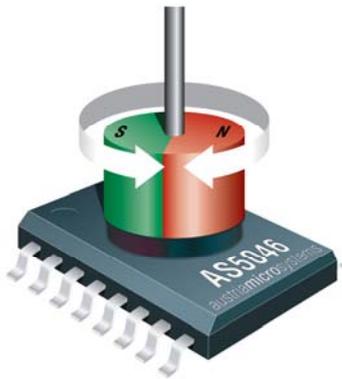


1 General Description



The AS5046 is a contactless angular measurement system-on-chip, combining integrated Hall elements, analog front end and digital signal processing in a single device.

It computes the mechanical angle of a simple 2 pole diametrically magnetized magnet that is placed either above or below the device.

The AS5046 has a resolution of 12bits, providing 4096 absolute positions. Furthermore, an analog output proportional to the angle is available.

The AS5046 can be configured to specific customer requirements by programming a one time programmable (OTP) register. An internal voltage regulator allows the AS5046 to operate from either 3.3 V or 5 V supplies.

Figure 1: Typical arrangement AS5046 and magnet

1.1 The AS5046 Demoboard

The AS5046 demoboard is a complete rotary encoder system with built-in microcontroller, USB interface, 4-digit 7-segment display and magnitude output LED. The board is USB powered or externally supplied for standalone operation. Dimensions: 72mm x 54mm (2.82 x 2.13 inch).

1.1.1 Programming

The demoboard also supports external circuits using the AS5046, such as the AS5046 adapter PCB (as shown below) or any other AS5046 customer application. These are connected to the demoboard and can be displayed, modified or permanently programmed using the AS5046 Demo Software.

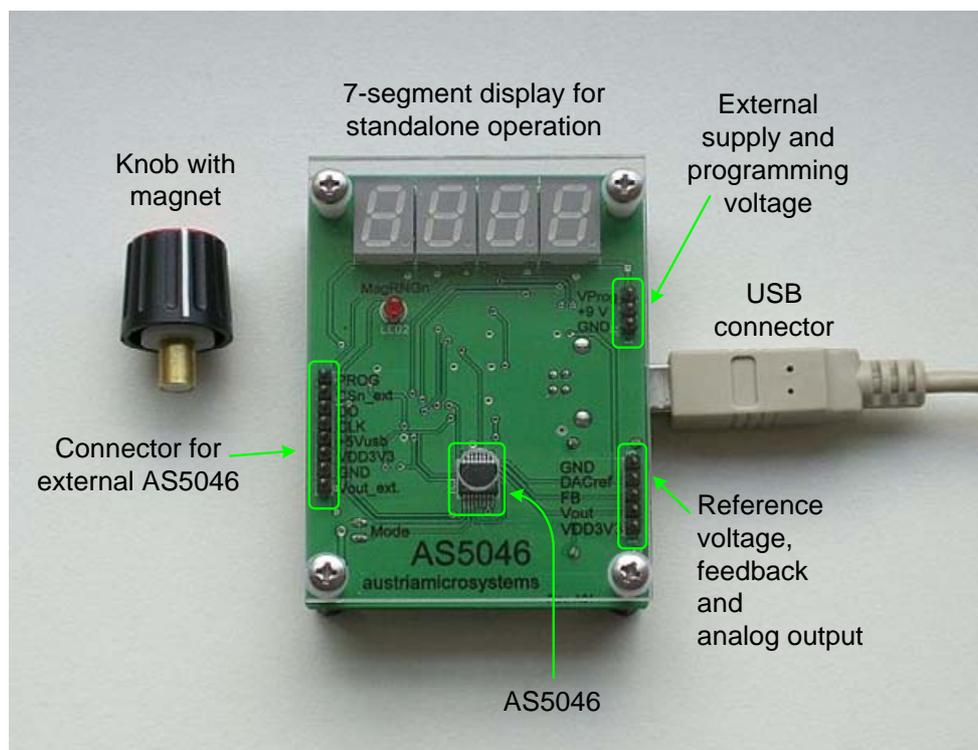


Figure 2: AS5046 demoboard

2 Operating the AS5046 Demoboard

The AS5046 demoboard can be used in several ways:

- **As standalone unit supplied by a 9V-battery**
Connect a 9V...12V supply to pins "GND" and "+9V" at the right side of the board. No other connections are required
- **As standalone unit supplied by an USB port**
Connect the demoboard to a PC using a USB/USB cable (included in demoboard shipment). The board is supplied by the 5V supply of the USB port. No other connections are required
- **As input device for the AS5046 demoboard software**
This configuration uses the same USB hardware connection as above, but additionally the AS5046 demoboard software is running. All indicators on the demoboard will be displayed on the PC screen as well.

Hardware Indicators

Refer to Figure 2:

2.1.1 7-Segment Display

The 4-digit display shows the absolute angle position of the magnet as a 10bit digital word (0...4095). Each digit corresponds to $(360/4096) = 0.35$ degrees.

Note: The absolute position is monitored continuously. It does not require moving the magnet to a zero position before it can calculate the absolute position. When power is lost (e.g. when you unplug the demoboard and re-connect it), it will instantly display the correct position.

2.1.2 MagRng LED

The AS5046 provides several options of detecting movement and distance of the magnet in the vertical (Z-) direction. Signal indicators MagINC, MagDEC and LIN are available as status bits in the serial data stream, while MagRngn is an open-drain output that indicates an out-of range status (on in YELLOW or RED range).

2.2 Connectors

2.2.1 USB Connector

The USB connector is used to supply the demoboard with 5V power and as an interface to the AS5046 demo software, if it is used.

2.2.2 8-pin Male Connector (left side on demoboard)

This connector is used to connect an external AS5046 encoder that can be displayed, modified and permanently programmed with the AS5046 demoboard software (see Figure 11). It also fits the AS5046 adapter PCB (see Figure 2 and Figure 12), which is available separately.

2.2.3 3-pin Male Connector (right side on demoboard)

This connector is used to connect an external supply (pins +9V, GND) for standalone operation, in case the USB connector is not used. Vzapp is the connector for the programming voltage for permanently programming the external AS5046 (OTP).

2.2.4 5-pin Male Connector (right side on demoboard)

- Vout: OPAMP analog output.
- DACref: Optionally, an external reference source, applied at DACref can be used. This programming option is useful for applications requiring a precise output voltage that is independent of supply fluctuations, for current sink outputs or for applications with a dynamic reference, e.g. attenuation of audio signals.
- FB: Per default, the gain of the Op-Amp is internally fixed at 2x. Optionally, the internal gain setting resistors may be switched off, allowing an external gain setting with two resistors at pins Vout (pin #12, Op-Amp output) and FB (pin #11, inverting input).
- Ground and VDD3V3

3 AS5046 Demoboard Software

The AS5046 demoboard software can be downloaded for free from the Internet at:

http://www.austriamicrosystems.com/03products/products_detail/AS5046/download_AS5046.htm?#software

Although the AS5046 demoboard can be used as standalone unit, this software has several indicators and allows access to extra features, such as:

- Displaying the absolute angle as 10bit-word (0..4095), as absolute degrees (0..360) and as rotary dial
- Displaying the analog voltage output
- Displaying the status and diagnostic bits (magnitude ranges) of the AS5046
- Programming the zero position (OTP)
- Programming clockwise or counterclockwise operation
- Putting the AS5046 in alignment mode to aid centering the magnet over the IC.

3.1 Getting Started

This software allows you to become familiar with the principle of the AS5046 magnetic rotary encoder. In order to get started, you need:

- The AS5046 demo software
- A Win2000®, Win-Me® or Win-XP® operating system
- The AS5046 demoboard and USB cable
- One free USB slot on your PC to connect the demoboard

3.2 Installing the Software

Installation Process: The installation process consists of three steps:

- Demoboard software installation
- Hardware driver installation
- Reboot

3.2.1 Step 1/3: Demoboard Software Installation

The demoboard should not be connected when the software is installed for the first time.

Run the File "AS50xx DemoSW Setup v. 1.x.exe" and follow the step-by-step instructions.

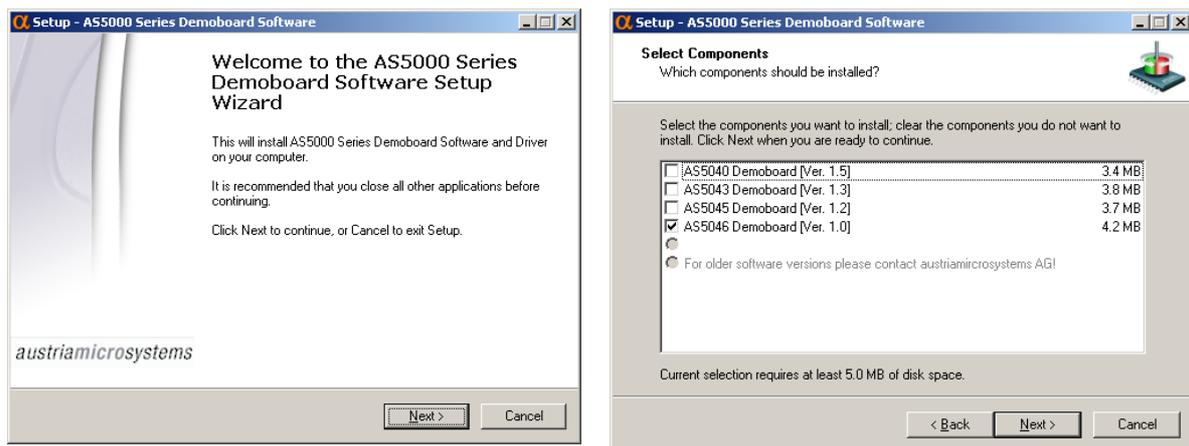


Figure 4: Software installation

The software packet contains several different versions. Make sure to select the software version related to the AS5046 demo board (not to the AS5040 or AS5045) to ensure proper function (see Figure 4).

3.2.2 Hardware Driver Installation

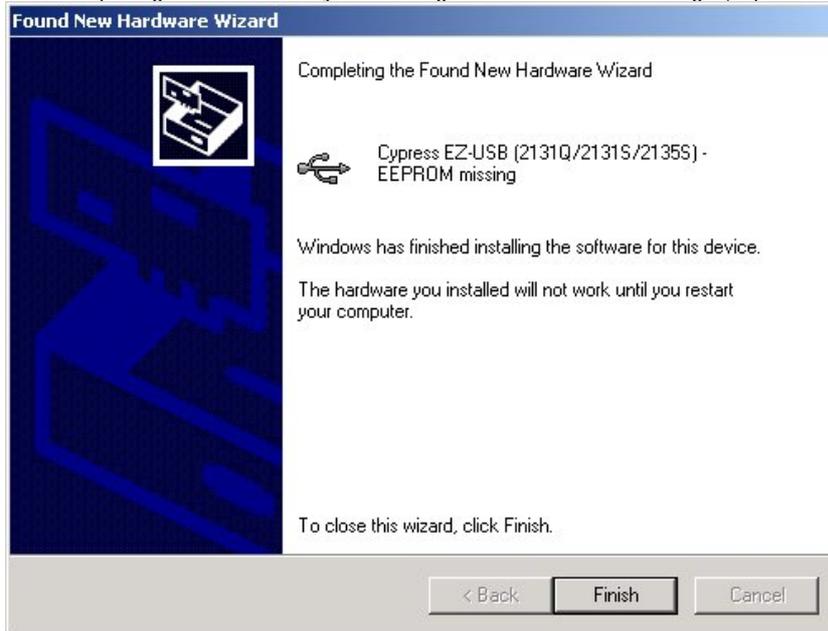
Step 2/3: Installing the USB Controller

Connect the demoboard to a free USB slot on your PC. Your Windows® software will automatically detect the USB controller on the demoboard:



When prompted for an installation file, refer to the file "ezusbw2k.inf" that was extracted during the demoboard software installation (step 1) in the directory of your choice (default C:\program files\austramicrosystems AG\AS5046_DemoBoardSW_x.x).

After completing the installation, you should get this or a similar message (depends on platform):



Click on "finish".

3.2.3 Step 3/3: Reboot

Reboot your PC if requested by the operating system.

3.3 Software Usage

After starting the software the demo board displays several tabs described below.

Note: Before starting the software the board needs to be connected to the PC. For details read section 7.2.

3.3.1 2-Wire Readout

After starting the demo software by double-clicking the "AS5046.exe" icon and selecting the 2-Wire-Readout tab, position information and analog output voltage of the rotary encoder is displayed along with other register information (see Figure 5).

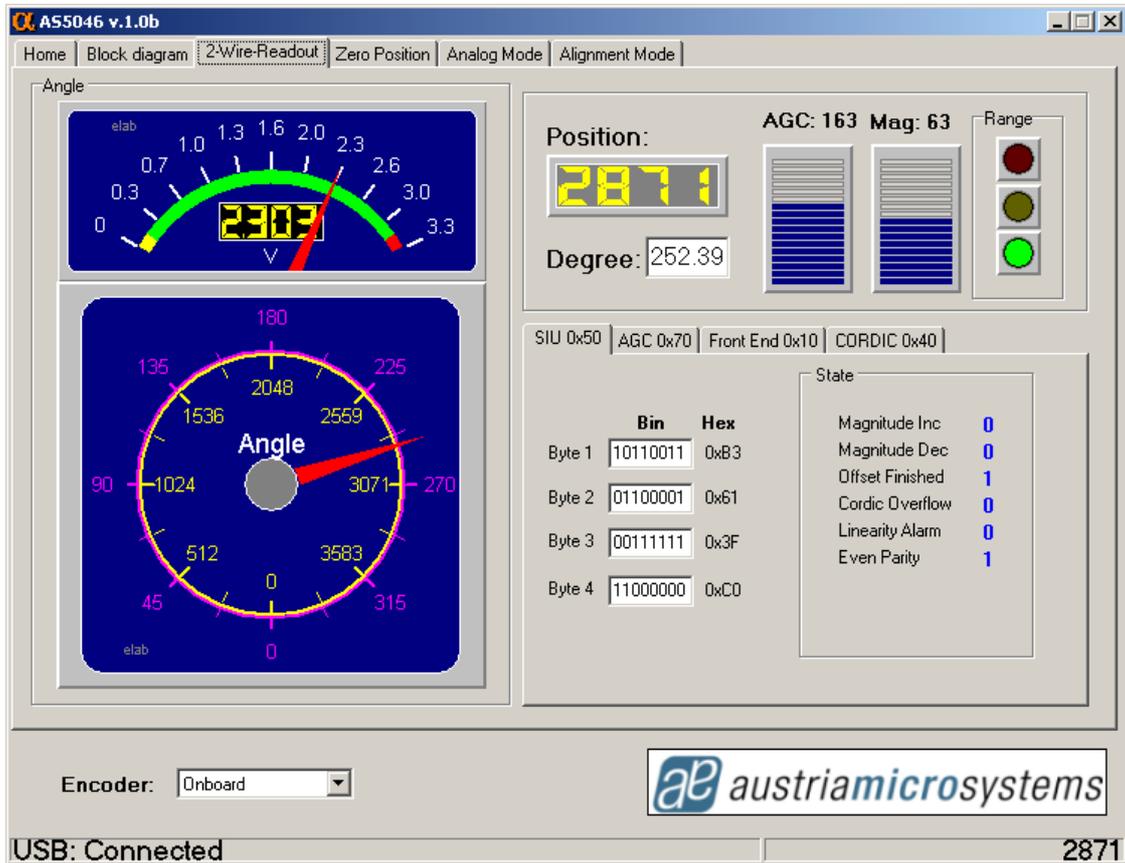


Figure 5: SSI-readout tab

Absolute angle information:

The absolute angle information is displayed in analog and digital form. It is calculated as:
 $\text{degree} = (360/4096 * \text{absolute position})$.

Absolute position information:

This indicator displays the absolute encoder position as a 12-bit value. Each digit corresponds to
 $(360 \text{ degrees} / 4096) = 0.0879 \text{ degrees}$. The range of the serial absolute output is always 0 to 4095.

Analog output voltage:

The voltage meter shows the value outputted by Vout when the feedback and DACref is at default.

Magnetic range indicators:

Three lights indicate the magnetic input field of the encoder (Red, Yellow, Green)

Range   	Range   	Range   
Green: ~45...75mT	Yellow: ~ 25...45mT or ~75...135mT	Red: ~<25mT or >~135mT
For details on the magnetic input field ranges please refer to the data sheet section "Z-Axis Range Indication".		

State Indicators:

Offset Comp Finish: indicates the finished offset compensation. Data is valid, when this bit = 1.

CORDIC Overflow: Internal DSP error. Data is invalid when this bit = 1.

Linearity Alarm: Internal DSP warning. The accuracy will be reduced when this bit = 1.

Magnitude Increment, Magnitude Decrement: These bits are set when the magnetic field becomes stronger (MagInc = 1) or weaker (MagDec = 1), e.g. when the magnet is moved away or towards the chip. These signals can be used to add a pushbutton function to the AS5046. When both bits are set, they indicate that the magnetic field strength is out of the recommended range of 45 - 75mT (>75mT to close, <45mT to far). The AS5046 will still continue to operate, even when both bits are set, but the accuracy may be out of spec.

Even Parity: Parity bit for transmission error detection.

Encoder: Onboard / External:

This field selects whether the onboard AS5046 (on the demo board) or an external AS5046 (connected to the 8-pin connector at the left side of the demo board) is selected. Note that permanent write (programming) is only enabled for the external Encoder.

USB connection status:

Displays the status of the USB connection. The connection is not polled permanently by the PC operating system, so it may take a few seconds before the actual status is updated. If the status displays "USB: no connection", try to unplug and re-connect the USB cable. See also section 7.2 "Suggested Sequence of Connecting and Disconnecting".



Figure 6: USB connection status

Sub-Window:

By double-clicking the angular gauge, a separate, resizable window appears, showing the gauge and the incremental outputs in detail (see Figure 7).

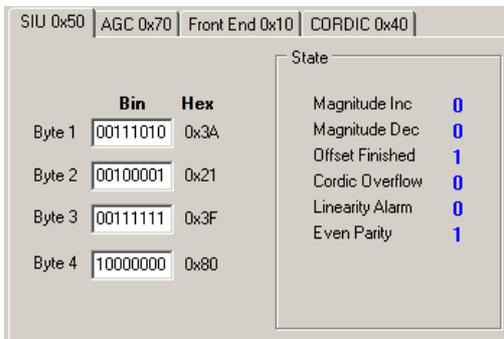


Figure 7: SSI-tab sub-window

3.3.2 Registers

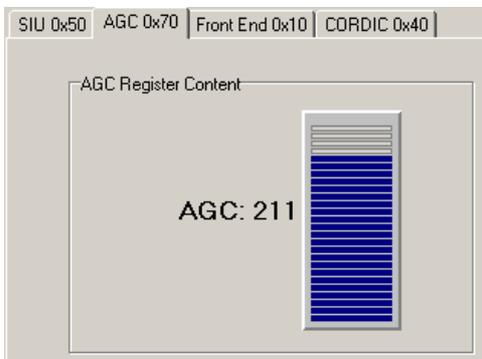
The 2-wire interface of the AS5046 enables to address, read and write four register regions described in the following.

SIU Serial Interface User:



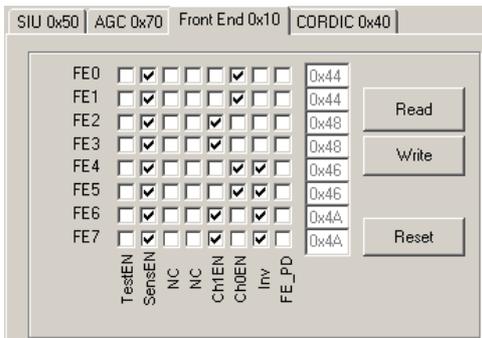
The absolute angle information is displayed in analog and digital form. It is calculated as: $\text{degree} = (360/4096 * \text{absolute position})$.

Automatic Gain Control:



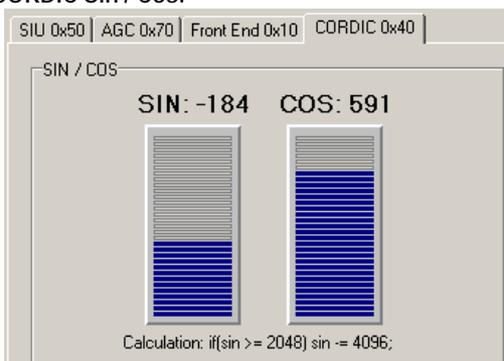
This indicator displays the absolute encoder position as a 12-bit value. Each digit corresponds to $(360 \text{ degrees} / 4096) = 0.0879 \text{ degrees}$. The range of the serial absolute output is always 0 to 4095.

Front End:



The voltage meter shows the value outputted by Vout when the feedback and DACref is at default.

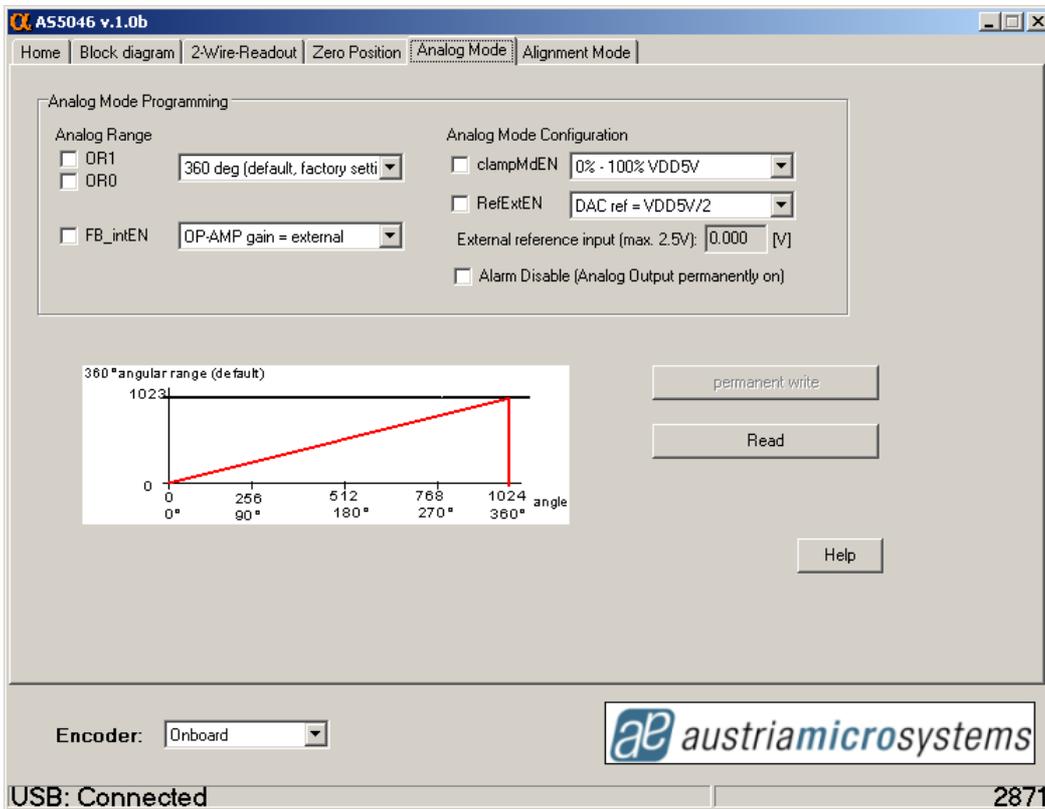
CORDIC Sin / Cos:



Three lights indicate the magnetic input field of the encoder (Red, Yellow, Green)

3.3.3 Analog Mode Tab

Five bits of the OTP are used to configure the AS5046 analog output modes. (For more details please refer to the data sheet)



Analog Output Range:

The Angular Range selector allows a digital pre-selection of the angular range. The AS5046 can be configured for a full scale angular range of 45°, 90°, 180° or 360°.

OR1	OR0	Mode	Note
0	0	360° Angular Range	default mode analog resolution= 10bit (4096 steps) over 360°
0	1	180° Angular Range	analog resolution= 10bit (4096 steps) over 180°
1	0	90° Angular Range	analog resolution= 10bit (4096 steps) over 90°
1	1	45° Angular Range	analog resolution= 9 bit (512 steps) over 45°

Clamped Mode:

Depending on the application, the analog output can be set as rail-to-rail output or as clamped output with 10%-90% of $\frac{1}{2} * VDD5V$ (pin16) or DACref (pin9).

ClampMdEN	Output	Note
0	0% - 100%	default mode ; internal DACreference
1	10% - 90%	External DAC reference

Note: The output is also related to the RefExtEN OTP bit.

External Reference:

The default DAC reference is the voltage at pin #16 (VDD5V) divided by 2. Using this reference, a system that has an output voltage ratiometric to the supply voltage can be built. Optionally, an external reference source, applied at pin#9 (DACref) can be used.

RefExtEN	Output	Note
0	Voltage at pin 16 (VCC5V)	default mode
1	Voltage at pin 9 (DACref)	

OPAMP Feedback:

The output is ratiometric to the supply voltage (VDD5V), which can range from 3.0V to 5.5V. If the DAC reference is switched to an external reference (pin DACref), the output is ratiometric to the external reference.

FB_intEn	Feedback	Note
0	external	External resistors required at pin 11 and pin 12. (see Page 17)
1	internal	Op-Amp gain fixed at 2 Demoboad default (programmed)

Alarm Disable:

It is possible to enable the analog output permanently (it will not be switched off even if the magnetic field is out of range). To enable this feature an OTP bit in the factory setting (FS6) must be set. By checking "Alarm Disable" this bit is set.

3.3.4 Zero Position Tab

This tab allows you to set an individual zero position or counter-clockwise operation temporarily by modifying the according OTP bits (Z0...Z9, CCW). When applying a programming voltage of 7.5 to 8 Volts to pin PROG (see next page) and clicking "permanent write", those bits can be programmed permanently (see Figure 8).

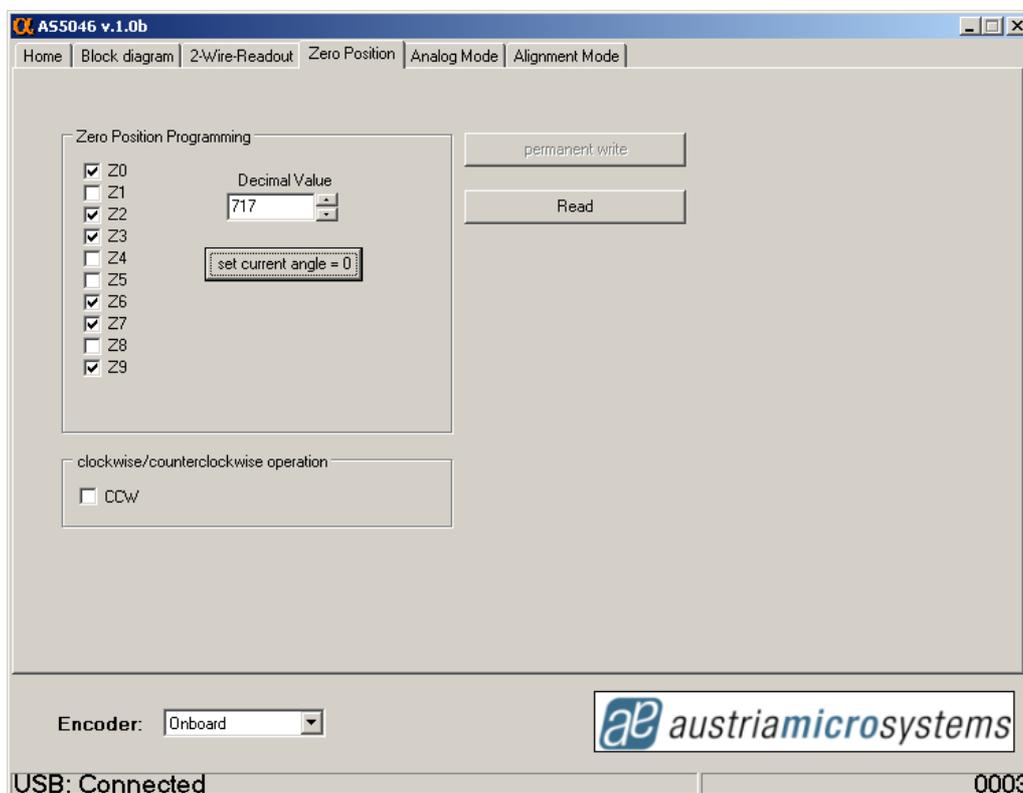


Figure 8: Zero position programming

Zero Position Programming:

Binary Indicator: This indicator will display the absolute position, which is the new Zero-position as a binary code. This value is updated, every time the button "set current angle = 0" is clicked. The factory default setting is 0. If, after power-up, a value other than 0 is displayed, this indicates that the encoder has already been programmed.

Decimal Indicator: This indicator will display the absolute position, which is the new Zero-position as a decimal number. This value is updated, every time the button "set current angle = 0" is clicked. The factory default setting is 0. If, after power-up, a value other than 0 is displayed, this indicates that the encoder has already been programmed.

Button "Read": This button reads the settings of the OTP register. It will overwrite any settings made since the last power-up, e.g. incremental mode, resolution, zero-position, index or ccw.

Button "Set Current Angle": When this button is pressed, the currently read angle is updated as the new temporary zero position. The Indicators will display the current (internal) reading and the absolute output will be reset to = 0.

Clockwise / Counter-clockwise operation: This selector reverses the direction of both the incremental as well as the absolute outputs. This bit should be set, when the magnet is placed underneath the AS5046 to match the physical rotation with the indicated rotation.

Permanent programming:

The button "permanent write" is used to program the OTP registers permanently. It can only be used for the external encoder and it is disabled by firmware when the onboard encoder is selected. To write the register settings permanently, a programming DC voltage of 7.5V to 8V must be applied to pin Vzapp (+) of the 3-pin connector on the right hand side of the demo board (top view). The external supply must be able to source up to 130 mA.

All the required timings for programming the external AS5046 encoder are controlled by the AS5046 demo board USB controller. As long as no programming voltage is applied to the chip, clicking the "permanent write" button has no effect, although a warning message is displayed.

3.3.5 Alignment Mode Tab

The Alignment Mode simplifies the centering of the magnet over the chip surface. In this mode, the absolute value of the 10-bit angular data of the SSI interface indicates the magnitude of misalignment at a particular angle.

A low value indicates a well-centered magnet. A high value indicates that the magnet is off-center and needs to be shifted towards the diagonal center of the encoder.

A high value indicates large X or Y displacement, but also higher absolute magnetic field strength. The magnet is properly aligned, when the difference between highest and lowest value over one full turn is at a minimum.

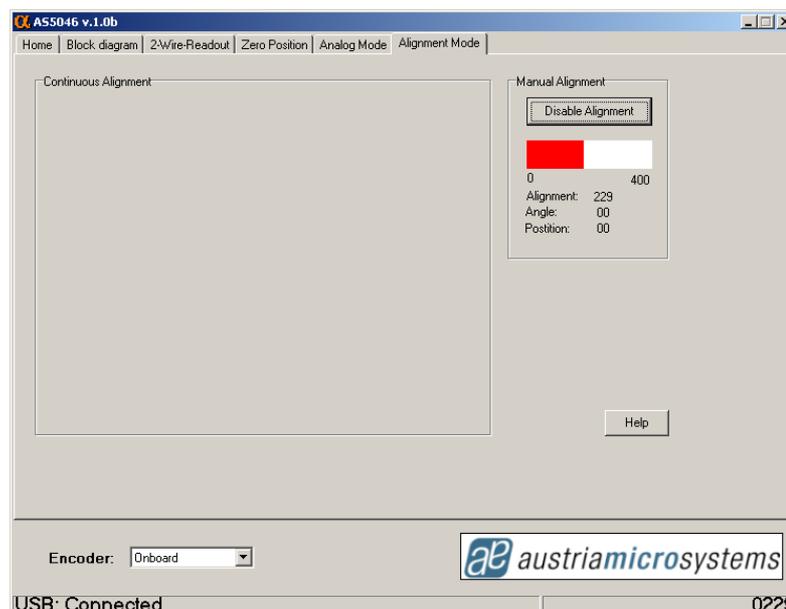


Figure 9: Alignment mode

Under normal conditions, a properly aligned magnet will result in a reading of less than 32 over a full turn. The MagINCn and MagDECn indicators will be = 1 when the alignment mode reading is < 32. At the same time, both hardware pins MagINCn (#1) and MagDECn (#2) will be pulled to VSS. A properly aligned magnet will therefore produce a MagINCn = MagDECn = 1 signal throughout a full 360° turn of the magnet. Stronger magnets or short gaps between magnet and IC may show values larger than 32. These magnets are still properly aligned as long as the difference between highest and lowest value over one full turn is at a minimum.

With AS5046 date code >=612xxx switching from alignment mode to normal operation can be done by software so both values can be read one after another.

When clicking on the "Enable Alignment" button the alignment reading is displayed on the right hand side (see Figure 9).

When checking "Cyclic Update" the position and angle of the encoder is displayed (see Figure 10) additionally to the alignment. The additional reading of the position will influence the performance of the alignment reading.

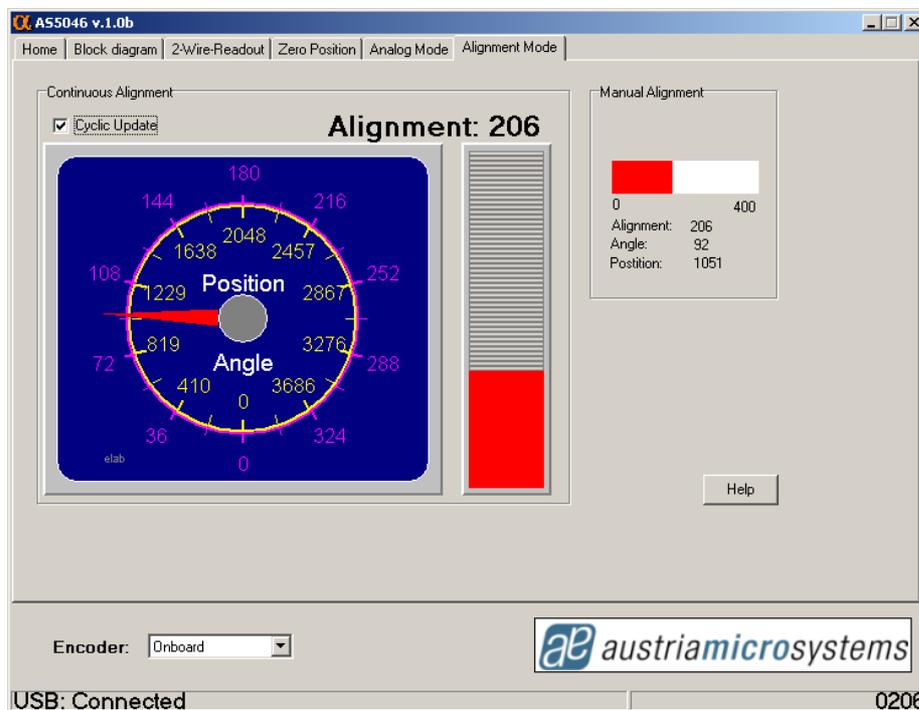
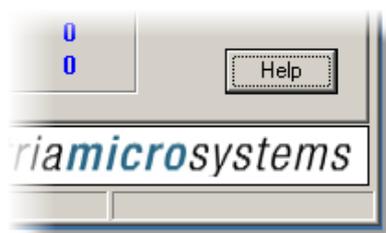


Figure 10: Alignment with cyclic update

All functions of the AS5046 can still be used, even when the magnet is misaligned. However, the linearity error will increase with increased misalignment.

3.4 Help Files

After installation of the software the help file AS50xx.chm can be found in the installation directory. It can be opened by double-clicking or clicking one of the Help-Buttons of the application.



3.5 Connecting and Programming an External AS5046

You can read and program an external AS5046 encoder by connecting it to the AS5046 demoboard as shown below:

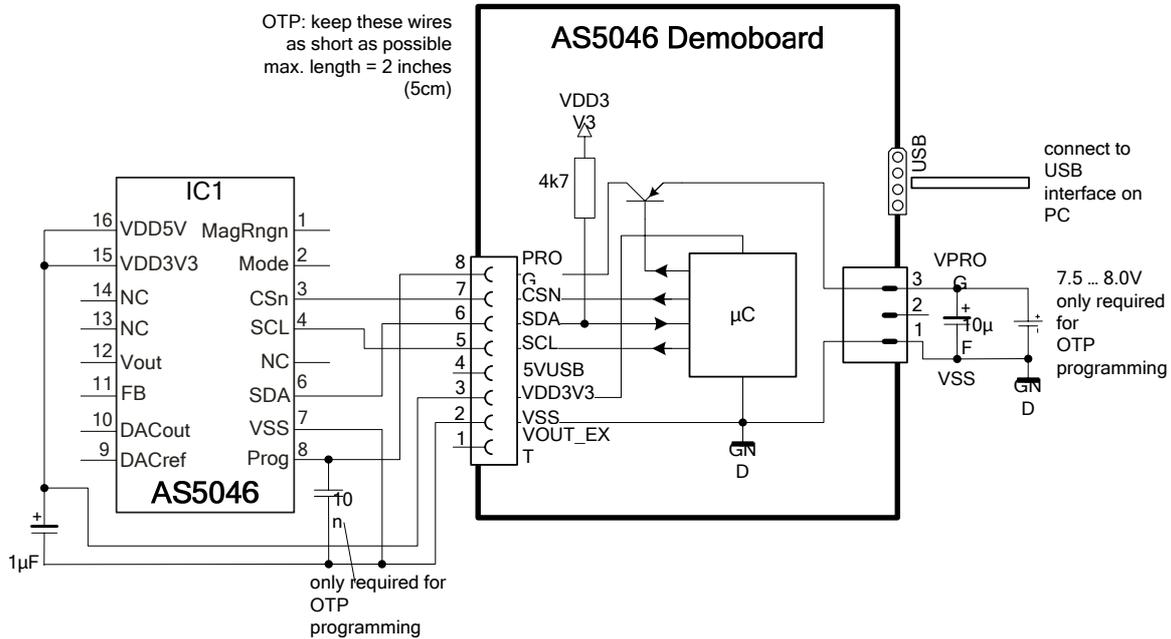


Figure 11: Connection diagram for an external AS5046 encoder connections

Since the onboard controller on the AS5046 demo board is supplied by 3.3V, the external AS5046 encoder must be configured for 3.3V supply as well. This is done by connecting pin VDD3V3 of the demo board to both pins 15 (VDD3V3) and 16 (VDD5V) of the external encoder.

Signal GND is connected to pin 7 (VSS).

A 1µF capacitor close to the IC, between the 3.3V supply and VSS (GND) is recommended, when the cable between demo board and external encoder is longer than about 1 foot (30 cm). OTP programming is only recommended with short wires (max. 5cm / 2 inches) between demo board and external AS5046 (see 3.5.3).

** If longer cables are used, a pull-down resistor at the DO line of 22k - 56k Ohms is recommended to discharge the signal between data transmissions and no static voltage is built up.*

The other required signals are CSn, CLK and DO.

For OTP programming and OTP read operations, signal PROG is also required.

3.5.1 Reading the External AS5046

The external AS5046 encoder can be read in the same way as the internal encoder.

Switching from internal to external encoder can be done on the bottom left corner of the demoboard software screen:



Encoder = external: **USB: Connected**

Additionally, when encoder = external is selected, the buttons "Permanent write" and "Read" are enabled in the "Zero Position" and "Incremental Mode" screens to allow OTP programming of the external encoder.

3.5.2 Changing Zero Position or User Parameter.

The programming options like zero position or other user parameter (MagCompEn, CCW, PWMDisable) can be modified at any time during normal operation. Permanently programming these registers will set the default setting after power-up. Programmed settings can again be modified during normal operation but will be reset to the programmed default state when the power supply is interrupted.

3.5.3 OTP Programming of the External AS5046 Encoder:

To program (zap) the external AS5046 encoder, a programming voltage of 7.5 to 8V DC (130mA) must be applied to pins VProg and GND of the 3-pin connector at the right hand side of the demoboard. A 10 μ F buffer cap is recommended for this voltage (see Figure 11).

Programming is not recommended with long wires between demoboard and external encoder, as the inductance of the cable may generate high voltage spikes, that can cause wrong programming or even harm the IC. The maximum wire length between the demoboard connector and the external encoder should be 50mm (2"). Additionally, a 10nF ceramic capacitor should be connected close to pin PROG and VSS.

For programming and OTP subsequent read operations, all signals shown in Figure 11 are required: PROG, CSn, DO, CLK, VDD3V3 and VSS. All these wires should have equal length.

An OTP (one time programming) cycle is automatically initiated, when button "Permanent write" is pressed. The default (non-programmed) logic state is "0", consequently the programmed logic state is "1". After programming, the chip must be reset by unplugging and reconnecting the demoboard (follow the instructions on the screen). If the external chip is not supplied by the demoboard but by an external voltage source, unplug and reconnect this supply as well.

The default state of unprogrammed bits is logic 0, programmed bits will be in logic 1 state.

Repeated OTP programming cycles are possible. Bits with a logic 0 state may still be programmed to logic 1 state, even if some other bits of the chip have already been programmed. However, bits with a logic 1 state cannot be programmed back to logic 0 state.

For repeated programming cycles, it is recommended to write a "0" into bits that are already programmed. Only those bits that are supposed to be programmed should be set to logic 1.

Note that the chip will not be programmed, as long as no programming voltage is applied to VProg, although the software will issue a warning message that the chip will be permanently programmed.

3.6 Connecting the AS5046 Adapter PCB to the Demoboard

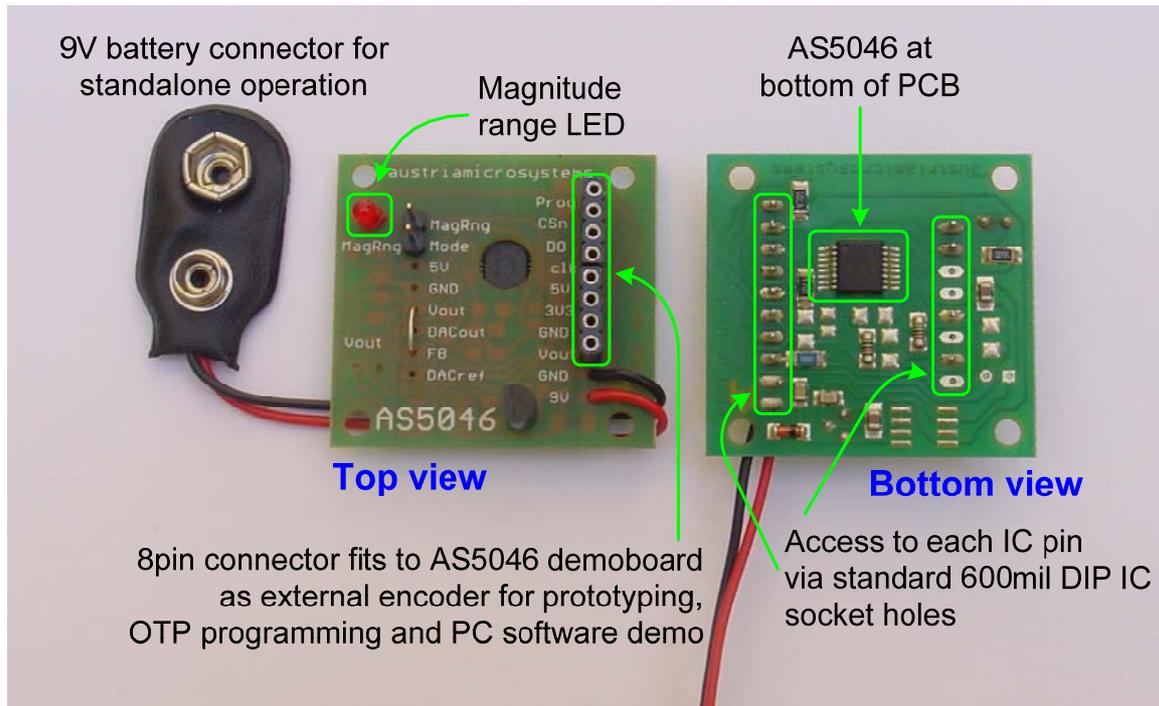


Figure 12: AS5046 adapter PCB: top and bottom view

Note: further information about the AS5046 adapter PCB is available in a separate document: "AS5046 Adapter PCB Operation Manual".

The AS5046 adapter PCB is intended as a standalone device that allows easy and quick testing of the AS5046 without the need of having to make your own PCB.

It allows access to each IC pin via a standard 100mil pitch, 600mil Dual-In-Line connector, has LEDs on all digital outputs and comes with an onboard 5V linear voltage regulator (78L05) and a battery clip to supply the board from a 9V battery.

The 7-pin female connector is designed to fit directly onto the AS5046 demoboard and use the adapter PCB as external encoder (software setting: Encoder = external).

The demoboard however, runs at 3.3V supply voltage. The adapter PCB is configured for 5V supply voltage. Connecting both boards without modifications will not harm any of the boards, but may lead to data transmission errors due to the different digital levels, especially when an extension cable is used between demoboard and adapter PCB.

If you use the adapter PCB as external encoder for the AS5046 demoboard with an extension cable or experience data transmission errors, it is recommended to configure the adapter PCB for 3.3V supply voltage. (See Figure 11)

Perform the following modifications:

- disconnect the 5V supply between demoboard and adapter PCB: cut off pin "+5VUSB" at the bottom of the AS5046 demoboard
- connect pins "3V3" and "5V" (see component print) on the adapter PCB. Ideally, connect the pins right at the bottom of the 7-pin female connector with a piece of wire or solder joint.
- you may also remove the 78L05 voltage regulator from the adapter PCB to prevent accidental damage of the IC when an input voltage is applied to the regulator (and the 5V output is fed to the VDD3V3 supply pin)

4 Pin Description

Pin	Symbol	Type	Description
1	MagRngn	DO_OD	Magnet Field Ma gnitude Ra NGe warning; active low, indicates that the magnetic field strength is outside of the recommended limits.
2	Mode	DI_PD, ST	Mode input. Select between low noise (open, low) and high speed (high) mode. Internal pull-down resistor
3	CSn	DI_PU, ST	Chip Select, active low; Schmitt-Trigger input, internal pull-up resistor (~50kΩ). Must be connected to VSS for I ² C data transmission.
4	SCL	DI,ST	Serial Clock Line. Clock input for I ² C data transmission
5	NC	-	Must be left unconnected
6	SDA	DIO	Serial Data Line. Bi-directional I/O for I ² C data transmission
7	VSS	S	Negative Supply Voltage (GND)
8	Prog	DI_PD	OTP Programming Input. Internal pull-down resistor (~74kΩ). Should be connected to VSS if programming is not used
9	DACref	AI	DAC Reference voltage input for external reference
10	DACout	AO	DAC output (unbuffered, Ri ~8kΩ)
11	FB	AI	Feedback, OPAMP inverting input
12	Vout	AO	OPAMP output
13	NC	-	Must be left unconnected
14	NC	-	Must be left unconnected
15	VDD3V3	S	3V-Regulator Output for internal core, regulated from VDD5V. Connect to VDD5V for 3V supply voltage. Do not load externally.
16	VDD5V	S	Positive Supply Voltage, 3.0 to 5.5 V

Figure 13: AS5046 pin-out and alignment tolerances

DO_OD	digital output open drain
S	supply pin
DO	digital output
DI	digital input
DI_PD	digital input pull-down
DO_T	digital output /tri-state
DI_PU	digital input pull-up
ST	Schmitt-Trigger input

4.1 Pin-Out and Magnet Misalignment

Shown above is the pin assignment and description for the AS5046. The Hall Sensors are arranged as a concentric circle at the center of the IC with a diameter of 2.2mm (87mil). The recommended magnetic field strength at this concentric circle is 45...75mT (see datasheet).

Ideally, the center of the magnet should be located right above the center of the IC (see graph). The more the magnet is off-center, the higher will be the non-linearity (deviation of actual position to indicated position). Consequently, the accuracy of the system depends on the misalignment of the magnet. For best performance, the magnet should be centered within a circle of 0.5mm diameter at the center of the chip.

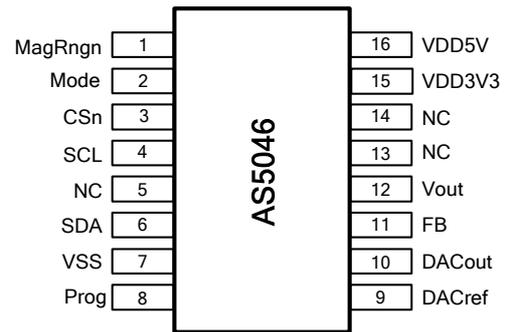


Figure 14: AS5046 pin assignment

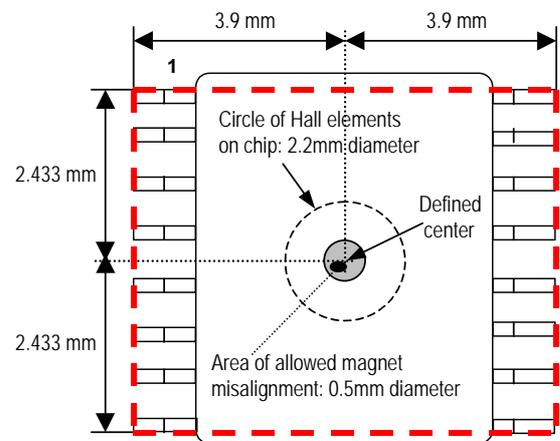
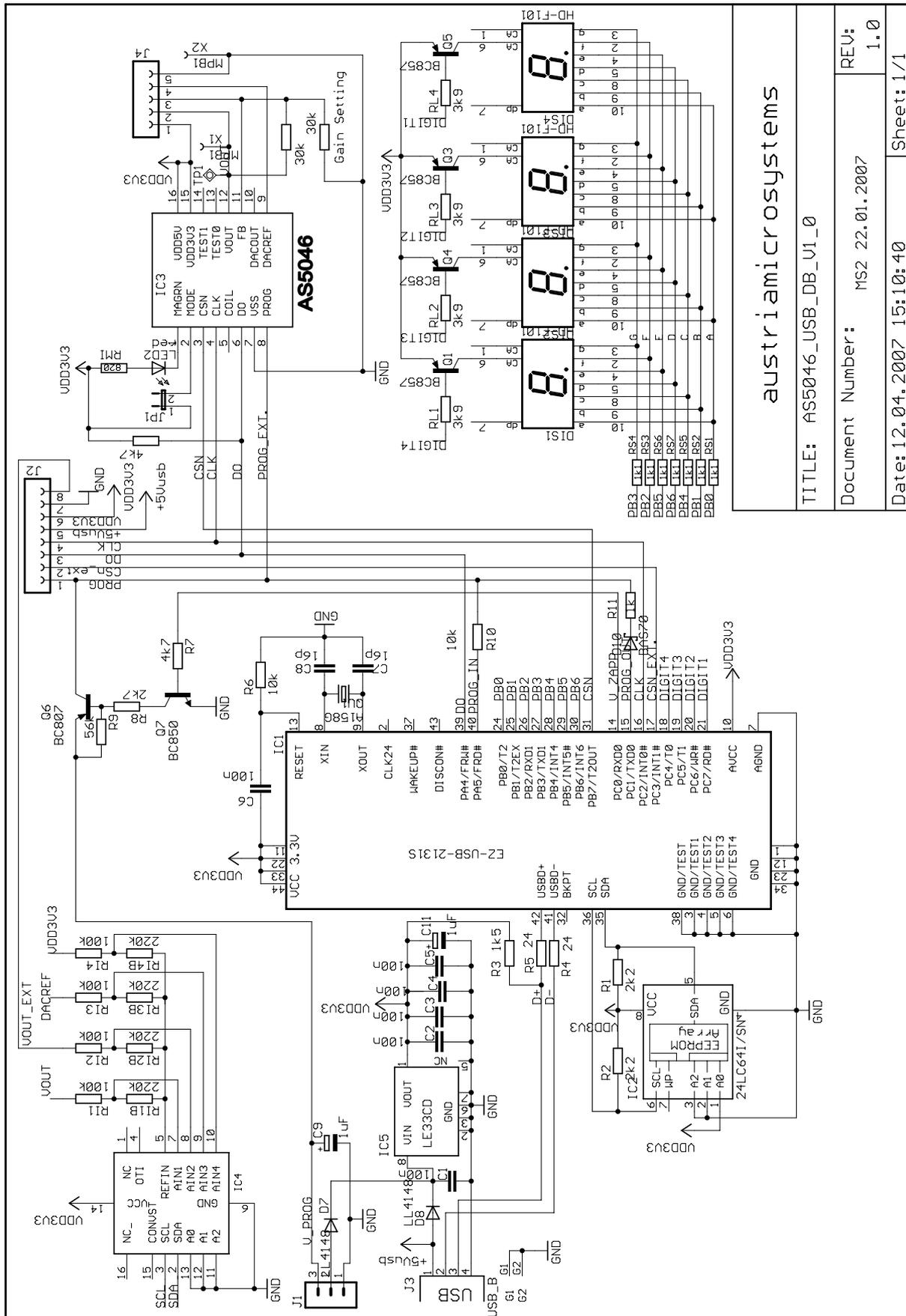


Figure 15: Magnet alignment tolerances

5 AS5046 Demoboard Schematic



austriamicrosystems	
TITLE: AS5046_USB_DB_V1_0	
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6 Demoboard Schematic Description

6.1 Main Parts

- AS5046 rotary encoder
- Microcontroller
- Power supply
- Indicators
- Connectors

6.1.1 AS5046 Rotary Encoder

The AS5046 (IC3) is configured for 3.3V supply (pin 15 & 16 tied together). The serial interface (pins CSn, CLK, DO) is controlled by the microcontroller. The Mode output, Magnet diagnostic outputs (MagInc, MagDec) and PWM output are directly connected to LEDs

6.1.2 Microcontroller

The installed Cypress™ EZ-USB controller (IC1) includes an on-chip USB PC-interface. The firmware is stored in an external E²PROM (IC2). The I/O-ports directly control the AS5046 and the 4-digit 7-segment display.

The firmware is configured such that the demoboard runs as standalone application or as an input device for the demoboard software. No user switching is required, the software detects automatically, which mode is required.

Furthermore, the controller provides the proper pulse timings for OTP programming of an external AS5046 encoder, connected to CON2. All that is required for programming is an external DC voltage of about 7.5V / 130mA.

6.1.3 ADC

To acquire voltage of the analog output of the onboard or external encoder an ADC (IC4) is used.

6.1.4 Power Supply

The 3.3V supply is provided by the linear voltage regulator IC5. Either the 5V supply from the USB port or an external DC voltage at pin 2/Con3 may be used as supply inputs.

6.1.5 Indicators

The 4digit 7-segment display for the absolute angle is controlled directly by the Microcontroller. The LEDs are connected to the digital outputs of the AS5046

6.1.6 Connectors

CON1 = USB connector for data transmission and power supply from PC

CON2 = 8-pin male 100mil pitch connector for connecting an external AS5046 application or the AS5046 adapter PCB (see chapter 3.6)

CON3 = 3-pin male 100mil pitch connector for connecting an external power supply and the OTP programming voltage.

7 Troubleshooting

7.1 Required Files

If you experience problems with the software, check that the required files are present:

Installation directory (default C:\program files\ austriamicrosystems AG\AS5046_DemoBoardSW_x.x):

- AS5046.exe
- AS50xx.chm
- ezmon.sys
- ezusb.sys
- ezusbw2k.inf

In the [windows][system32][drivers] directory:

- ezmon.sys
- ezusb.sys

In the [windows][system32][drivers]/inf directory:

- ezusbw2k.inf

7.2 Suggested Sequence of Connecting and Disconnecting

When operating the demo board and software it is advisable to proceed as:

7.2.1 Running the demo software

Before starting the demo software the demo board needs to be connected to the USB port of the PC.

1. Connect to the USB port.
2. Start the software.

7.2.2 Closing the demo software

After finishing the work with the demo board the software needs to be closed before disconnecting the demo board.

1. Close the software.
2. Disconnect from the USB port.

7.3 No USB Connection when Starting the Program

If the application can not connect to the demo board it is indicated in the lower left corner as shown in Figure 16.



Figure 16: No USB connection

- In this case please check the USB connection by unplugging and re-connecting the demo board. (Note that the software does not respond immediately after you unplugged and re-connected it. It may take a few seconds before the USB connection is established.)
- Verify all the required files are installed properly (see above)
- Verify the correct installation of the USB controller by calling the device manager ([start] [settings] [control panel] [system] [hardware] [device manager]) shown in Figure 17.

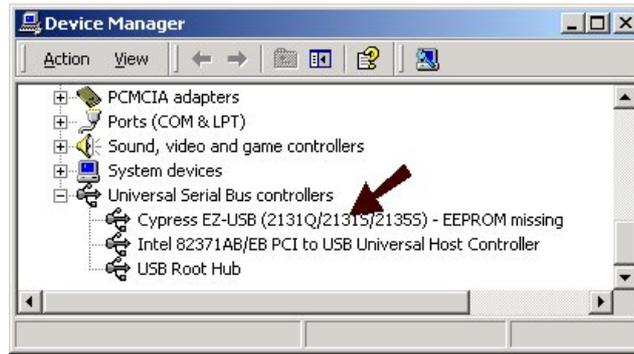


Figure 17: Device manager entry

7.4 USB Driver Error

If case the Device Manager displays a warning sign (see Figure 18) re-install the driver by double-clicking the device and selecting "Update Driver" as shown in Figure 19.



Figure 18 USB Driver was not installed correctly.

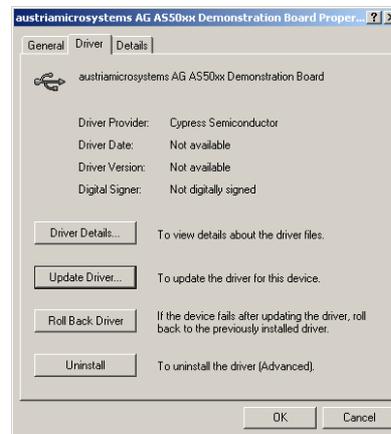


Figure 19 Update of the Driver in Case of Errors.

Re-install the drivers by specifying the path to the "ezusbw2k.inf" as described in section 3.2.2. (Default directory C:\program files\ austriamicrosystems AG\AS5046_DemoBoardSW_x.x).

Note that you will only find the device listed in the Device Manager when the demo board is connected!

7.5 Hardware and software compatibility

Every AS50xx demoboard is designed to read or program all kinds of externally connected encoders (e.g. a AS5040 demoboard is capable of programming AS5035, -40, - 43, -45 and - 46 as well). Due to the variety of encoder – demoboard – software combinations it is advisable to cross-check the setup with application note "AS5000 Hardware / Software Compatibility".

8 Revision History

Revision	Date	Description	
1.0	22-Mai-2007	Initial Creation	

9 Contact

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