

# AS5215

## Programmable 360° Magnetic Angle Encoder with SINE & COSINE Output Signals

## AS5215-AB-1.0 Adapterboard OPERATION MANUAL

### 1 General Description

The AS5215 is a redundant contactless rotary encoder sensor for accurate angular measurement over a full turn of 360° and over an extended ambient temperature range of -40°C...+150°C.

Based on an integrated Hall element array, the angular position of a simple two-pole magnet is translated into analogue output voltages. The angle information is provided by means of buffered sine and cosine voltages. This approach gives maximum flexibility in system design, as it

can be directly integrated into existing architectures and optimized for various applications in terms of speed and accuracy.

An SSI Interface is implemented for signal path configurations, as well as a one time programmable register block (OTP), which allows the customer to adjust the signal path gain for different mechanical constraints and magnetic fields.

### 2 The AS5215 Adapter board

#### 2.1 Board description

The AS5215 adapter board is a simple circuit allowing test and evaluation the rotary encoder quickly without building a test fixture or PCB. The connections of P1 are required for supplying, communicating and measuring. Connector JP2 provides access to PROG, CM\_2 and CM\_1 (sine common mode voltage of device 1 and device 2 – pin12, pin14). The common mode voltages at all CM pins provide the same level. Resistor R1, R2 (both 100k) are used as Pull-up on CS pins and the capacitors C1, C2 (both 2.2uF) are placed between VDD and GND.

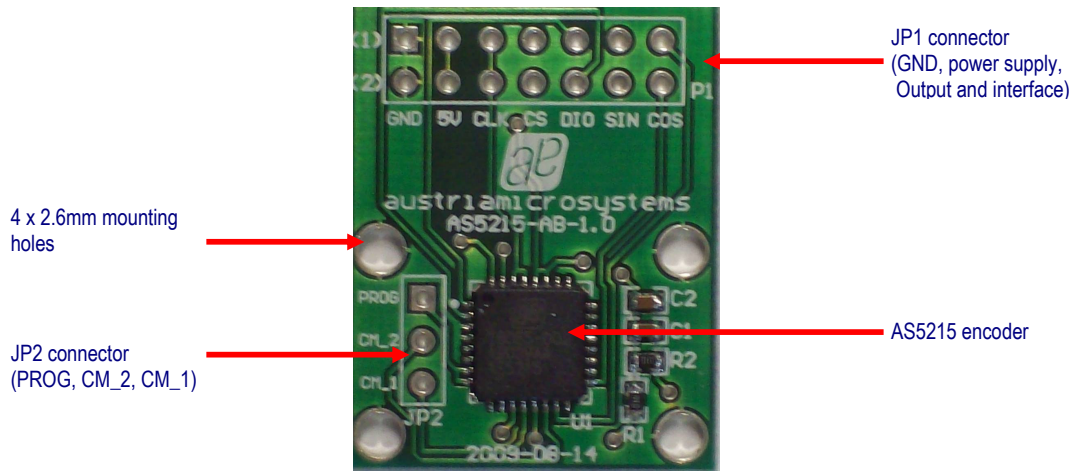


Figure 1: AS5215 Adapterboard

**Note:** On the AS5215-AB-1.0 both 5V and CLK pins are interconnected.

## 2.2 Mounting the AS5215 adapter board

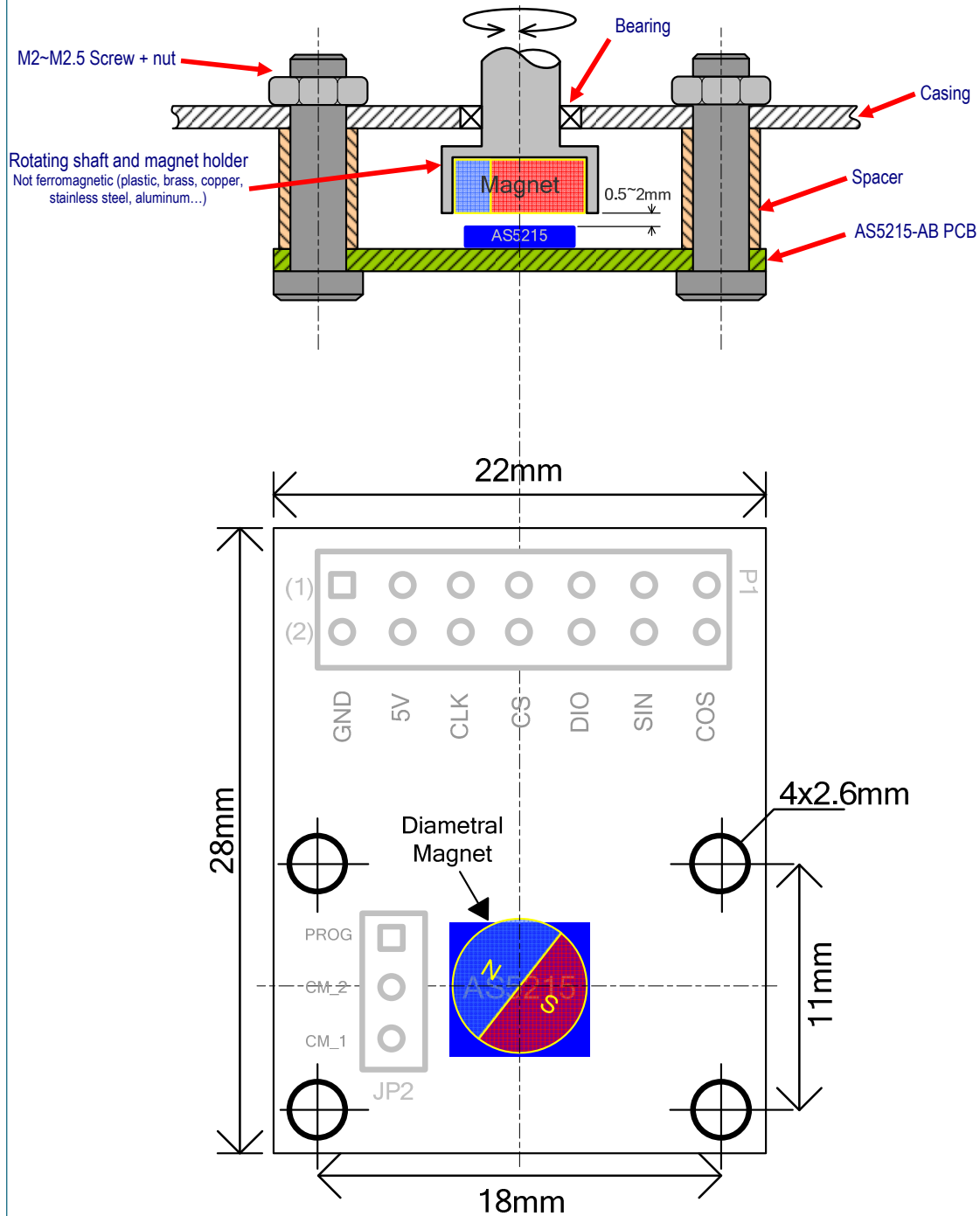


Figure 2: AS5215 adapter board mounting and dimension

A 6x2.5mm (standard magnet: AS5000-MD6H-2 from BOMATEC) diametric magnet must be placed over on under the AS5215 encoder, and should be centered on the middle of the package with a tolerance of 0.5mm.

The airgap between the magnet and the encoder casing should be maintained in the range 0.5mm~2mm.

The magnet holder must not be ferromagnetic. Materials as brass, copper, aluminum, stainless steel are the best choices to make this part.

### 3 AS5215 adapter board and pinout

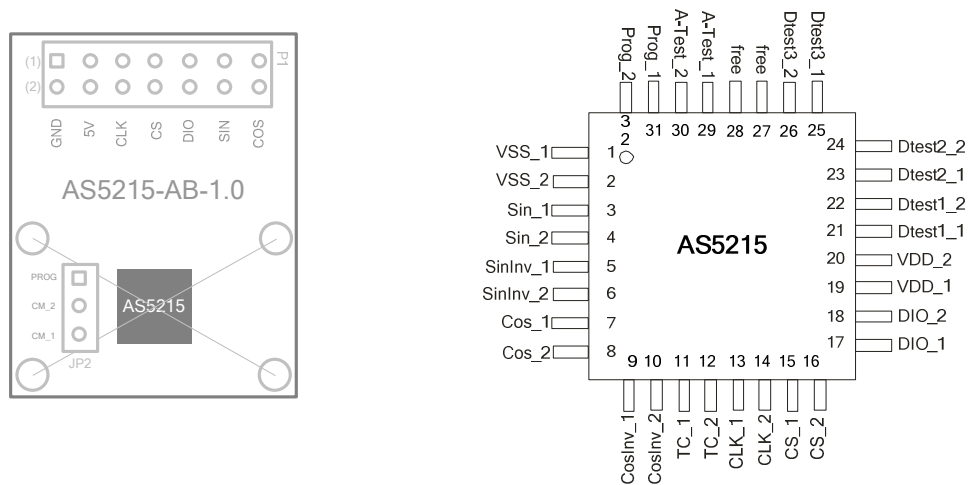


Figure 3: AS5215 adapter board connectors and encoder pinout

Pin# Board	Pin# AS5215	Symbol Board	Type	Description
JP1 - 1	9, 10	GND	S	Supply ground (Die 1)
JP1 - 2	9, 10	GND	S	Supply ground (Die 2)
JP1 - 3	27, 28	5V	S	Positive supply (Die 1)
JP1 - 4	27, 28	5V	S	Positive supply (Die 2)
JP1 - 5	29, 30	CLK	DI	Clock input for digital interface (Die 1)
JP1 - 6	29, 30	CLK	DI	Clock input for digital interface (Die 2)
JP1 - 7	31	CS	DI	Chip select (Die 1)
JP1 - 8	32	CS	DI	Chip select (Die 2)
JP1 - 9	1	DIO	DIO	Data I/O for digital interface (Die 1)
JP1 - 10	2	DIO	DIO	Data I/O for digital interface (Die 2)
JP1 - 11	11	SIN	AO	Switchable buffered analog outputs (Die 1)
JP1 - 12	13	SIN	AO	Switchable buffered analog outputs (Die 2)
JP1 - 13	15	COS	AO	Switchable buffered analog outputs (Die 1)
JP1 - 14	17	COS	AO	Switchable buffered analog outputs (Die 2)
JP2 - 1	7, 8	PROG		OTP Programming Pad
JP2 - 2	14	CM_2	AO	Switchable buffered analog or common mode output (SIN or CM of Die 2)
JP2 - 3	12	CM_1	AO	Switchable buffered analog or common mode output (SIN or CM of Die 1)

Table 1: Pin description

Pin types: DIO      digital input/output  
 DI                digital input  
 AO                analog output  
 S                 supply pin

## 4 Operation case

### 4.1 4.1 Standalone Sine-Cosine Output

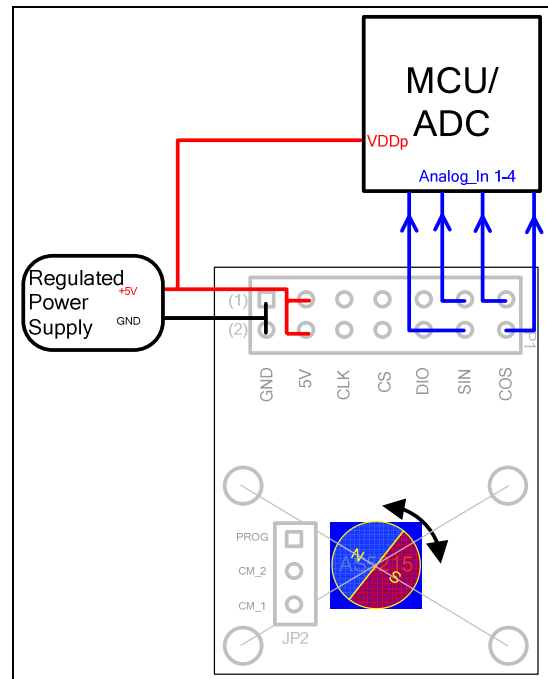


Figure 4: Operation cases with the adapter board

The AS5215 provides analog Sine and Cosine outputs (JP1 – 11, 12, 13, 14). These outputs allow the user to perform the angle calculation by an external ADC +  $\mu\text{C}$ , e.g. to compute the angle with a high resolution. The signal lines should be kept as short as possible, longer lines should be shielded in order to achieve best noise performance.

Through the programming of one bit, you have the possibility to choose between the analog Sine and Cosine outputs (SINP, COSP) and their inverted signals (SINN, COSN). Furthermore, by programming the bits <9:10> you can enable the common mode output signals of SIN and COS. JP2 – 2 and JP – 3 provide SIN or CM of both devices. The DC bias voltage is 1.5 or 2.5 V.

For further information, please refer to datasheet.

## 4.2 Programming the AS5215

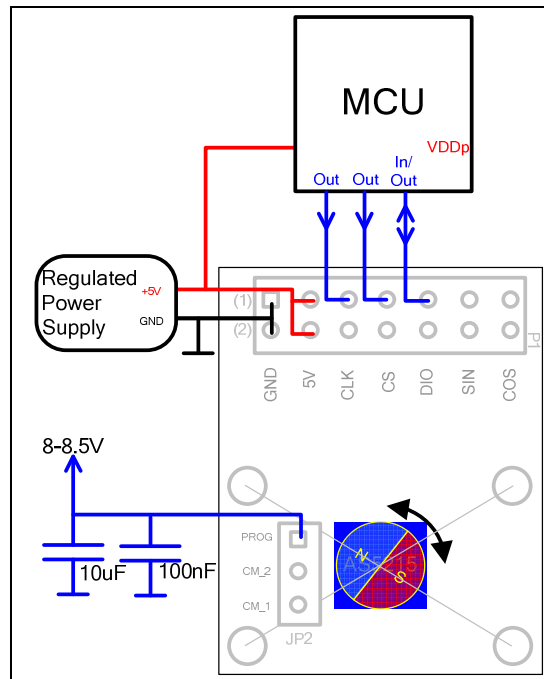


Figure 5: Programming with the adapter board

For programming of the OTP, an additional voltage has to be applied to the pin PROG. It has to be buffered by a fast 100nF capacitor (ceramic) and a 10uF capacitor.

Programming of the AS5215 OTP memory does not require a dedicated programming hardware. The programming can be simply accomplished over the serial 3-wire interface (see Figure 5 – shown for device 1). For permanent programming (command PROG OTP, #25), a constant DC voltage of 8.0 – 8.5V (=100mA) must be connected to PROG (connected to device 1 and device 2). For temporary OTP write (“soft write”; command WRITE OTP, #31), the programming voltage is not required.

For further information, please refer to datasheet.

## 5 AS5215 adapter board hardware

### 5.1 AS5215-AB-1.0 schematics

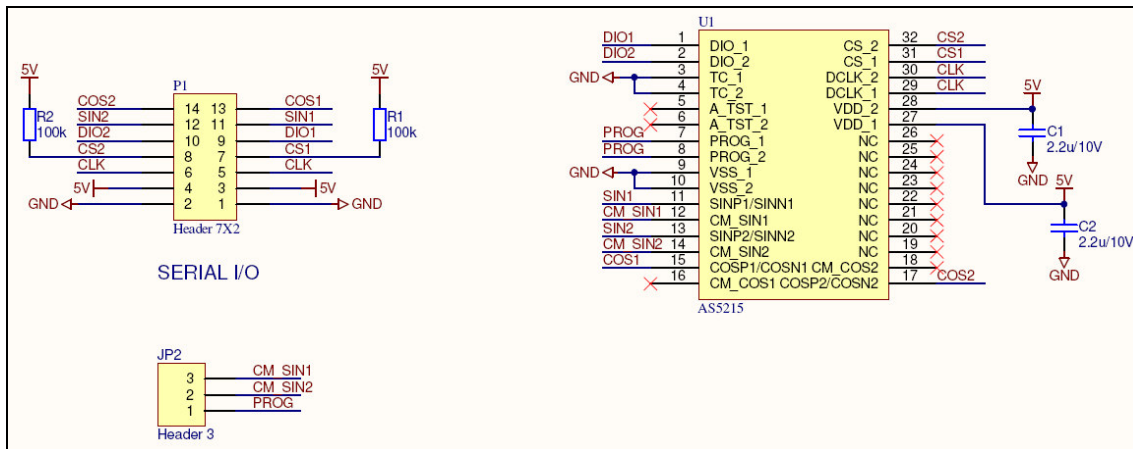


Figure 6: AS5215-AB-1.0 adapterboard schematics

### 5.2 AS5215-AB-1.0 PCB layout

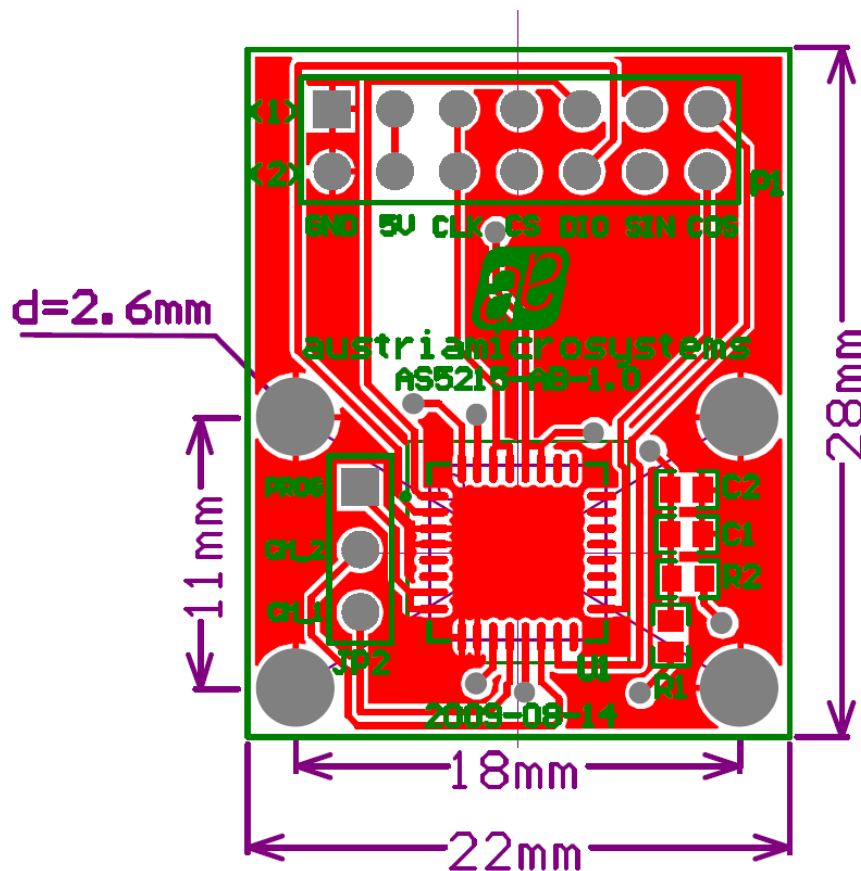


Figure 7: AS5215-AB-1.0 adapter board layout

## Revision History

Revision	Date	Description
1.0	25.August 2009	First version
1.1	02.September 2009	Insert original photos of adapterboard
1.2	09. December 2009	Insert Note (Chapter 2.1)

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