

TRIM REGISTER SETTINGS

There are five different settings for the sensor to initialize: **MBIT**, **BIAS**, **BPA**, **Pullup (PU)** and **CLK**. During calibration Heimann is storing the calibration settings in the EEPROM (please see datasheet for more information and EEPROM map).

MBIT

Where to find: Trim register 1, bits 0...3 and for setting the REF_CAL value, bits 4 and 5.

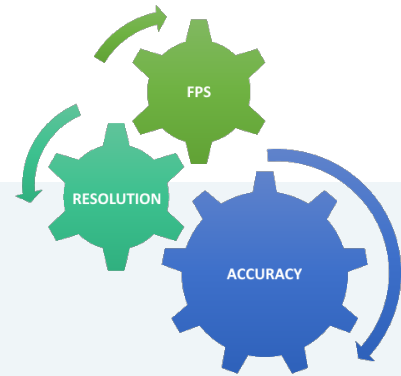
What it changes: The REF_CAL value selects the amplification. For more information, please see the table below or the datasheet. A higher REF_CAL value leads to a higher amplification and improved resolution. REF_CAL=0b11 is increasing drastically the noise and is not recommended to be used.

The MBIT parameter defines the ADC resolution and can be set from 4 to 12. The resolution is given by the formula:

$$\text{ADC resolution [bits]} = m + 4$$

Reducing the MBIT value increases the frame rate (FPS), but degrades the temperature resolution. The loss in temperature resolution doubles with each decrement in resolution. For example:

Bits set to 0b1100 = 0d12 = 12+4 bit = 16-bit resolution.



For a correct temperature calculation, an image without pattern and higher noise, we strongly recommend using the setting the sensor was calibrated with.

| PARAMETER | SYMBOL | CONDITION | TYPICAL | UNIT |
|--------------------|------------|------------|---------|------|
| ADC pos. Reference | V_{REFP} | REF_CAL 00 | 1.529 | V |
| | | REF_CAL 01 | 1.442 | |
| | | REF_CAL 10 | 1.355 | |
| | | REF_CAL 11 | 1.268 | |
| ADC neg. Reference | V_{REFN} | REF_CAL 00 | 0.850 | V |
| | | REF_CAL 01 | 0.901 | |
| | | REF_CAL 10 | 0.968 | |
| | | REF_CAL 11 | 1.056 | |

BIAS

Where to find: Trim register 2 (top half) and Trim register 3 (bottom half), bits 0...3

What it changes: The BIAS setting adjusts the BIAS current of the ADC. Reducing this will lead to a lower current consumption, but the sensor will not be sensitive below a certain point. Increasing this value increases the current consumption and the noise above a certain level.

The value can be set from 0b0...0b31, in order to change the current from 1 μ A to 13 μ A. This is resulting in a change of 0.375 μ A / bit.

BPA

Where to find: Trim register 5 (top half) and Trim register 6 (bottom half), bits 0...4

What it changes: The BPA is setting the current of the internal amplifiers. Reducing this will lead to a lower current consumption, but the sensor will not be sensitive below a certain point. Increasing this value increases the current consumption and the noise above a certain level.

The value can be set from 0b0...0b31 in order to change the current from 0.2 μ A to 4 μ A. This is resulting in a change of 0.11875 μ A / bit.

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PU

Where to find: Trim register 7 (top half), bits 0...3 for SCL and bits 4...7 for SDA

What it changes: The PU value changes the internal pullup resistor on SCL and SDA.

The value can set to the following values:

“1000” = 100 kOhm; “0100” = 50 kOhm; “0010” = 10 kOhm;
“0001” = 1 kOhm

We recommend to use 100 kOhms, in order to have the lowest level of noise in the image.

CLK

Where to find: Trim register 4, bits 0...5

What it changes: The CLK value changes the clock frequency of the sensor.

The value can be set from 0b0...0b63, in order to change the clock frequency from 1MHz to 13MHz. This is resulting in a change of 0.1875MHz / bit.

The measure time depends on the clock frequency settings. One quarter frame takes about:

$$t_{FR4} = \frac{32 \cdot (2^{MBIT} + 4)}{F_{CLK}} \approx 27ms @ 5MHz$$