

**1. GENERAL DESCRIPTION**

The SENIS® Fast Magnetic Angle Sensor (FAMAS) SENA2Dx is an integrated magnetic field sensor which measures the in-plane orientation of a magnetic field, such as that of a permanent magnet attached on-axis to a rotating shaft. The integrated signal processing circuit works as a servo loop and tracks the magnetic position digitally. Thus, the angular position of the magnetic field, the direction of rotation and the angular velocity are available within less than 1  $\mu$ s.

There are three modes of operation available - fast, balanced and high resolution – to offer optimal performance for the required application.

Apart from its fast response the proprietary measurement principle of FAMAS offers unprecedented accuracy for all angles as well as multi-turn capability. In contrast to most common analog angle sensors FAMAS does not require any linearization of its signals for accurate sensing. The measurement has a highly linear response by default with a digital output. Therefore, no external ADC's or angle calculations are needed, saving cost and space, as well as time.

FAMAS is linear over a very high field range, offering low as well as very high magnetic field detection.

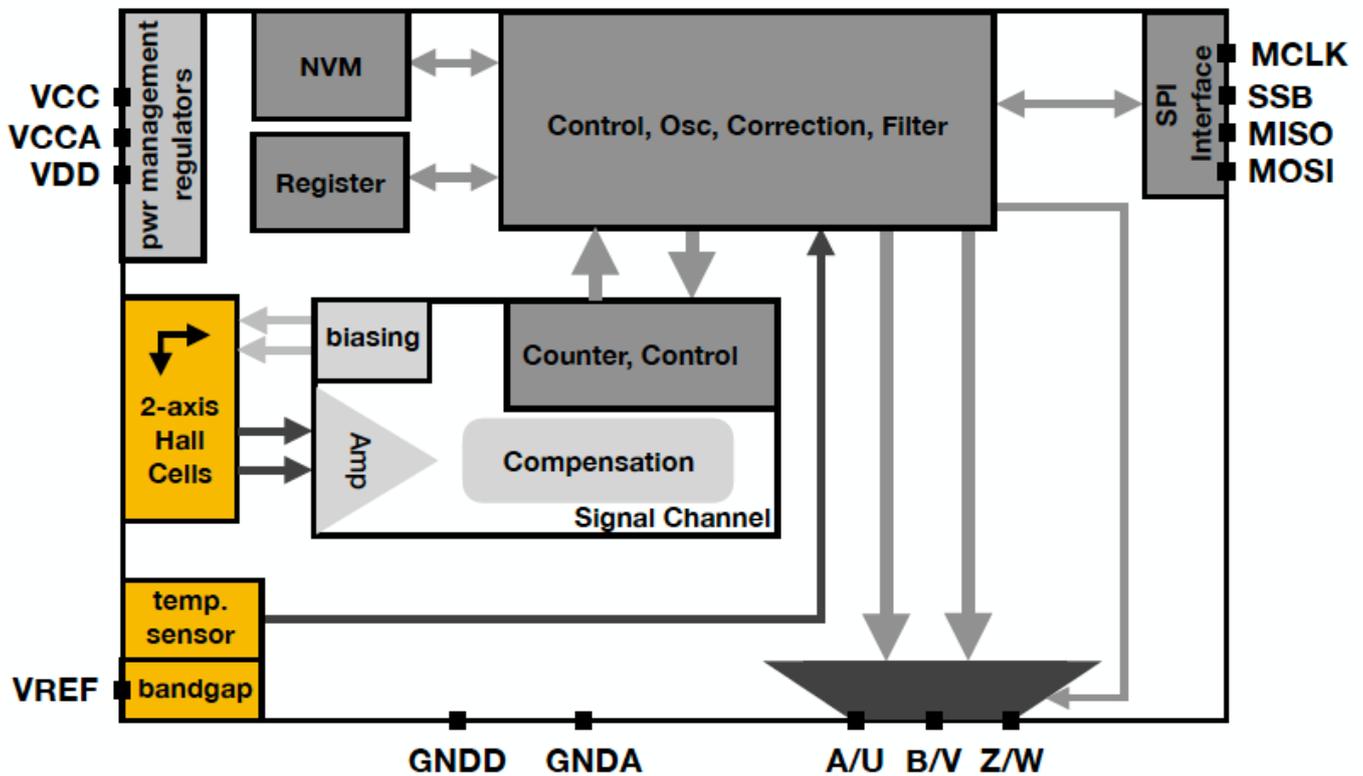
By default, FAMAS sensor offers 3 different communication outputs: SPI, Quadrature interface with index and UVW. Using only one additional frequency converter for example, the digital output of FAMAS can be easily converted into a proportional analog signal if required with no loss of its outstanding performance. This makes FAMAS ideally suited as a more robust and direct replacement for traditional analog angle sensors.

**NOTE:** For detailed information see the SENA2Dx datasheet.

TYPICAL APPLICATIONS:	FEATURES:
<ul style="list-style-type: none"> <li>▪ Digital angular sensor, 0–360°</li> <li>▪ Incremental angular encoder</li> <li>▪ Fast measurement of the small rotational movements</li> <li>▪ BLCD motor control</li> <li>▪ Robotics (actuator control)</li> <li>▪ Rotational speed control</li> <li>▪ Steering-angle detection</li> <li>▪ Industrial sewing machines</li> <li>▪ Sawing machines</li> </ul>	<ul style="list-style-type: none"> <li>▪ Proprietary Hall based measurement with direct angle-to-digital conversion</li> <li>▪ Extremely stable and robust against external disturbance and positioning errors</li> <li>▪ Direction, angle and rotation speed of the magnetic field, from DC up to 400 krpm</li> <li>▪ Direct angle information, no external ADC or angle calculations required</li> <li>▪ High angular resolution, i.e. 0.088°</li> <li>▪ Fast response time, less than 1<math>\mu</math>s</li> <li>▪ On-chip Offset, Sensitivity and Temperature correction</li> <li>▪ Permanent configuration programming possible by inbuilt non-volatile memory</li> <li>▪ Outputs: SPI, Quadrature interface with Index (ABZ) or AqB, UVW</li> <li>▪ Commutation signals UVW configurable for 2, 4, 6 and 8 pole magnets</li> <li>▪ Low magnetic field detection</li> </ul>



## 2. BLOCK DIAGRAM



## 3. SENSOR OUTPUT

SENA2Dx sensors provides the following three outputs:

- SPI, digital output
- Quadrature interface with Index (ABZ)
- UVW output

One powerful feature of this sensor is the direct digital information on the measured angle, so there is no need for an external analog-to-digital converter (ADC), nor for any external electronic circuitry required for the calculation of the angle.

Some examples of the integration of SENA2Dx in a customer's data acquisition system are listed below:

### 3.1 Analog Output - AqB to Frequency Converter

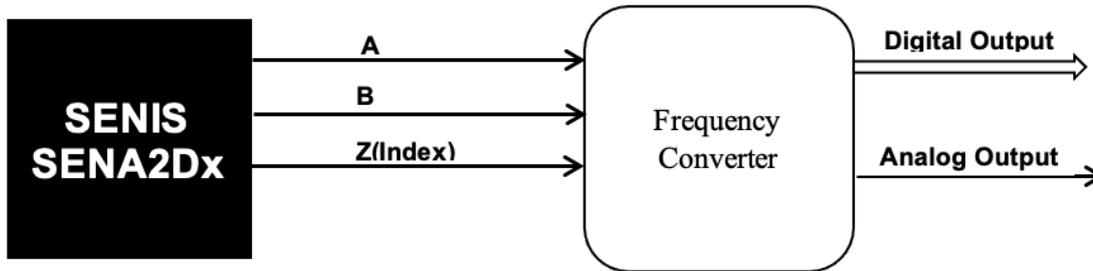


Figure 1: SENA2Dx AqB to Analog Conversion through a Frequency Converter to get the analog voltage proportional to the angle

The output pulses A and B from SENA2Dx are connected to a Frequency Converter, which converts the A and B quadrature output into a voltage that is proportional to the measured angle (i.e., to the encoder position).

### 3.2 Digital Output - AqB to Quadrature Counter

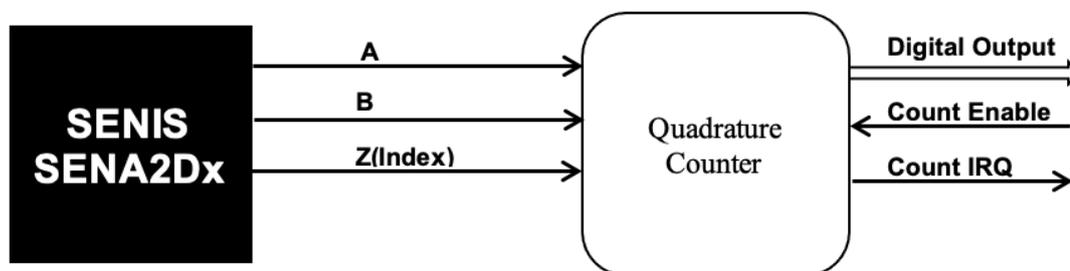


Figure 2: SENA2Dx AqB to Digital Conversion through a Quadrature Counter to get the direction and count enable signals

The output pulses A and B from SENA2Dx are connected to the decoded input of a Quadrature Counter and is then converted to a non-quadrature, up/down, free running counter (no need for an Analog-to-Digital Converter).

### 3.3 Digital Serial Interface - SPI to Microprocessor

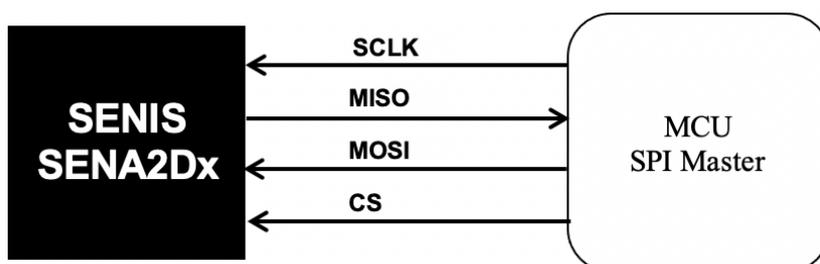


Figure 3: SENA2Dx Connection to a Microprocessor via SPI in a Master-Slave Configuration