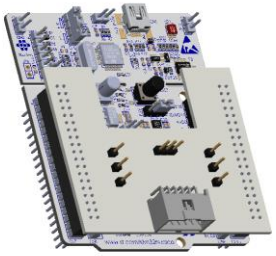
HEDS-9922PRGEVB

Magnetic Encoder IC Programming Kit



Programming Kit Notes

1. Introduction

1.1 Description

AEAT-9922 is an angular magnetic rotary sensor that provides accurate angular measurement over a full 360 degrees of rotation.
It is a sophisticated system that uses integrated Hall sensor elements with complex analog and digital signal processing within a single device. A simple two-pole magnet generates the necessary magnetic field by rotating it in perpendicular. Wide magnetic field sensor configurations allow On Axis (end of shaft) or Off Axis (side of shaft) modes in application. The Broadcom AEAT-9922 is a versatile solution capable of supporting a broad range of applications with its robust architecture to measure and deliver both absolute and incremental signals.
The absolute angle measurement provides an instant indication of the magnet's angular position with a selectable and one-time programmable resolution from 10 to 18 bits.

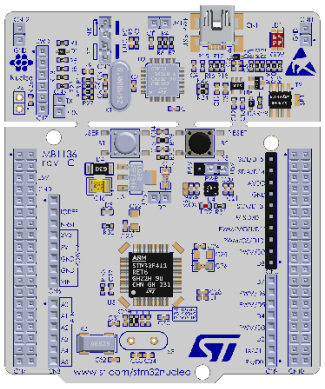
When selected, its positioning data is then represented in its digital form to be assessed through a standard SSI (parity) and SPI (with CRC and Parity option) communication protocol.
Where desired, users may also choose to receive its absolute angle position in PWM-encoded output signals (with CRC).
The incremental positions are indicated on ABI and UVW signals with wide user configurable resolution from 1CPR and up to 10,000CPR.of ABI signals and pole pairs from 1 to 32pole pairs (2 to 64 poles) for UVW commutation signals.

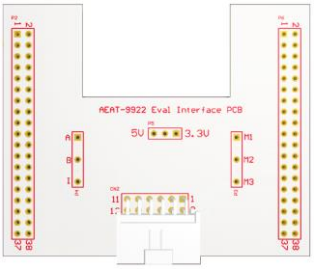
For ease of setup, Broadcom has made available development tools to perform the calibration process without other measurement equipment. These **Programming Kits** can be ordered through the normal Broadcom Sales Channels.

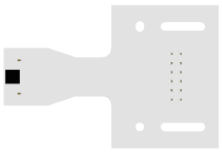
1.2 Programming Kit content

The programming kits include following items:

- STM32-Nucleo 64 Programming Board x1
- AEAT-9922 Interface Board x1
- AEAT-9922 Eval Board x2
- 6mm(d) x 2.5mm(h) Dipole magnet
- 12-pin ribbon cable
- Micro USB cable



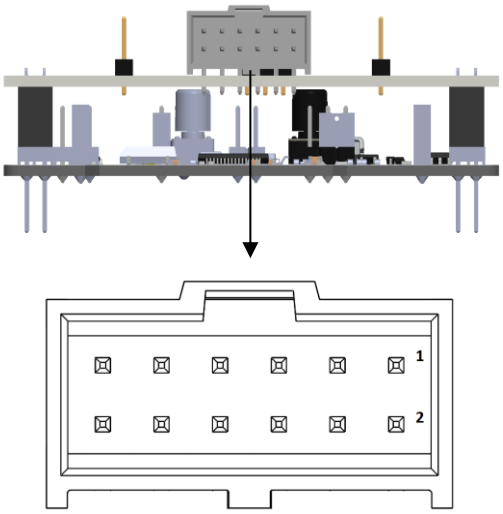




2. Programming kit pin-out

Figure below shows the pin assignment for each I/O port.

Pin	Description	Function
1	A	Incremental signal A
2	B	Incremental signal B
3	VSS	Supply Ground
4	VDD	Supply Input
5	I	Incremental signal Index
6	MSEL	Mode Selection
7	M2	I/O pad. Refer to MATS table
8	M3	I/O pad. Refer to MATS table
9	M0	I/O pad. Refer to MATS table
10	M1	I/O pad. Refer to MATS table
11	VDDA	Supply Input
12	VSSA	Supply Ground



MATS Table

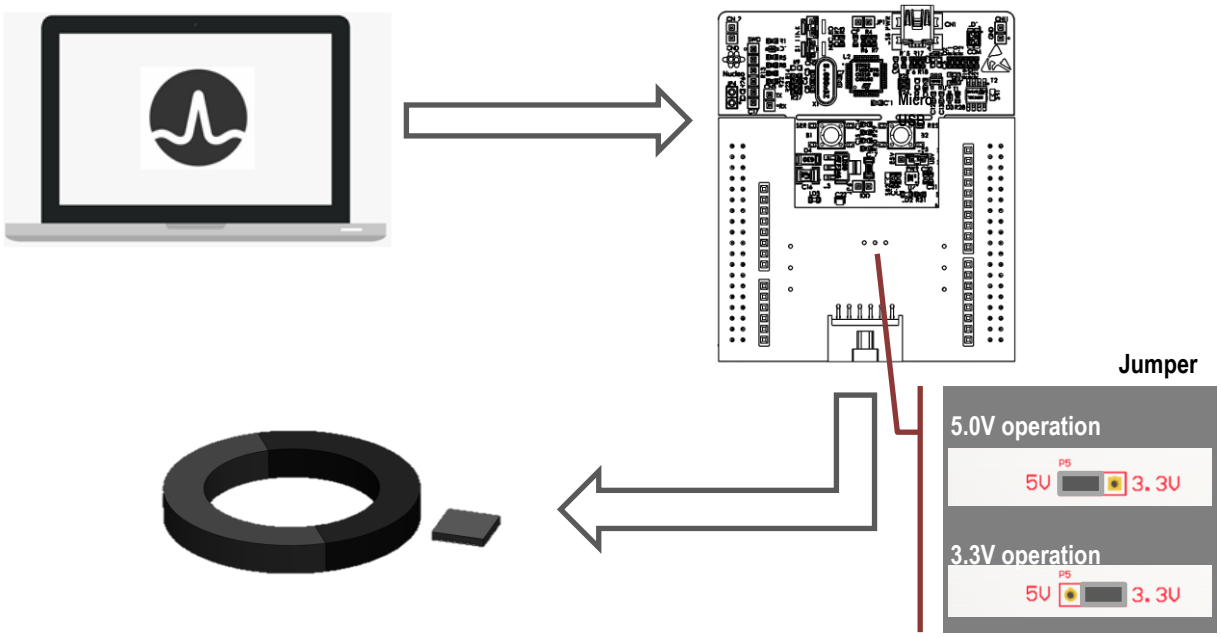
Mode / Pin	SPI-3	SSI-3 (A)	SSI-3 (B)	SSI-2 (A)	SSI-2 (B)	SPI-4 (A)	SPI-4 (B)	UVW	PWM
MSEL	0	0	0	0	0	1	1	1	1
PSEL[1]	x	x	x	x	x	0	0	1	1
PSEL[0]	x	0	1	0	1	0	1	0	1
M0	0	1	1	1	1	NCS	NCS	ERR	ERR
M1	DIN	NSL	NSL	0	0	MOSI	MOSI	V	-
M2	SCK	SCL	SCL	SCL	SCL	SCK	SCK	U	-
M3	DO	DO	DO	DO	DO	MISO	MISO	W	PWM

NOTE PSEL[1], PSEL[0] is configure through memory

MSEL, M0, M1, M2, M3 is configure through IO pads

Hardware Setup

1. Connect the STM32-Nucleo to PC via USB port
2. Connect 12-pin ribbon cable; one end to Interface board; the other to encoder.
3. Select the operating voltage of sensor by connecting the jumper either to 3.3V or 5V.



Program Installation

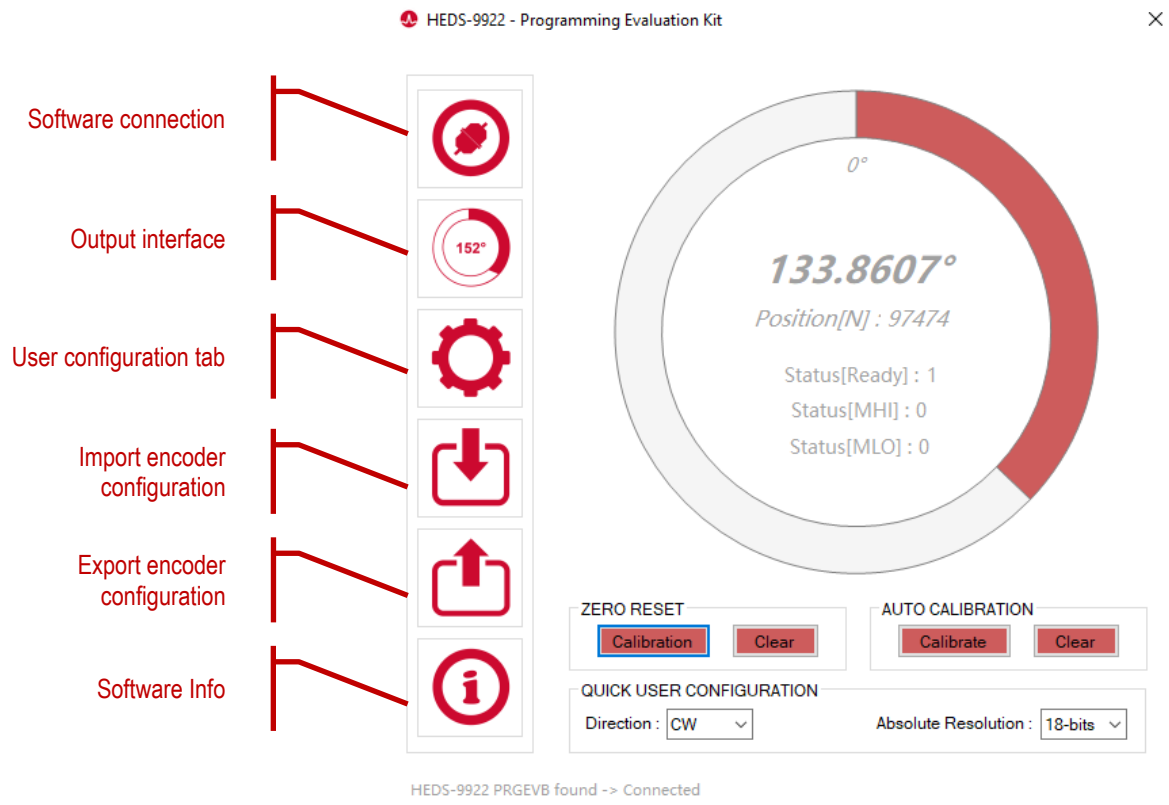
The installation software for the Programming Kit available in the USB drive provided. To install the application software, double-click the software **AEAT-9922 Programming Kit Appication Ver x.x.x.msi** and follow the on-screen instructions to finish the installation.

After the installation is complete, the program is available in the selected working directory.

NOTE The software is for PCs running on the Windows operating system. The minimum requirements are Window 10 64-bit operating system.

User interface of calibration software

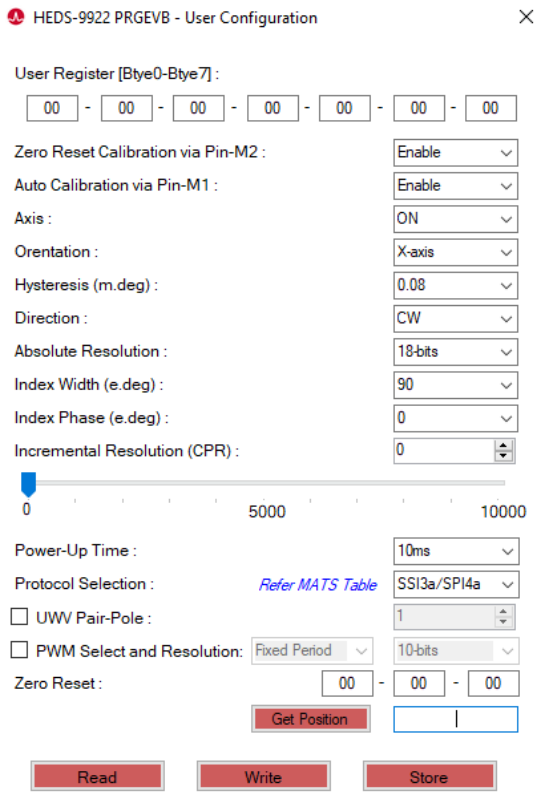
Main Tab



Functional description of each button is as follows:

Name	Description
Software connection	Enable software connection to board
Output interface	Toggle between Fix mode and Chart mode
User configuration tab	Configure
Import encoder configuration	Recall encoder configuration from saved file
Export encoder configuration	Save existing encoder configuration to file
Software Info	Software revision
Zero Reset	Calibrate : Reset single-turn position Clear : Erase reset data
Auto Calibration	Calibrate : Initiate calibration sequence Clear : Erase calibration data
Direction	Select the counting direction with respect to magnet turning
Absolute resolution	Select the absolute resolution

User Configuration Tab



Functional description of each button is as follows:

Name	Description
User Register [Byte0-Byte7]	User programmable memory
Zero Reset Calibration via M2	Enable calibration through hardware pin **M1**
Auto Calibration via M1	Enable calibration through hardware pin **M2**
Axis	Select **On-Axis** or **Off-Axis**
Orientation	Select the Off-Axis orientation
Hysteresis	Select the Incremental hysteresis
Direction	Select the counting direction with respect to magnet turning
Absolute Resolution	Select the absolute resolution
Index Width	Select the Index width
Index Phase	Select the Index location
Incremental Resolution (CPR)	Select the incremental resolution
Protocol Selection	Select the protocol per MATS table
UVW Pair-Pole	Select the UVW pole-pair resolution
PWM Select Resolution	Select the PWM type and resolution
Zero Reset	Input single-turn offset value

NOTE "Read" encoder configuration from memory and "Write" the configuration into memory after selection. "Store" configuration in memory to be available on the next power up.

Calibration Process

Once the encoder is assemble (SMT) to PCB, mount to the motor system with magnet setup per data sheet.

- Encoder configuration can be loaded before or after calibration.
- Perform Auto-calibration followed by Zero Reset.

Auto-Calibration

1. Rotate the magnet at a constant-speed (any direction)
    a. Constant speed range is between 10RPM to 2000RPM
2. Once the speed stabilize, initiate the calibration sequence by
    a. Software
        i. SPI commands via PC software interface
        ii. Calibration status will display once complete.
    b. Hardware
        i. Send High pulse >50ms to I/O pin M1.
        ii. Calibration status will be displayed on A B I pin
3. Calibration data is automatically saved in memory at the end of the sequence.

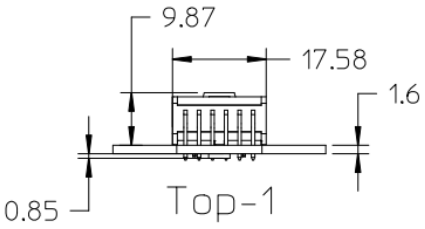
Zero Reset Calibration

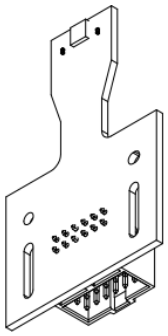
1. Stop the magnet at reset position
2. Initiate the reset calibration sequence by
    a. Software
        i. SPI commands via PC software interface
        ii. Calibration status will display once complete.
    b. Hardware
        i. Send High pulse >50ms to I/O pin M2.
        ii. Calibration status will be displayed on A B I pin
3. Calibration data is automatically saved in memory at the end of the sequence.

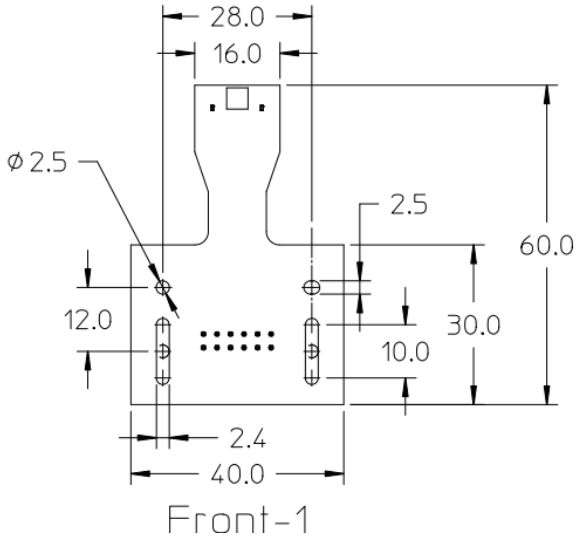
NOTE For a detailed description of each of the parameters, refer to the data sheet and application note.

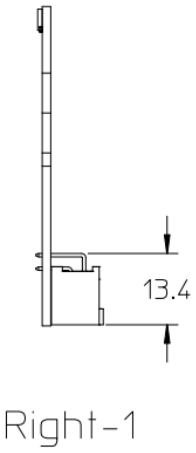
Mechanical Dimension

AEAT-9922 Evaluation Board









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