

# Erriez Half step Rotary Encoder

1.0.1

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## Chapter 1

# 3 speed Rotary Encoder Half Step library for Arduino

This is an optimized three speed Rotary Encoder library for Arduino which supports:

- Half step Rotary Encoder types.
- Detect three rotation speeds.
- Configurable rotation speed sensitivity.
- Polling and interrupt based.
- Single or multiple Rotary Encoders.
- Optional Rotary button.
- Pin state table in flash.

### Half step / half step Rotary Encoders

The difference between a half step or half step Rotary Encoder type is how the data signals of the two pins are generated. It depends on the mechanical construction of the notches and contacts inside the Rotary Encoder.

Please refer to the [ErriezRotaryEncoderFullStep](#) library for full step Rotary Encoders. Experiment with the full step and half step libraries which works optimal for your Rotary Encoder.

### Hardware

Connect the two rotary pins to the DIGITAL pins of an Arduino board.

A third rotary button pin is not used in the Rotary library, but can be used in the sketch.

Tested with Arduino IDE v1.8.5 on hardware:

- Arduino UNO
- Arduino Nano
- Arduino Micro
- Arduino Pro or Pro Mini
- Arduino Mega or Mega2560
- Arduino Leonardo
- WeMos D1 R2 & mini (ESP8266)

## Interrupts

Both rotary pins must be connected to a DIGITAL pin with interrupt support, such as `INT0` or `INT1`. This is chip specific. Please refer to the documentation of your board or `attachInterrupt()`.

### Arduino UNO hardware

The connection below can be used for polled and interrupts. An optional button pin can be connected to DIGITAL pin 4.

Rotary pin	Arduino UNO/NANO/Mega2560/Leonardo board
1	DIGITAL pin 2 (INT0)
2	DIGITAL pin 3 (INT1)
Button (optional)	DIGITAL pin 4
GND	GND

### Arduino WeMos D1 R2 & mini (ESP8266) hardware

Note that some ESP8266 pins mixes ESP8622 GPIO pins with Arduino digital pins. Connect a Rotary Encoder to the following pins which can be used with polled and interrupt examples:

Rotary pin	ESP8622 pin	Text on board / WeMos D1 & R2
1	GPIO13	D7 (MOSI)
2	GPIO12	D6 (MISO)
Button (optional)	GPIO14	D5 (SCK)
LED (Not used)	GPIO2	D4
GND	GND	GND

**Note:** An external pull-up resistor is required when a pin does not have an internal pull-up.

```
1 {c++}
2 // Connect the rotary pins to the WeMos D1 R2 board:
3 #define ROTARY_PIN1      12
4 #define ROTARY_PIN2      13
5 #define ROTARY_BUTTON_PIN 14
```

## Examples

The following examples are available:

- Rotary | Interrupt | `InterruptHalfStepBasic`
- Rotary | Interrupt | `InterruptHalfStepButton`
- Rotary | Interrupt | `InterruptHalfStepCounter`
- Rotary | Polled | `PolledHalfStepBasic`
- Rotary | Polled | `PolledHalfStepButton`
- Rotary | Polled | `PolledHalfStepCounter`
- Rotary | Polled | `PolledHalfStepMultiple`

## Documentation

- [Doxygen online HTML](#)
- [Doxygen PDF](#)

## Usage

### Read rotary with polling

```

1 {c++}
2 #include <ErriezRotaryHalfStep.h>
3
4
5 // Connect rotary pins to the DIGITAL pins of the Arduino board
6 #define ROTARY_PIN1 2
7 #define ROTARY_PIN2 3
8
9 // Enable ONE of the three constructors below with different number of arguments:
10
11 // Initialize half step rotary encoder, default pull-up enabled, default
12 // sensitive=100
13 RotaryHalfStep rotary(ROTARY_PIN1, ROTARY_PIN2);
14
15 // Or initialize half step rotary encoder, pull-up disabled, default sensitive=100
16 // RotaryHalfStep rotary(ROTARY_PIN1, ROTARY_PIN2, false);
17
18 // Or initialize half step rotary encoder, pull-up enabled, sensitive 1..255
19 // A higher value is more sensitive
20 // RotaryHalfStep rotary(ROTARY_PIN1, ROTARY_PIN2, true, 150);
21
22 void loop()
23 {
24     int rotaryState = rotary.read();
25
26     // rotaryState = -3: Counter clockwise turn, multiple notches fast
27     // rotaryState = -2: Counter clockwise turn, multiple notches
28     // rotaryState = -1: Counter clockwise turn, single notch
29     // rotaryState = 0: No change
30     // rotaryState = 1: Clockwise turn, single notch
31     // rotaryState = 2: Clockwise turn, multiple notches
32     // rotaryState = 3: Clockwise turn, multiple notches fast
33 }

```

### Read rotary with interrupts

```

1 {c++}
2 #include <ErriezRotaryHalfStep.h>
3
4 // Connect rotary pins to Arduino DIGITAL pins with interrupt support:
5 //
6 // +-----+-----+-----+-----+
7 // |           Board           | DIGITAL interrupt pins |
8 // +-----+-----+-----+-----+
9 // | Uno, Nano, Mini, other 328-based | 2, 3 |
10 // | Mega, Mega2560, MegaADK         | 2, 3, 18, 19, 20, 21 |
11 // | Micro, Leonardo, other 32u4-based | 0, 1, 2, 3, 7 |
12 // +-----+-----+-----+-----+
13 //
14 #define ROTARY_PIN1 2
15 #define ROTARY_PIN2 3
16
17 // Enable ONE of the three constructors below with different number of arguments:
18
19 // Initialize half step rotary encoder, default pull-up enabled, default
20 // sensitive=100
21 RotaryHalfStep rotary(ROTARY_PIN1, ROTARY_PIN2);
22
23 // Or initialize half step rotary encoder, pull-up disabled, default sensitive=100
24 // RotaryHalfStep rotary(ROTARY_PIN1, ROTARY_PIN2, false);
25
26 // Or initialize half step rotary encoder, pull-up enabled, sensitive 1..255
27 // A higher value is more sensitive
28 // RotaryHalfStep rotary(ROTARY_PIN1, ROTARY_PIN2, true, 150);
29
30 void setup()

```

```
31 {
32   // Initialize pin change interrupt on both rotary encoder pins
33   attachInterrupt(digitalPinToInterrupt(ROTARY_PIN1), rotaryInterrupt, CHANGE);
34   attachInterrupt(digitalPinToInterrupt(ROTARY_PIN2), rotaryInterrupt, CHANGE);
35 }
36
37 void rotaryInterrupt()
38 {
39   int rotaryState = rotary.read();
40
41   // rotaryState = -3: Counter clockwise turn, multiple notches fast
42   // rotaryState = -2: Counter clockwise turn, multiple notches
43   // rotaryState = -1: Counter clockwise turn, single notch
44   // rotaryState = 0: No change
45   // rotaryState = 1: Clockwise turn, single notch
46   // rotaryState = 2: Clockwise turn, multiple notches
47   // rotaryState = 3: Clockwise turn, multiple notches fast
48 }
```

## Library dependencies

- None.

## Library installation

Please refer to the [Wiki](#) page.

## Other Arduino Libraries and Sketches from Erriez

- [Erriez Libraries and Sketches](#)



## Chapter 2

# Class Index

### 2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

<a href="#">RotaryHalfStep</a>	
Half step Rotary Encoder class . . . . .	<a href="#">9</a>



## Chapter 3

# File Index

### 3.1 File List

Here is a list of all documented files with brief descriptions:

<a href="#">ErriezRotaryHalfStep.cpp</a>	
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# Chapter 4

## Class Documentation

### 4.1 RotaryHalfStep Class Reference

Half step Rotary Encoder class.

```
#include <ErriezRotaryHalfStep.h>
```

#### Public Member Functions

- [RotaryHalfStep](#) (uint8\_t pin1, uint8\_t pin2, bool pullUp=true, uint8\_t sensitivity=100)  
*Constructor half step Rotary Encoder.*
- int [read](#) ()  
*Read Rotary Encoder state.*
- void [setSensitivity](#) (uint8\_t sensitivity)  
*Set sensitivity value.*
- uint8\_t [getSensitivity](#) ()  
*Get sensitivity value.*

#### 4.1.1 Detailed Description

Half step Rotary Encoder class.

Definition at line 41 of file ErriezRotaryHalfStep.h.

#### 4.1.2 Constructor & Destructor Documentation

##### 4.1.2.1 RotaryHalfStep::RotaryHalfStep ( uint8\_t pin1, uint8\_t pin2, bool pullUp = true, uint8\_t sensitivity = 100 )

Constructor half step Rotary Encoder.

#### Parameters

<i>pin1</i>	Rotary Encoder pin 1
<i>pin2</i>	Rotary Encoder pin 2
<i>pullUp</i>	true: Enable internal pull-up on Rotary Encoder pins [default argument]. false: Disable internal pull-up on Rotary Encoder pins.
<i>sensitivity</i>	Set sensitivity rotation speed value 0..255. A higher is more sensitive for rotation speed, a smaller value is less sensitive or will disable speed detection. Default is 100.

Definition at line 84 of file ErriezRotaryHalfStep.cpp.

### 4.1.3 Member Function Documentation

#### 4.1.3.1 `uint8_t RotaryHalfStep::getSensitivity ( )`

Get sensitivity value.

##### Returns

Sensitivity value 0..255.

Definition at line 175 of file ErriezRotaryHalfStep.cpp.

#### 4.1.3.2 `int RotaryHalfStep::read ( )`

Read Rotary Encoder state.

Call this function as fast as possible to prevent missing pin changes. This seems to work for most rotary encoders when calling this function within 10ms in an endless loop.

The sensitivity value is used to calculate three rotation speeds by measuring the speed of the Rotary Encoder pin changes. The rotation speed depends on the number of Rotary notches and knob size. The value should experimentally determined.

##### Returns

Rotary speed and direction -3: Counter clockwise turn, multiple notches fast -2: Counter clockwise turn, multiple notches -1: Counter clockwise turn, single notch 0: No change 1: Clockwise turn, single notch 2: Clockwise turn, multiple notches 3: Clockwise turn, multiple notches fast

Definition at line 115 of file ErriezRotaryHalfStep.cpp.

#### 4.1.3.3 `void RotaryHalfStep::setSensitivity ( uint8_t sensitivity )`

Set sensitivity value.

##### Parameters

<i>sensitivity</i>	Sensitivity value 0..255
--------------------	--------------------------

Definition at line 164 of file ErriezRotaryHalfStep.cpp.

The documentation for this class was generated from the following files:

- [ErriezRotaryHalfStep.h](#)
- [ErriezRotaryHalfStep.cpp](#)

## Chapter 5

# File Documentation

### 5.1 ErriezRotaryHalfStep.cpp File Reference

Three speed half step Rotary Encoder library for Arduino.

```
#include <pgmspace.h>
#include "ErriezRotaryHalfStep.h"
```

#### Macros

- #define `DIR_NONE` 0x00  
*No complete step yet.*
- #define `DIR_CW` 0x10  
*Clockwise step.*
- #define `DIR_CCW` 0x20  
*Counter-clockwise step.*
- #define `RHS_START` 0x00  
*Rotary half step start.*
- #define `RHS_CCW_BEGIN` 0x01  
*Rotary half step counter clock wise begin.*
- #define `RHS_CW_BEGIN` 0x02  
*Rotary half step clock wise begin.*
- #define `RHS_START_M` 0x03  
*Rotary half step start.*
- #define `RHS_CW_BEGIN_M` 0x04  
*Rotary half step clock wise begin.*
- #define `RHS_CCW_BEGIN_M` 0x05  
*Rotary half step counter clock wise begin.*

#### 5.1.1 Detailed Description

Three speed half step Rotary Encoder library for Arduino.

Source: <https://github.com/Erriez/ErriezRotaryEncoderHalfStep> Documentation↔  
: <https://erriez.github.io/ErriezRotaryEncoderHalfStep>

## 5.2 ErriezRotaryHalfStep.h File Reference

Three speed half step Rotary Encoder library for Arduino.

```
#include <Arduino.h>
```

### Classes

- class [RotaryHalfStep](#)  
*Half step Rotary Encoder class.*

### 5.2.1 Detailed Description

Three speed half step Rotary Encoder library for Arduino.

Source: <https://github.com/Erriez/ErriezRotaryEncoderHalfStep> Documentation↔  
: <https://erriez.github.io/ErriezRotaryEncoderHalfStep>



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