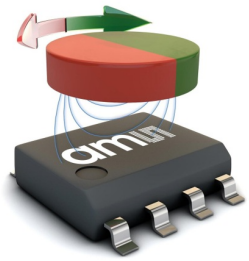

ams AS5600 12-bit Programmable Contactless Potentiometer User Manual

Operation Manual: AS5600-SO_EK_AB
AS5600
12-bit Programmable Contactless Potentiometer

Revision History

Revision	Date	Owner	
1.0	05.05.2014	rph	Initial Revisi

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General Description

The adapter board allows an easy and fast evaluation of the AS5600 rotary magnetic position sensor in the lab or together with an existing system. This small factor board is fully assembled with the AS5600 position sensor and its necessary external components. All relevant signals are available on a dual-row 2.54mm 4-pin header footprint and can be easily wired to an existing application. The AS5600 is a programmable Hall-based rotary magnetic position sensor with a high-resolution 12-bit analog or PWM output for contactless potentiometers. Based on planar Hall technology, this device measures the orthogonal component of the flux density (Bz) from an external magnet while rejecting stray magnetic fields.
The default range of the output is 0 to 360 degrees, but the full resolution of the device can be applied to a smaller range by programming a zero angle (start position) and a maximum angle (stop position).
The I²C interface is used for configuration and user programming of non-volatile parameters in the AS5600 without requiring a dedicated programmer.

1.1 Kit Content

This kit contains the following material listed in Table 1. Additional material can be found on our webpage.

Table 1:
Kit Content

No	Item	Description	Info
1	AS5600-SO_EK_AB		
2	AS5000-MD6H-1	Reference Magnet	Find the datasheet o http://ams.com/eng

Getting Started

The AS5600 adapter board is ideal for the rapid setup of a contactless potentiometer. Additionally to the adapter board, a sensor magnet in a mechanical setup is required. A reference magnet comes with the kit.

2.1 Adapter Board Pin-Out

The pin-out of the adapter board is shown in Table 2. For additional information on the AS5600 pins refer to the product datasheet.

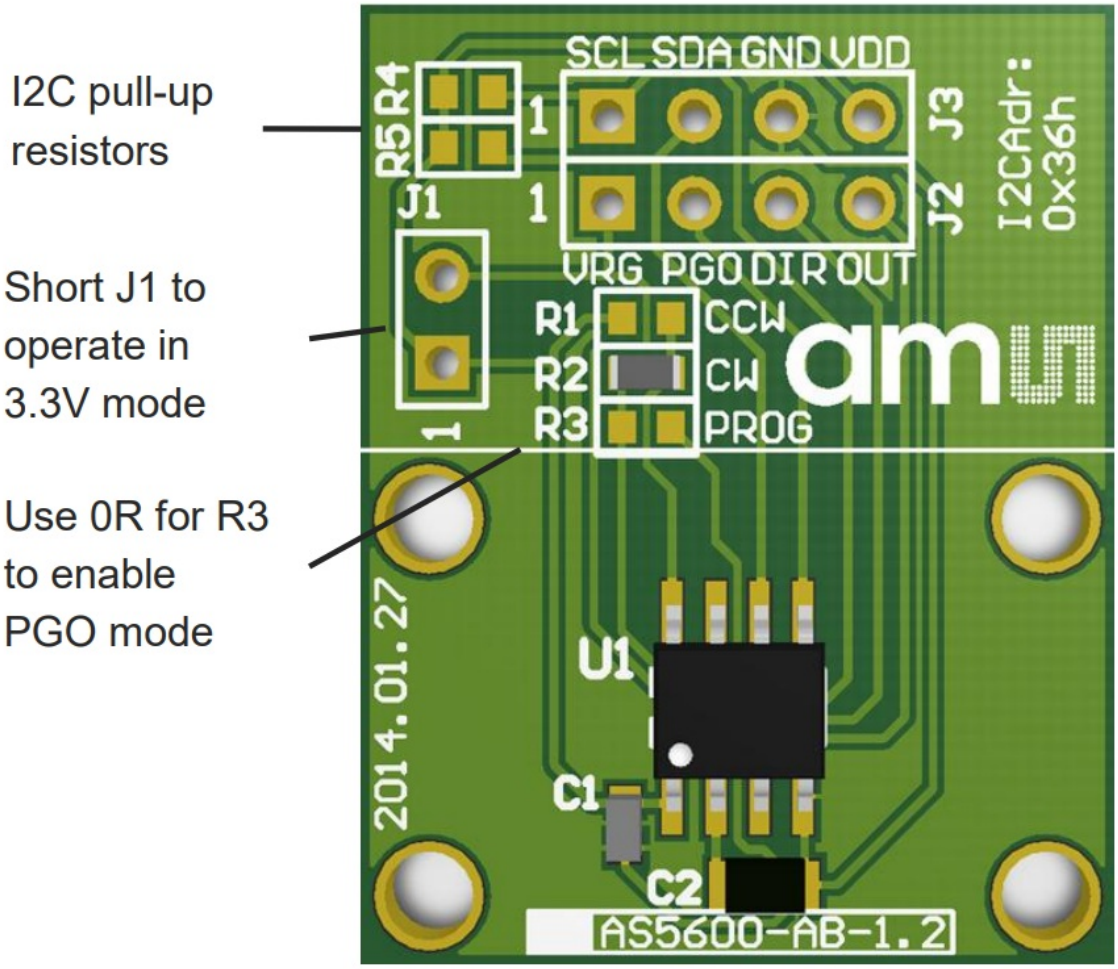
Table 2: Adapter Board Pin-Out

Header	Pin	Symbol	Description	Info
J2	1	SCL	I2C Clock	Use R4 if pull-up is req uired
J2	2	SDA	I2C Data	Use R5 if pull-up is req uired
J2	3	GND	Ground	
J2	4	VDD	Positive Power Supply	
J3	1	VRG	LDO Pin in 5V Mode	Leave open in 5V mode . Pull to VDD using J1 i n 3.3V Mode
J3	2	PGA	Programming Mode	Pull to GND using R3 fo r Programming Option B (refer to the datashee t)
J3	3	DIR	Direction input	CCW default. Pulled to GND using R2. Remove R2 and insert at R1 for CCW direction .
J3	4	OUT	Output Pin	Analog Output default, PWM possible, Is used for programming option B

2.2 Adapter Board Description

The AS5600 is connected over the dual-row 2.54mm 4-pin header footprint. Connect the desired pins of the AS5600 using the headers and resistors.

Figure 1: Adapterboard Description

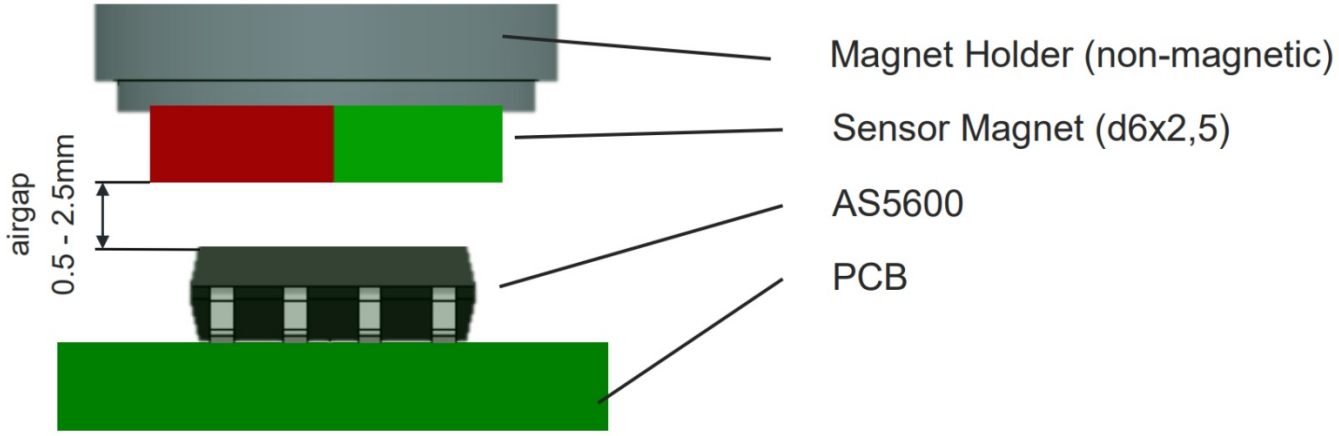


2.3 Mechanical Setup

To set up a contactless potentiometer a magnet holder and a magnet are needed to be used with the AS5600 position sensor on a PCB. The configuration is shown in Figure 2.

airgap 0.5 – 2.5mm

Figure 2: Mechanical Configuration



The magnet should be aligned by reading the output of the AGC register of the AS5600. For optimal alignment, the AGC value is in the middle of the AGC range.

Note: If the magnetic field seen by the AS5600 is below 8mT, the output is switched off and permanent angle programming is not possible.

2.4 Electrical Setup

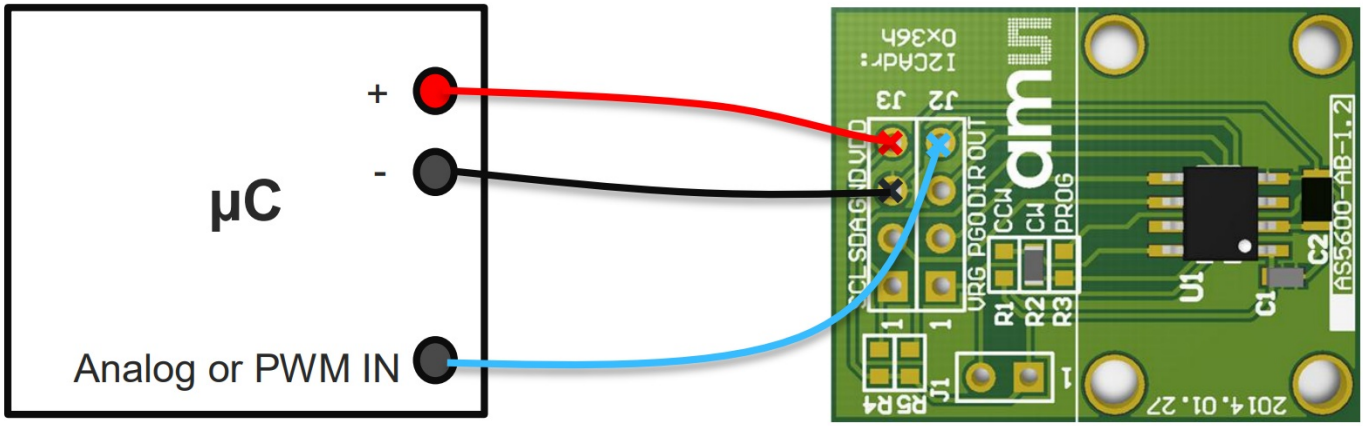
The adapterboard is many used in the following configurations in 5V or in 3.3V mode.:

2.4.1 3-Wire Mode

In this mode, the power supply and the output pin of the adapterboard are connected. To program a custom angular output range, short R3 using a 0R resistor to enable the programming option B. Follow the step-by-step

instructions in the AS5600 datasheet to program the device.

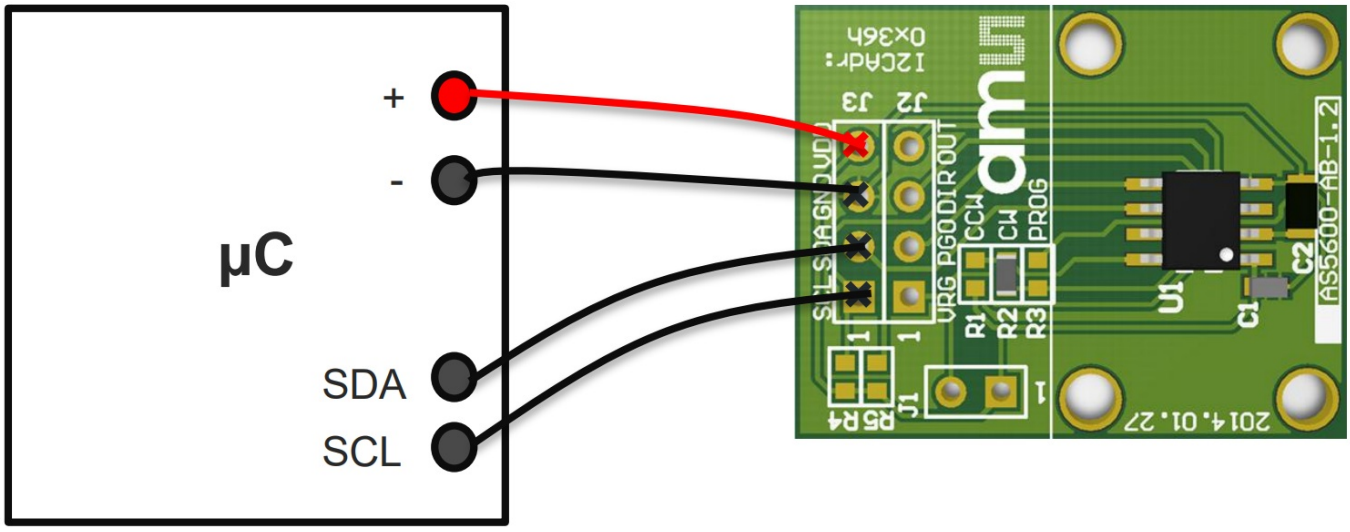
Figure 3: Using the board in 3-Wire Mode



2.4.2 I2C Mode

Using the I2C Interface, all functions of the AS5600 can be configured and permanently programmed. Additionally, the output and a raw angle (unmodified value) can be read from the output registers.

Figure 4: Using the board in I2C Mode



AS5600 Configuration

All options to configure the AS5600 are shown below. The AS5600 operates with a default configuration if no configuration was programmed.

3.1 Programming the output range

To adjust a custom angle to the full output range or to modify the Zero Position of the device, the AS5600 must be programmed. Following options are availbale:

- Programming start and stop position with I2C (Option A)
- Programming start and stop position in 3-Wire Mode (Option B)
- Programming an angular excursion with I2C (Option C)

Follow the step-by-step instructions in the AS5600 datasheet for one of the above programming options.

Note: To program only the zero position with Option B, Program an angular excursion of 360deg using Option C first.

3.2 Programming a configuration

A configuration must be written using the I2C interface. The Burn_Setting command (Write 0x40 into register 0xFF) can be used to permanently program a configuration.

3.2.1 Low Power Mode

Three low power modes are available to reduce the power consumption down to 1,5mA max.

3.2.2 Hysteresis

A 1 to 3 LSB hysteresis of the 12-bit resolution can be enabled.

3.2.3 Output selection

Per default, the Analog Output is active if a magnet is present. Additionally, the Output Pin can be switched to PWM with the option to select a PWM frequency (115Hz,230Hz,460Hz,920Hz)

3.2.4 Slow Filter

The slow filter allows for improving the output noise. The default setting for the Slow Filter is 16x and can be reduced for faster response.

3.2.5 Fast Filter

The fast filter is active by selecting a Fast Filter Threshold. If the output value remains below the threshold, the output noise is defined by the slow filter setting. When exceeding the threshold, the output noise is defined from the fast filter for fast output response. The output noise is again defined by the slow filter as soon as the output stays in the threshold again.

3.2.6 Watchdog

If the watchdog is active, the AS5600 automatically enters Low Power Mode 3 after one minute if the output value stays within a threshold of 4 LSB.

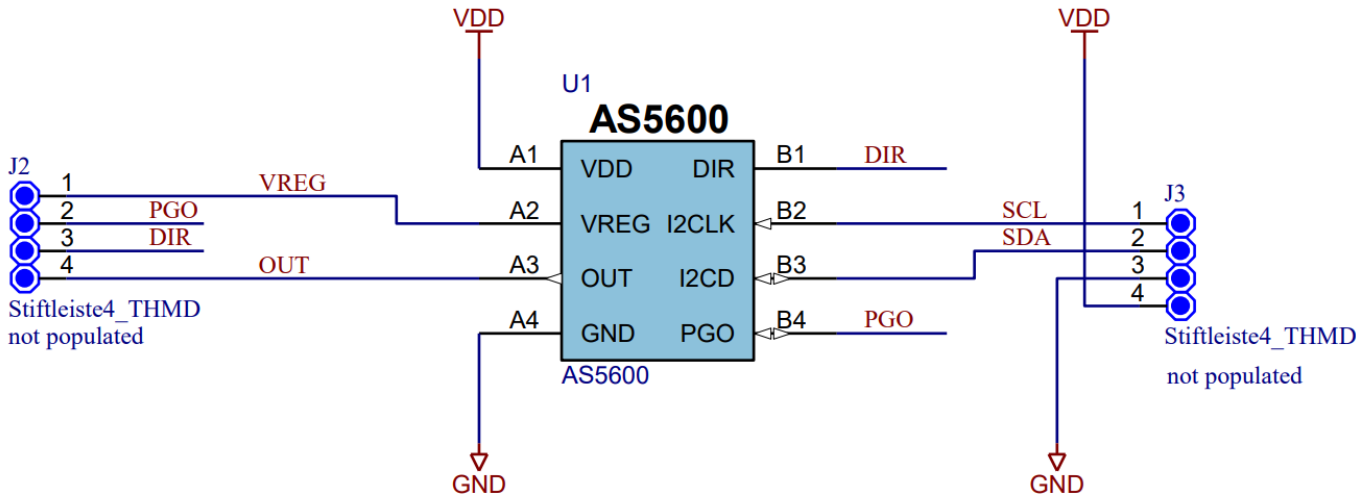
Board Schematics, Layout, and BOM

The schematic, layout, and BOM of the adapterboard are shown below for reference.

4.1 Schematics

The schematic of the board is shown below in Figure 5.

Figure 5: Adapterboard Schematic



Note1: Supply

J1=OPEN: 5V

J1=CLOSED: 3.3V

Note2: PGO

R2=NC: Normal Operation

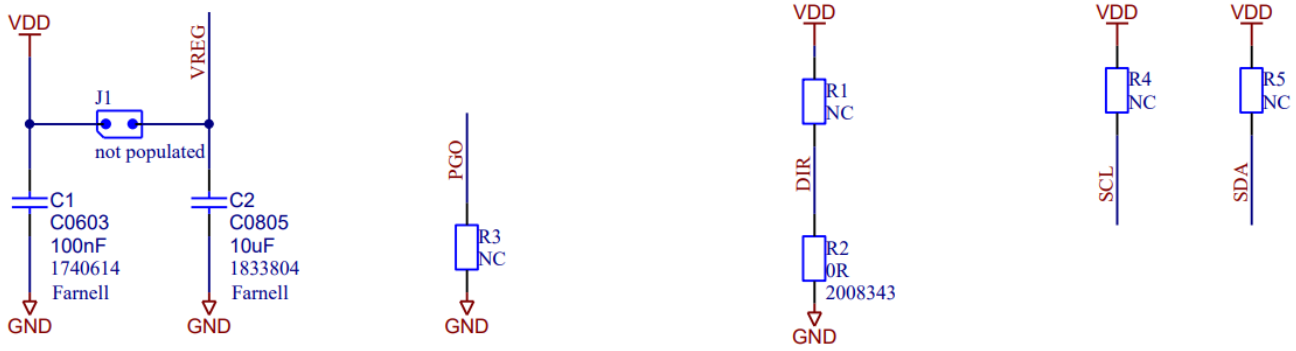
R2=0R: Programming Option

Note3: Direction

R1=NC/R3=0R: CW

R1=0R/R3=NC: CCW

Note4: Optional pull-ups



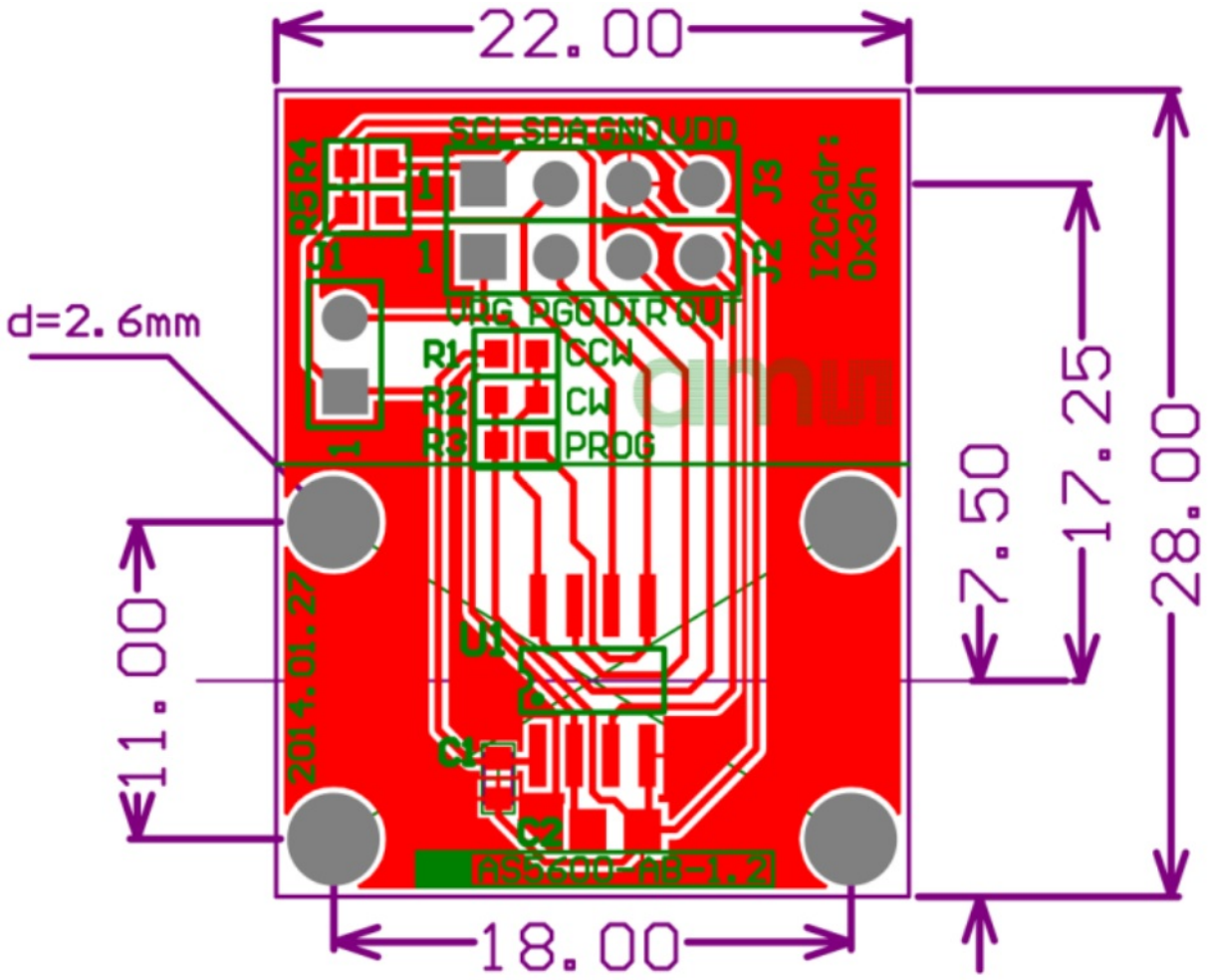
Note5: Adapterboard can be used with AS5XXX-UCB-1.0 (Use 4pin I2C header in 3.3V mode)

Note6: AS5600 I2C Address is 0x36h=

4.2 Layout and Board Dimensions

The PCB layout is shown below in Figure 6.

Figure 6: Adapterboard layout



4.3 Bill of Materials

The BOM of the PCB is below in Table 3.

Table 3:

Bill of Materials

Designator	Part	Footprint	Manufacturer
J1	Jumper / not populated		
J2	Header / not populated		
J3	Header / not populated		
R1	Resistor / not populated	R0603	
R2	0R	R0603	
R3	Resistor / not populated	R0603	
C1	C0603	0603	
C2	C0805	0805	
R4	Resistor / not populated	R0603	
R5	Resistor / not populated	R0603	
U1	AS5600	SOIC-8	amsAB

Evaluation tools

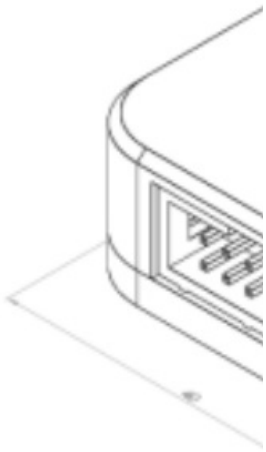
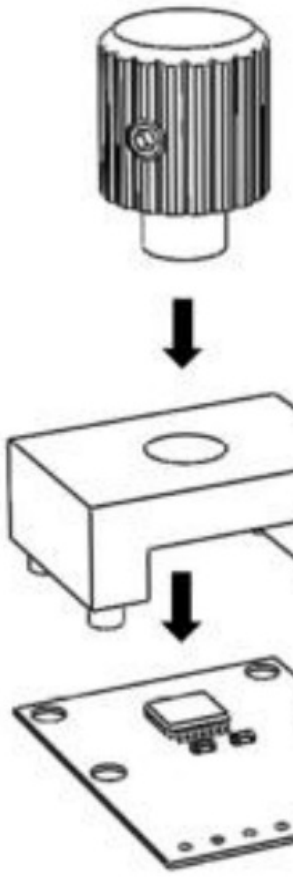
To configure the AS5600, no dedicated programmer is needed. For fast setup time, the USB I&P Box can be used to configure the AS5600 over I2C. The USB I&P Box can be ordered from the AMS webpage.

Additionally, a magnet holder kit is available with consists of a distance block and a Knob that holds the sensor magnet.

Please find the ordering information below in Table 4.

Table 4:"

Ordering Information for Evaluation Tools

Ordering Code	Description	Image
1.0 I&P Box	To configure the AS5600	
USBRMH05-DK-XX-	Rotary Magnet Holder for adapterboard	

Ordering Information

Please find the ordering information below in Table 5.
Table 5: Ordering Information

Ordering Code	Description	Comments
AS5600-SO_EK_AB	AS5600 Adapterboard	For rapid evaluation and prototyping

Get additional support material online at **http://www.ams.com/AS5600.**

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Documents / Resources

	ams AS5600 12-bit Programmable Contactless Potentiometer [pdf] User Manual AS5600, 12-bit Programmable Contactless Potentiometer, AS5600 12-bit Programmable Contactless Potentiometer, AS5600-SO_EK_AB

References

- **Sensor Solutions | ams**
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Manuals+.