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1. Sensor Board Details

Table 1. Sensor Characteristics

Design ID	Design Type	Single / High Res / Redundant	Number of Pole Pairs	PCB Size [mm]	Coil Size DOUT / DIN [mm]	Target Size DOUT / DIN [mm]	Air Gap (Nominal) [mm]	Accuracy (Nominal) [deg mech.]
RAA2P3500R0100ABI	Rotary	Single	1	45 x 45	34 / 13	35 / 12	1.50	±0.121

Table 2. Chip Characteristics

Chip	Coil Type	Interface	Internal Resolution
RAA2P3500	Single Coil	ABI	14 Bit

1.1 Test Conditions

- Measurements are done in a lab environment at room temperature.
- The supply voltage level is 5V supplied by the measurement Hardware (VDD = 5V)
- The nominal accuracy is measured @ nominal air gap.
- Inductance and the DC resistance of the TX coil are measured using a Smart Tweezer ST5S LCR Meter.

1.2 Tx Coil and Frequency Parameters

Set C_{TX} transmit frequency between 2.2 and 5.6 MHz. To ensure a high-quality factor, a NP0 capacitor was used. F_{TX} was measured by the RAA2P3500 itself.

Table 3. Sensor Characteristics

L_{TX}	R_L	C_{TX}	F_{TX} meas.
2.0 μ H	1.3 Ω	1100 pF	3.22 MHz

1.3 Calibration Register Settings

The registers up to 0x32 are for the general operation of the chip.

0x34 to 0x6E contain the offset compensation, linearization and zero point.

Registers in the row 0x70 control options for the upper and lower limits of the magnitude and the position range.

The last row contains customer IDs and spare bits and the CRC checksum at 0x8E.

Table 4. Registers Dump

	0x00	0x02	0x04	0x06	0x08	0x0A	0x0C	0x0E
0h	0x10E0	0x0080	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
10h	0x0000	0x0000	0x0000	0x00DC	0x0000	0x0FFF	0x0207	0x0180
20h	0xC401	0x0800	0xEE0A	0x0000	0x0000	0x0000	0x0000	0x1580
30h	0x8075	0x0000	0x4000	0x4000	0x0000	0x0000	0x039B	0x0000
40h	0xF0D4	0xA51A	0x3D82	0xA4E0	0x815F	0x7DA6	0x58F1	0xA799
50h	0xB04A	0x5C16	0xF9CE	0xF5BD	0xD0D1	0xA31A	0x3D42	0x44DF
60h	0x8B60	0x7DE6	0xF8F9	0xB499	0xB10A	0x1C20	0x09CF	0xF5EE
70h	0x0FFF	0x1000	0x0FFF	0x0000	0x0000	0x07A0	0x3FFF	0x0666
80h	0x0000	0x0000	0x0001	0x0000	0x0000	0x0000	0x0000	0x0C99

1.4 Sensor Board

Figure 1. displays the sensor board layout, consisting of one transmitter coil, two receiver coils, the RAA2P3500 and additional passive components.

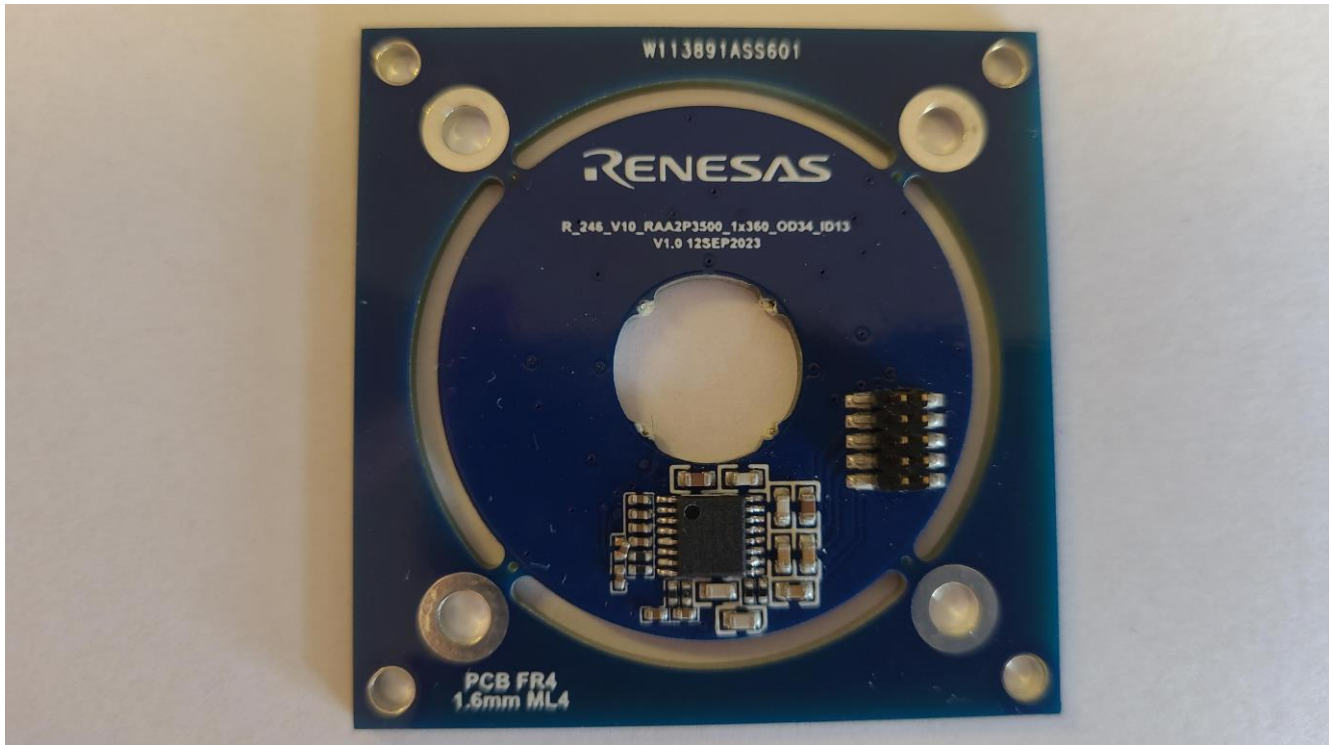


Figure 1. Sensor Board

1.5 Sensor Target

Figure 2. displays the target used during the measurements.



Figure 2. Sensor Target

2. Measurement Setup

2.1 General

All measurements were performed on a 4-axis positioning test bench. During the measurement, the target was moved to a defined position. The rotor position read from the sensor is compared to the rotor position measured by high precision reference encoder.

$$f_{mechanical} = \text{real sensor position} - \text{ideal position value}$$

2.2 Design-Specific Test Setup

Figure 3. displays the test setup, the sensor board and target are mounted on the 4-axis positioning test bench.

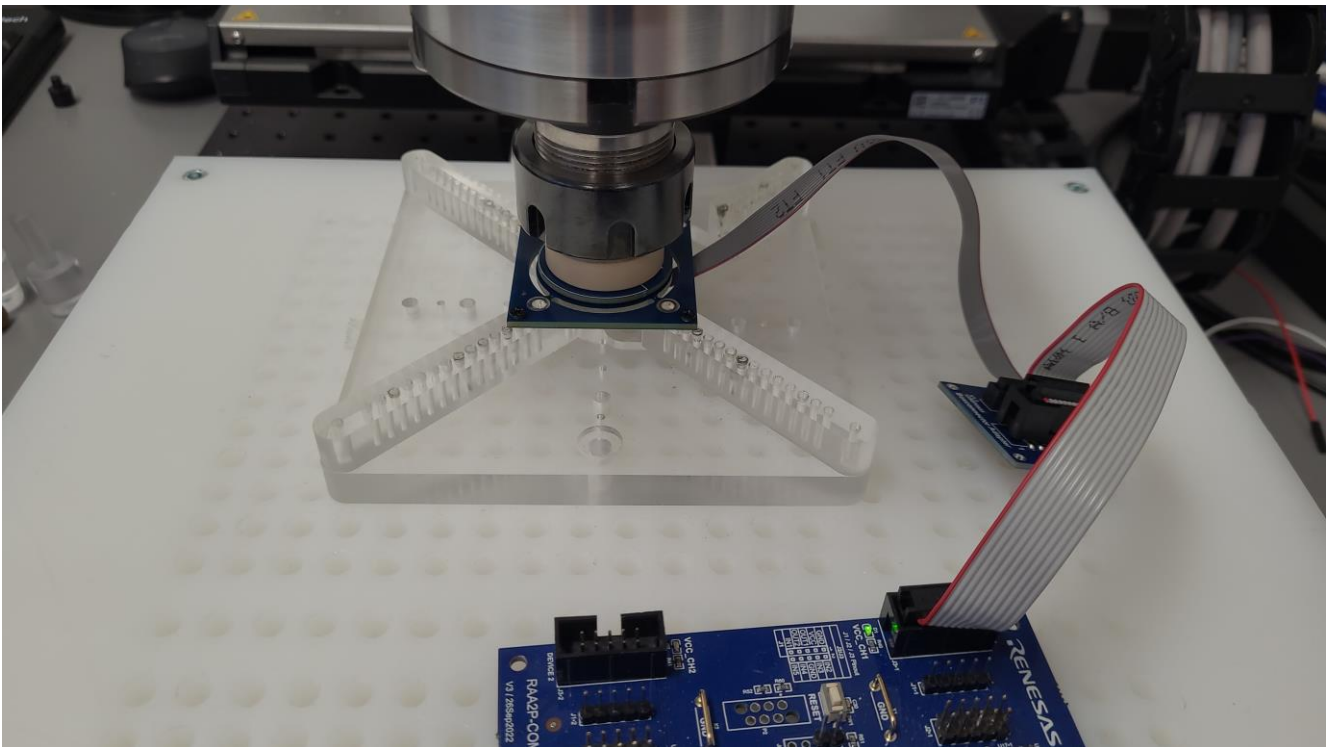


Figure 3. Setup

3. Measurement Results

3.1 Angle Error Primary Coil

The coil offset was compensated without target, then the design was linearized at nominal position. The plot below displays the error of the primary angle measured over the given positions. Measurements are done with the memory settings, as shown in Table 4.

Note: Line Chart Naming: X_ . ____ Y_ . ____ AG_ . ____

- X = radial displacement in mm
- Y = radial displacement in mm
- AG = Air Gap in mm

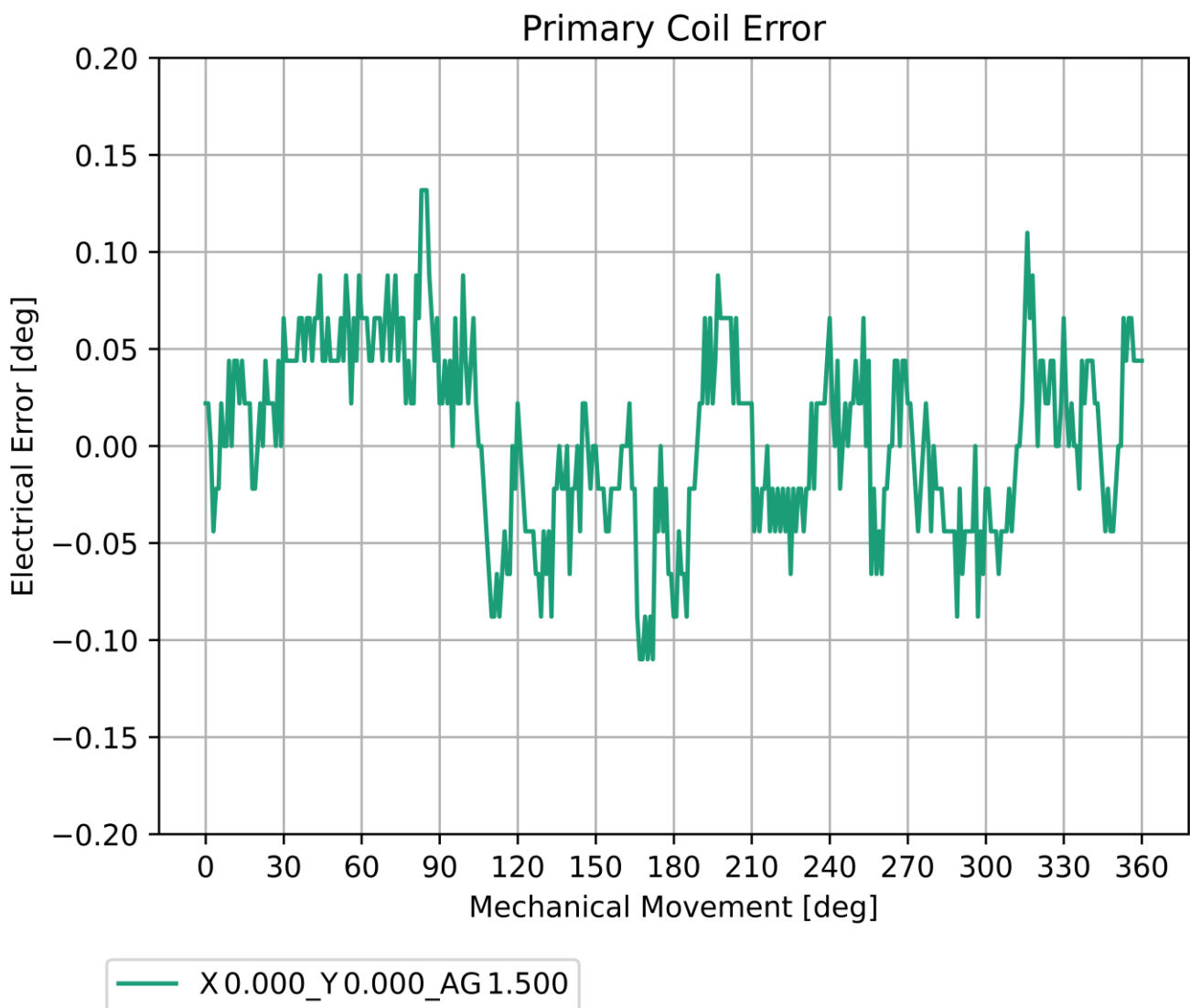


Figure 4. Primary Coil Error

3.2 Magnitude Primary Coil

The plot below displays the primary magnitude measured over the given positions. Measurements are done with the memory settings, as shown in Table 4.

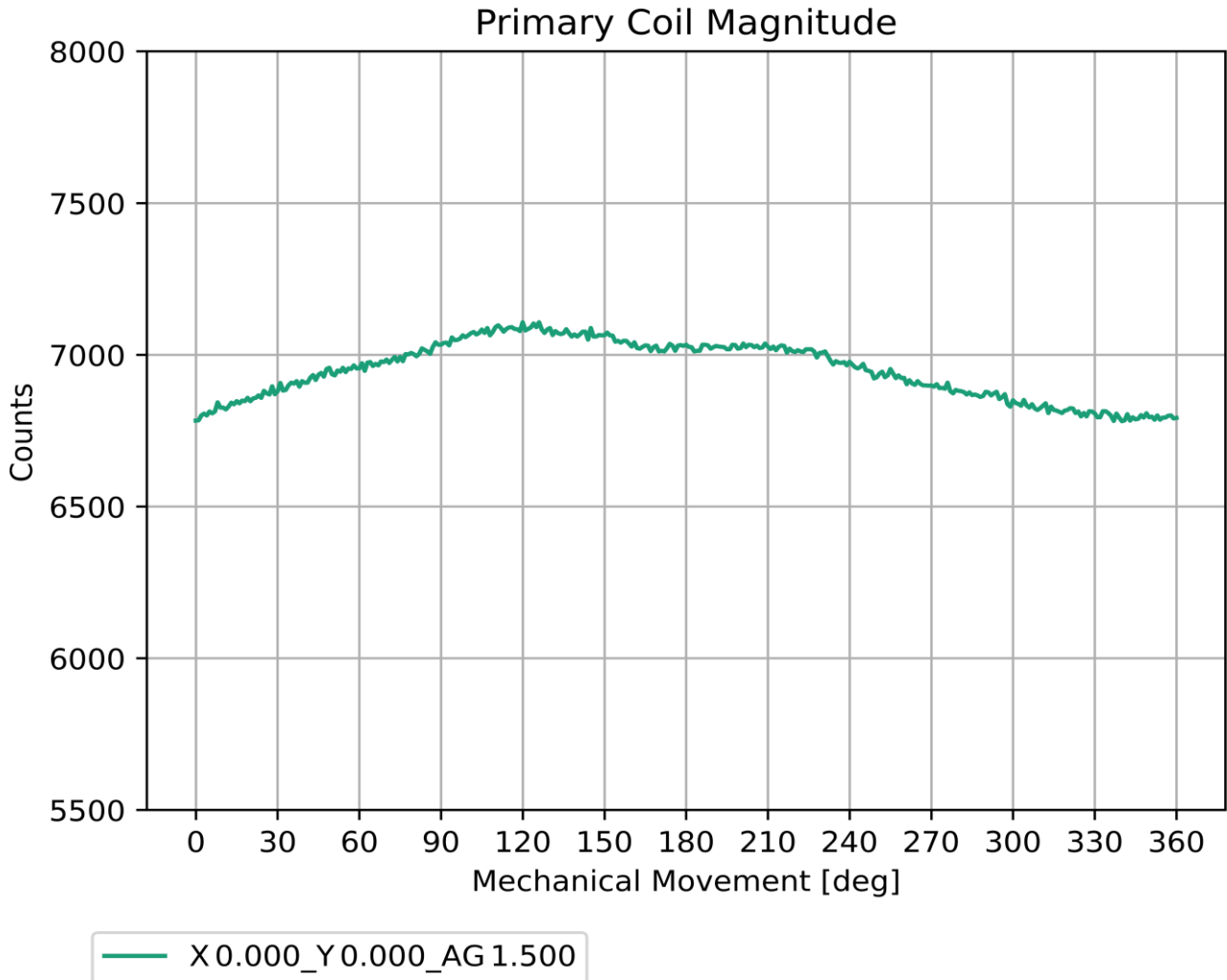


Figure 5. Primary Coil Magnitude

3.3 Gain Primary Coil

The plot below displays the primary coil gain setting measured over the given positions. Measurements are done with the memory settings, as shown in Table 4.

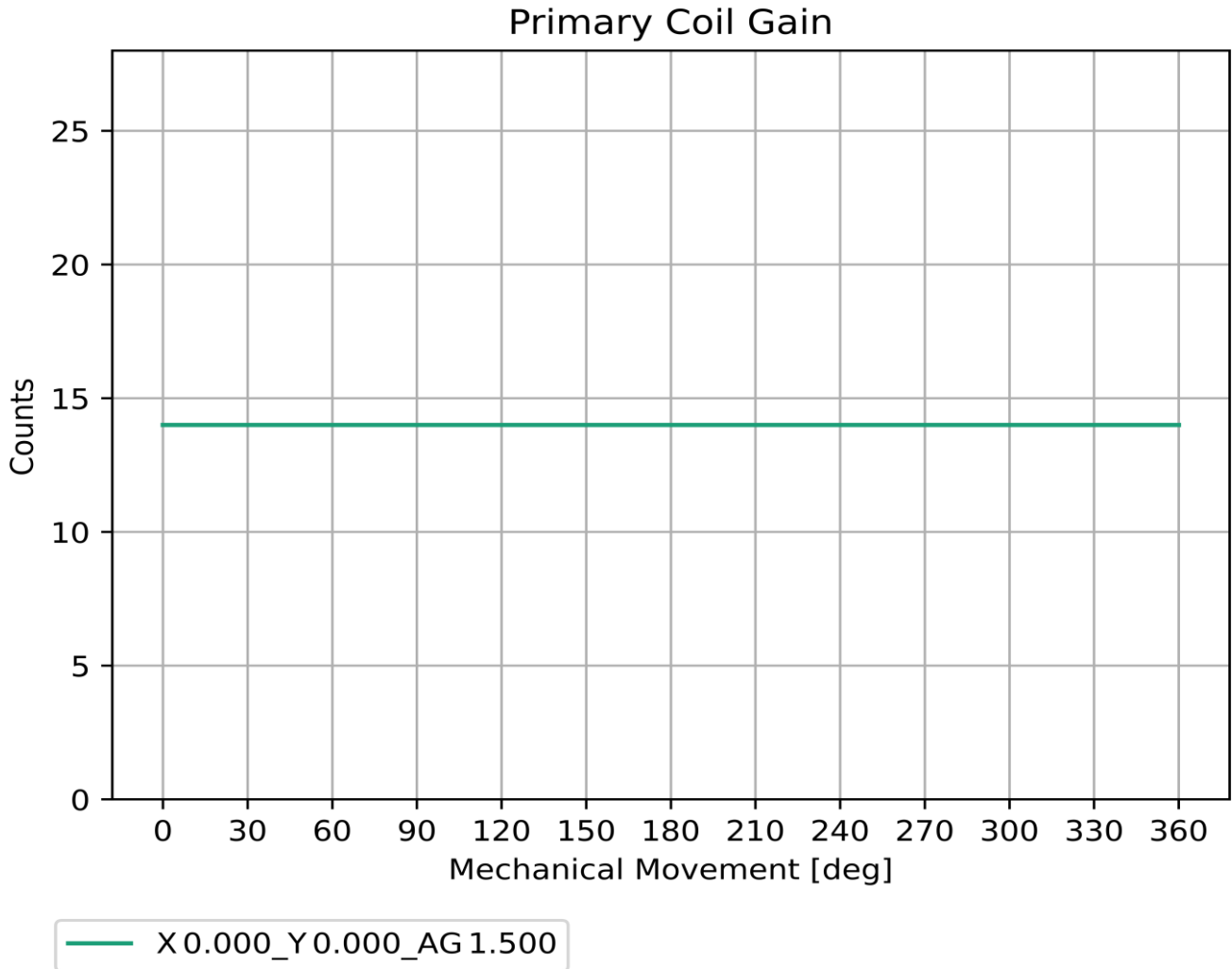


Figure 6. Primary Coil Gain

4. Revision History

Revision	Date	Description
1.0	Feb. 24, 25	Initial release.