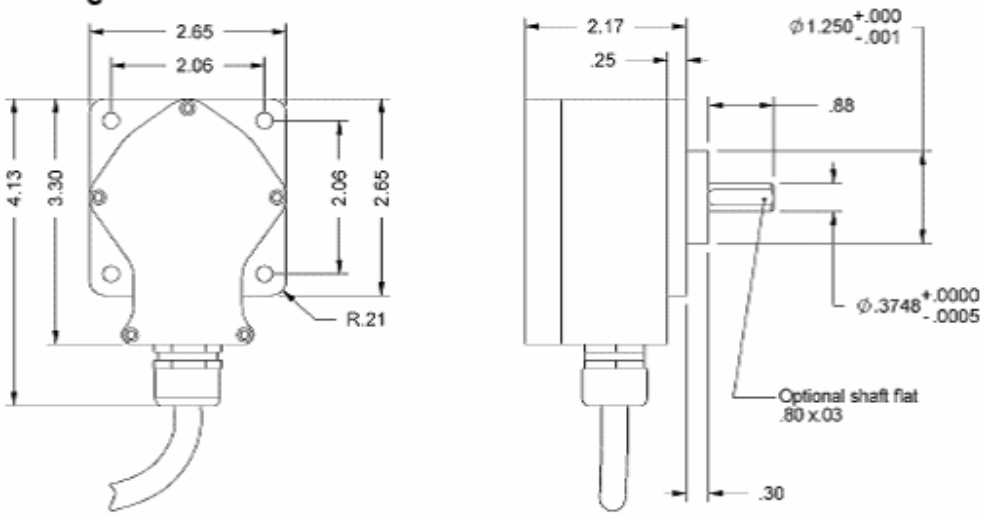
- 10-pin screw-on connector.
- Cable version comes standard with a 6' cable.
- Shaft seal to protect the encoder from liquids. Note that this option adds about 3.5 in-oz. of shaft drag.
- 3/8" diameter shaft with or without flat.

Features:

- NEMA size 25 package
- Anodized milled aluminum housing with O-ring housing seal
- ABEC 5 bearings
- 3/8" diameter shaft, flat option available
- Up to 15 devices on a single 6-pin telephone-type cable
- 12-bit accuracy
- Update rate is 4 milliseconds
- EEPROM stores downloadable parameters
- Field programmable resolution (2 to 4096 CPR)
- Remotely updatable firmware
- Field programmable zero position
- Single-turn and multi-turn modes
- Low power: 18.5mA max
- 1500uA sleep mode for battery operation
- Uses standard PC data rates up to 115 Kbaud
- -25 to 70°C operating temperature
- 360° range
- 12-bit analog output
- Free software and source code provided



Mechanical Drawing:



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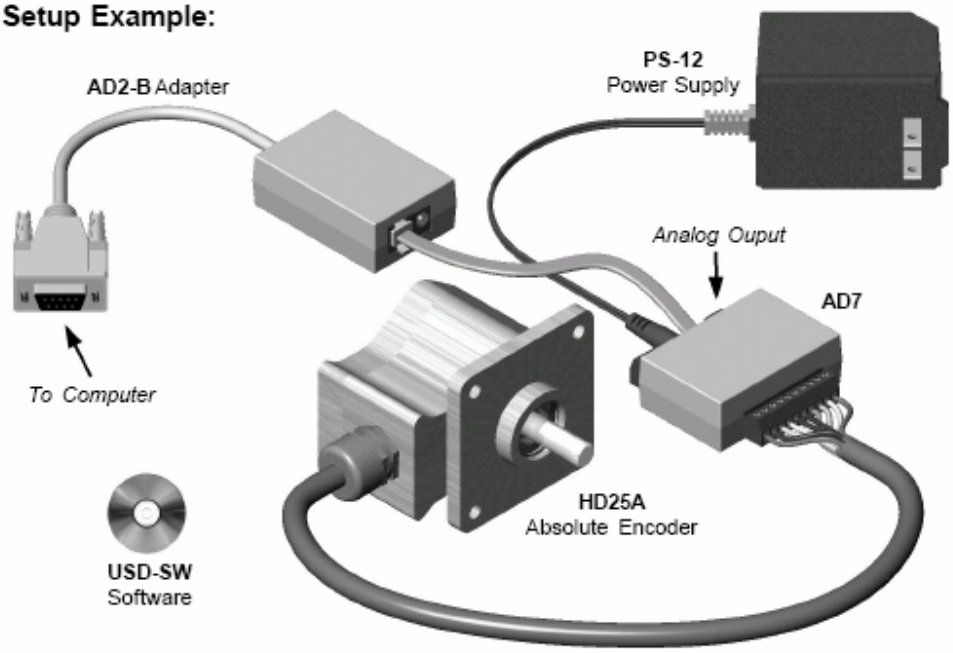
Setup Example:



Environmental Specifications:

Operating Temperature	-25° to 70°C
Storage Temperature	-40° to 100°C
Shock	60G's for 11 mSec
Vibration (5 to 2kHz)	20Hz to 2000Hz @ 20 G's
Humidity With Shaft Seal	100% condensing (NEMA IP65)
Humidity Without Shaft Seal	98% non-condensing

Electrical Specifications:

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

Parameter	Min.	Typ.	Max.	Units
Supply Voltage (PWR)	5.5	-	16	Volts
Supply Current (active)	-	16	18.5	mA
Supply Current (sleep)	-	-	1.5	mA
Analog Output Impedance (Anlg+)	950	1,000	1,050	Ohms
Zero Scale Analog Voltage	0	.0005	.003	Volts
Full Scale Analog Voltage	4.079	4.095	4.111	Volts
Differential Nonlinearity	-1.0	-	1.0	LSB

Absolute Maximum Ratings:

Parameter	Min.	Max.	Units
Supply Voltage (PWR)	0	16	Volts
DataH, DataL, Busy+, Busy-	-14	14	Volts
Electrical Tracking (Multi-turn mode)	-	1,800	RPM
Electrical Tracking (Single-turn mode)	-	3,600	RPM
Position Update Rate*	-	4	mSec

* The internal microcontroller takes a snapshot of the disk every 4 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.

Mechanical Specifications:

Max Axial Load	250 pounds
Max Radial Load	100 pounds
Bearings	ABEC 5 440 stainless steel with light preload
Bearing Life in Millions of Revs.	(124 / load in lbs.) ^ 3
Bearing Life at 4 Pound Load	2,300,000,000 Revs.
Moment of Inertia	2.8 x 10^{-4} oz-in-sec^2
Max Acceleration	100,000 rev / sec^2
Max RPM Without Seal (mechanical)	15,000 RPM
Max RPM With Seal (mechanical)	6,000 RPM
(both limited by electrical tracking)	3,600 single-turn, 1,800 multi-turn
Size	NEMA size 25
Housing and Cover Material	Anodized aluminum
Weight	16.91 oz.
Shaft Material	Stainless steel and nickelplate
Shaft Diameter	.3745 - .3748 (3/8) in.
Shaft Optional Flat Size	.08 long x .03 in. deep
Shaft Runout	<=.0003 T.I.R.
Shaft Torque (without optional seal)	<1/2 in-oz.
Shaft Torque (with optional seal)	3.5 in-oz. typical

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SEI Software:

The software includes a demo/configuration utility which detects encoders on the network and displays their position on the screen. The **SEI** software recognizes encoders on the bus and assigns them unique addresses automatically. The utility includes diagnostics which displays the status, assigned address, serial number, model, and version of each encoder and verifies that the **SEI** bus is operating correctly. It also allows the user to change the resolution, address, mode, and zero position of each encoder. The **SEI** software has the ability to record positions to file. The format is Windows 95/98/ME and Windows NT/2000/XP compatible software on a CD-ROM. A "readme" file contains additional information.

Part# **USD-SW** (Included with every order)

AD7:

HD25A Breakout Box:
Connect the **HD25A** to the **AD7** to have easy access to both the **SEI** bus and the analog output. The **AD7** has both a power jack for plugging in a US Digital **PS-12** power supply, and screw terminals for connecting a customer supplied power supply (5.5 to 16VDC). DIN rail mounting is available. There is a 6-pin RJ-12 female connector to connect the **AD7** to the **SEI** bus via either an **AD2-B** or **AD2-A**. This in turn allows complete control of the **HD25A** via your PC. Analog+ and Analog- are available on a two position screw terminal plug / socket on the **AD7**.

Part Number:
AD7
AD7-NP (no power supply)

Pin-outs:

Analog Out:

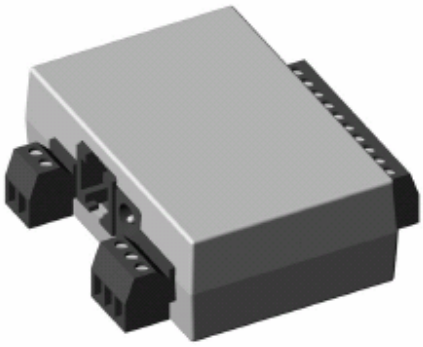
Pin	Description
1	Analog-
2	Analog+

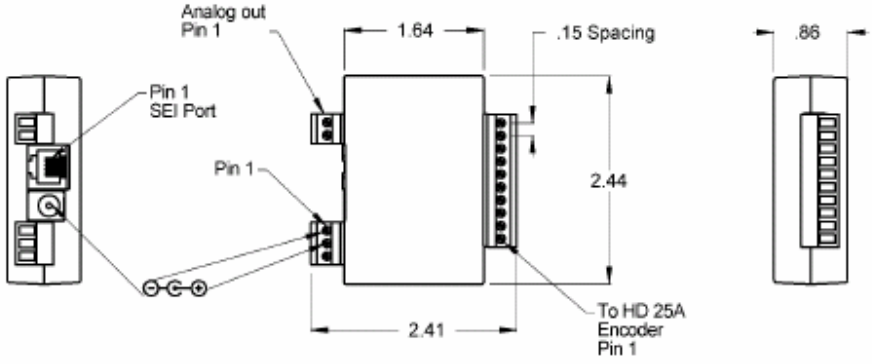
Power:

Pin	Description
1	Ground
2	Power
3	Case Ground

HD25A Interface:

Pin	Description
1	DataH
2	Busy+
3	Analog+
4	Power
5	NC
6	Ground
7	Case Ground
8	DataL
9	Busy-
10	Analog-





Analog Output:
The **HD25A** has a 12-bit DAC and 2 dedicated analog output line (Analog+, Analog-). This DAC has a full range of 0 to 4.095V which is 1mV 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 CPR which yields 1 count per tenth of a degree. This makes the DAC output equal to 1mV per tenth of a degree or 0 to 3.599V. When the DAC needs to have the full range to 4.095V, the single turn resolution should be set to 4096. This is easily done with the available software which runs on a PC. See above for information on the **AD7 HD25A** Breakout Box.

Notice:
In applications where a failure could result in an unacceptable loss, we recommend that your system be designed to include two redundant encoders with the outputs from both continuously compared to make sure that they agree. If there is a discrepancy, the system should be designed to automatically shut down as a fail-safe measure to minimize the risk of damage or danger. This product is not certified for applications where a failure could result in a costly, dangerous, or life threatening situation.

For information on compatible cables and connectors, please see the **Cables & Connectors** data sheet.
For information on the **AD2-A** or **AD2-B**, please see the **AD2-A** or **AD2-B** data sheets.
For more information on the **SEI** bus, please see the **SEI** bus data sheet.
For more information on the **HD25A** Communications Protocol, please see the **A2** Communications Protocol data sheet.
For information on retaining the muti-turn position, please see the **SEI-UPS** uninterruptable power supply data sheet.

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Compatible Cables & Connectors:

10-pin Round:	
CON-RC10	Connector
CA-3627	Connector on one end of a 6' shielded twisted pair cable
CA-4893	10-pin round connector to 6-pin modular connector via a 6' shielded twisted pair cable

Note: See Cables & Connectors data sheet for more information.

Cable Notes:

When the HD25A encoder is ordered with a 6 FT cable already attached, no connector is provided (longer lengths are available). Cables are ±5% of the specified length.

CA-3627:

10-pin Round Connector:		
Pin	Name	Color
A	DataH	Blue w/ White Stripe
B	Busy+	Brown w/ White Stripe
C	Analog+	Orange w/ White Stripe
D	Power	Green w/ White Stripe
E	NC	-
F	Ground	Gray w/ White Stripe White w/ Gray Stripe
G	Case Ground	White w/ Green Stripe
H	DataL	White w/ Blue Stripe
I	Busy-	White w/ Brown Stripe
J	Analog-	White w/ Orange Stripe

Term Descriptions:

Name	Description
Analog+	Analog version: positive analog voltage output.
Analog-	Analog version: analog signal ground.
Busy	Bidirectional differential acknowledge line.
Data	Bidirectional differential data line.
Ground	Ground, common for power, data and busy pairs.
Power	Power supply input.
NC	No connection.

CA-4983:

10-pin Round Connector:		
Pin	Name	Color
A	DataH	Orange
B	Busy+	Red
C	Analog+	Black
D	Power	Gray
E	NC	-
F	Ground	Brown
G	NC	-
H	DataL	Blue
I	Busy-	Green
J	Analog-	Yellow

CA-4893:

6-pin Modular Connector:		
Pin	Name	Color
1	Ground	Brown
2	Busy+	Red
3	Busy-	Green
4	Power	Gray
5	DataL	Blue
6	DataH	Orange
*NC	Analog+	Black
*NC	Analog-	Yelow

* Not connected to modular connector but available in cable.

Ordering Information:

HD25A - [ ] — [ ] — [ ] — [ ]

Shafts/Sealed:
O = Non-sealed.
S = Sealed.*
F = Flat non-sealed.
FS = Flat sealed.*

Encoder Connector:
CC10 = 10-pin connector on the HD25A with a 10-conductor mating cable pre-attached.
CN10 = 10-pin connector only.
CA10 = 10-conductor cable attached.

End Cable:
NC = No connector.
AD7 = Breakout box attached.**
MD6 = SEI connector attached.***

Cable Length:
Specify cable length here if ordering cable option. (6FT is standard).

Notes:
* Adds about 3.5 in-oz. of shaft drag.
** Power supply included.
*** End Cable MD6 has no analog output.

Ordering Quick Guide:

PC Interface (SEI): Specify "end cable" option MD6. Order separately AD2-B (RS232 to SEI Adapter).
Analog: Specify "end cable" option AD7.
PC Interface (SEI) & Analog: Specify "end cable" option AD7. Order separately AD2-B-NP (RS232 to SEI Adapter) and CA-8-6FT (6' Modular Cable).