

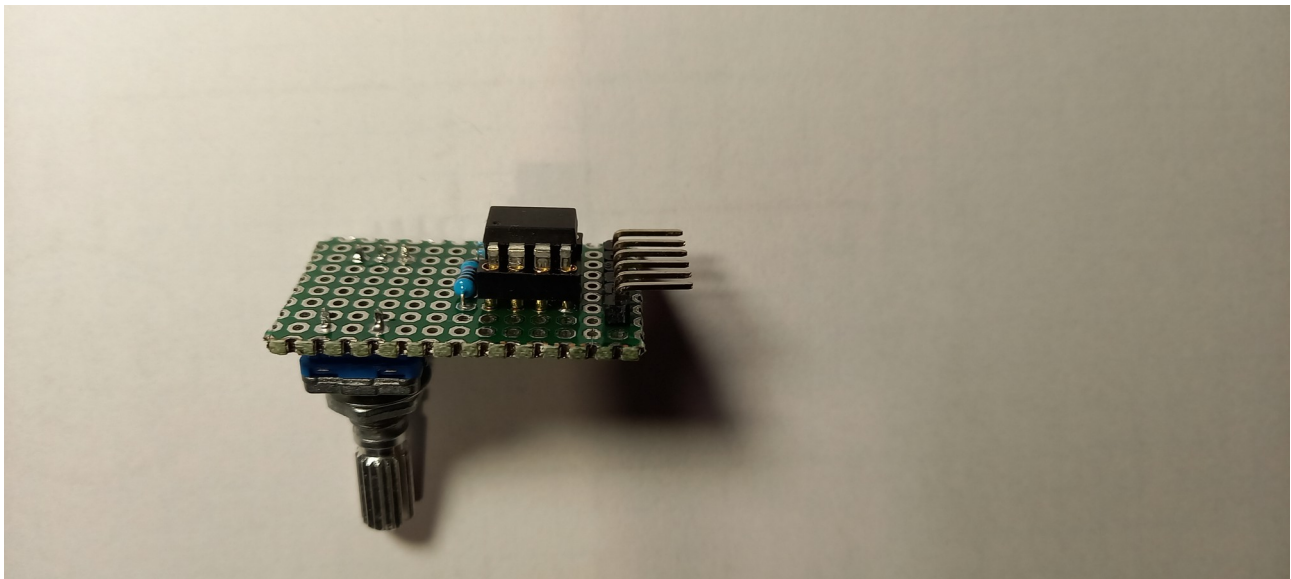
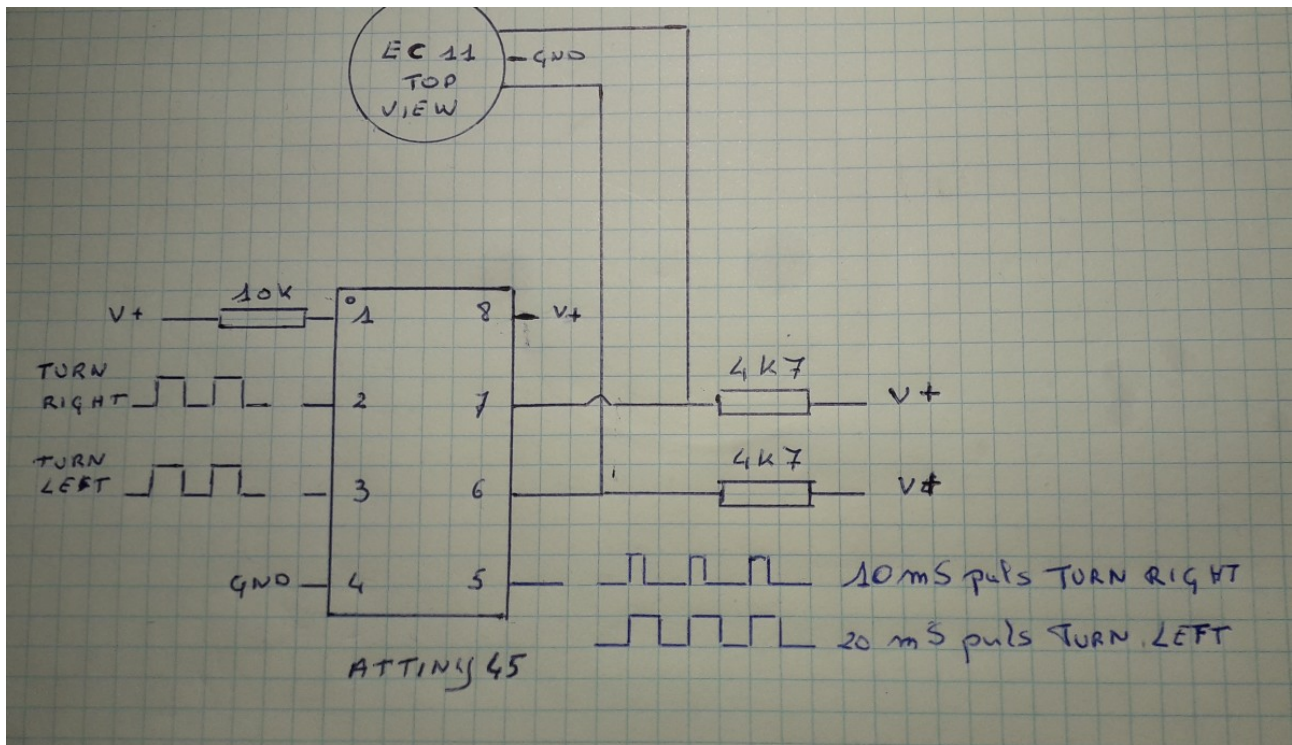
# EC11 rotary encoder the easy way

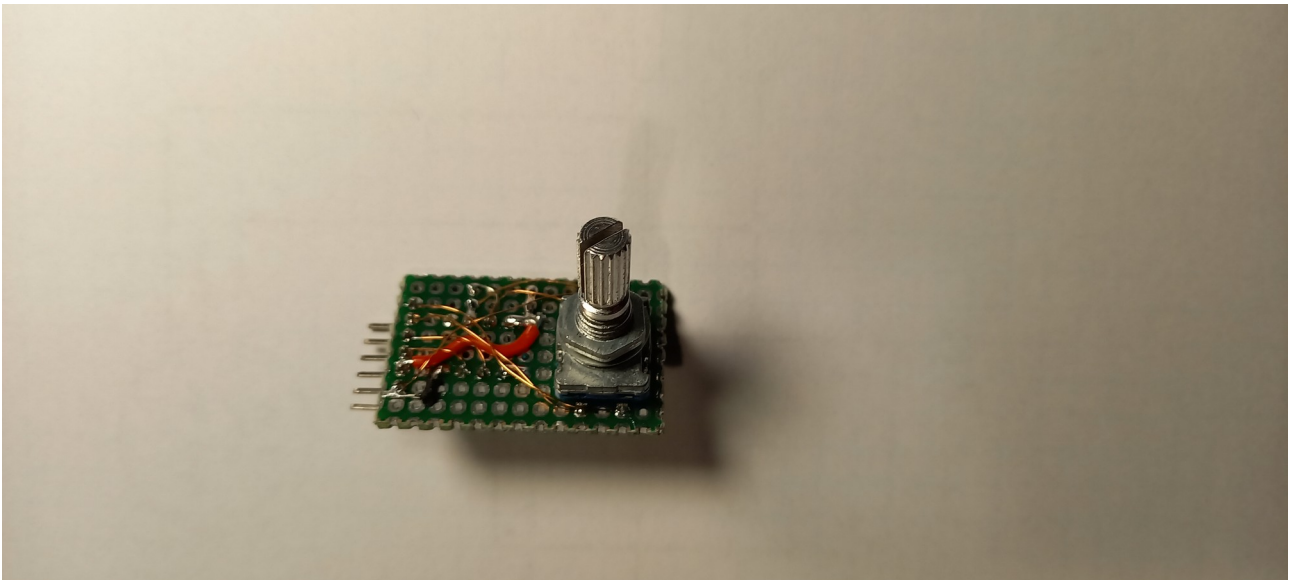
**If desired, only 1 input on main MCU per rotary encoder, even with push button**

## **Specifications**

power supply 3.3V or 5V  
no extra capacitors or resistors  
no libraries  
works for slow and fast rotation  
no unwanted pulses  
cheap about 3€  
easy to build

## Only as a rotary encoder (ATTINY45)





### **what do we need**

1x ATTINY45  
2x 4K7  
1x 10K  
1x EC11

### **We have 2 options for the connection to the main MCU**

#### **with 2 outputs**

1x pulse output when turning right  
1x pulse output when turning left  
The ATTINY45 provides 20 millisecond pulses on either the right turn output or the left turn output.

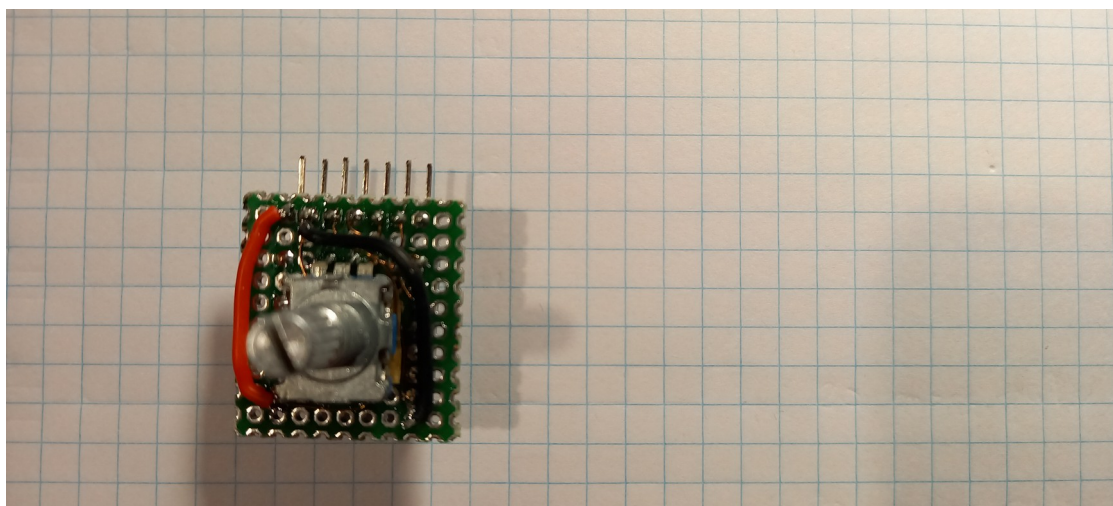
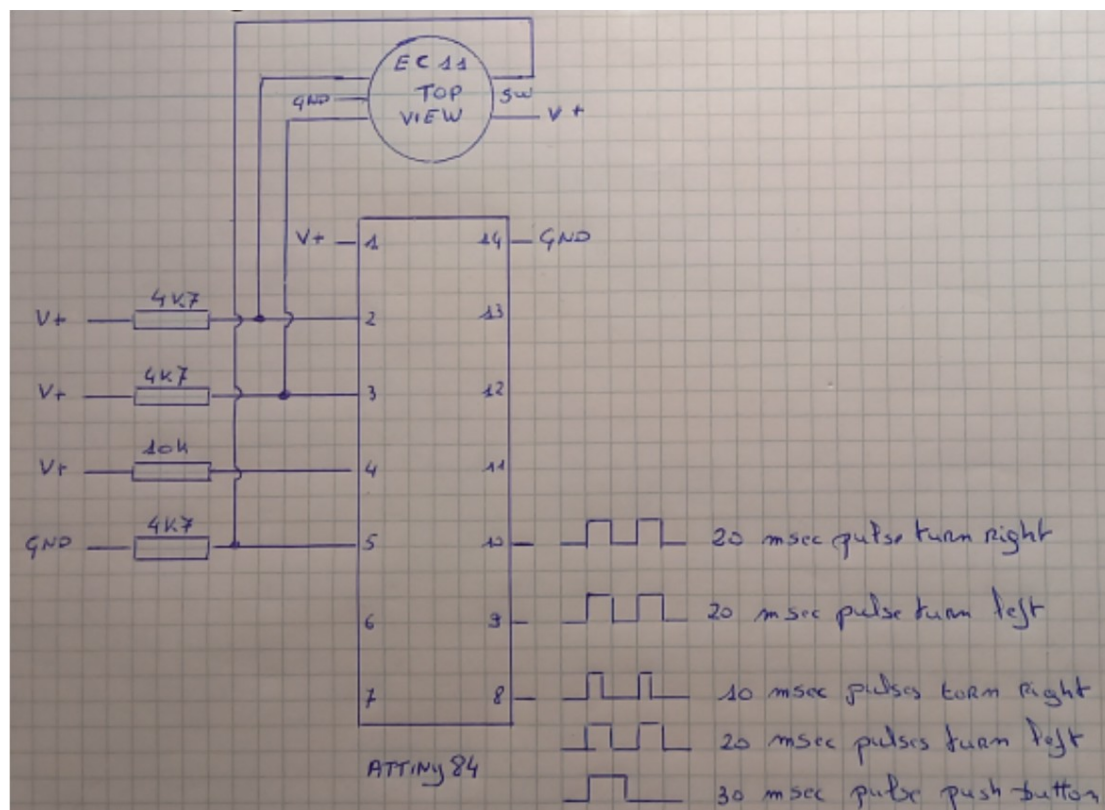
#### **with 1 output**

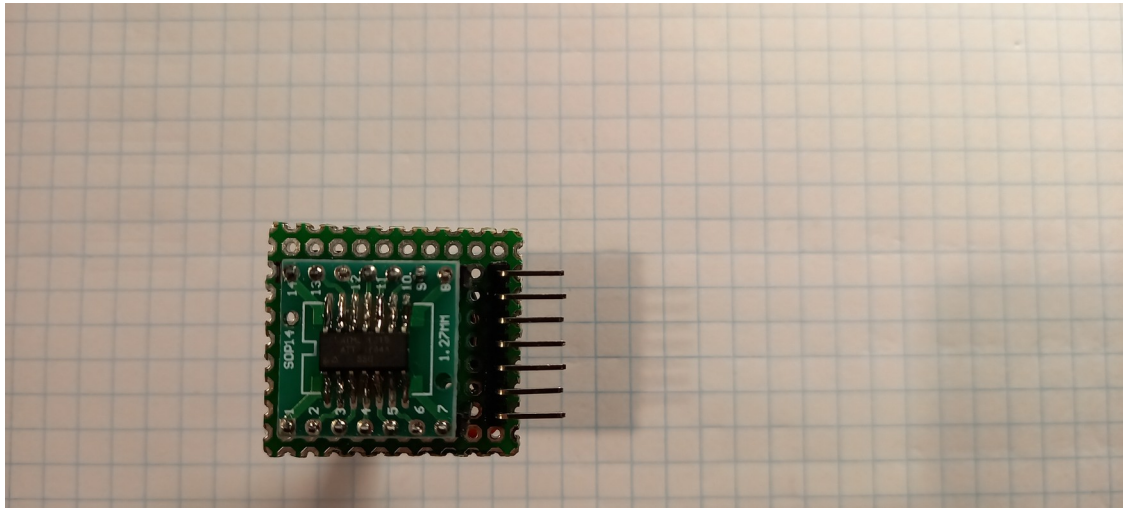
1x output  
The ATTINY45 delivers  
10 millisecond pulses when turning clockwise  
20 millisecond pulses when turning counterclockwise on the same output.  
decoding must be done on main mcu  
ESP32 example program at the end of this pdf file

Thanks to

<https://www.elektormagazine.nl/labs/rotary-encoder-on-a-single-mcu-pin>  
for the 1 input idea

## As a rotary encoder with push button (ATTINY84)





### **what do we need**

- 1x ATTINY84
- 3x 4K7
- 1x 10K
- 1x EC11 with pushbutton

### **We have 2 options for the connection to the main MCU**

#### **with 2 outputs**

1x pulse output when turning right

1x pulse output when turning left

The ATTINY84 provides 20 millisecond pulses on either the right turn output or the left turn output.

Push button must be connected separately to main MCU

#### **with 1 output**

The ATTINY84 delivers

10 milliseconds pulses when turning clockwise

20 milliseconds pulses when turning counterclockwise

30 milliseconds pulse when push button is pressed

and this on the same digital output

decoding must be done on main mcu

ESP32 example program at the end of this pdf file

Thanks to

<https://www.elektormagazine.nl/labs/rotary-encoder-on-a-single-mcu-pin>

for the 1 input idea



When programming the ATTINY, do not forget to program the boot loader

```
ATTINY45_1OUTPUT | Arduino 1.8.9
Bestand Bewerken Schets Hulpmiddelen Help
Automatische opmaak
Schets archiveren
Codering herstellen en opnieuw laden
Bibliotheken beheren...
Seriële monitor
Seriële Plotter
ESP32 Sketch Data Upload
WiFi101 / WiFiNINA Firmware Updater

27 bool input_1_vorig;
28 unsigned long begin;
29
30 void setup() {
31   pinMode(1, INPUT);
32   pinMode(2, INPUT);
33   pinMode(3, OUTPUT);
34   pinMode(4, OUTPUT);
35   pinMode(0, OUTPUT);
36 }
37
38 void loop() {
39   input_1_bool = digitalRead(1);
40   input_2_bool = digitalRead(2);
41   delay(2);
42   if(input_1_bool != input_1_vorig)
43     if(input_1_bool == HIGH)
44       if(!input_1_LTO (1.6.11+ only): "Enabled"
45         begin_millis = millis()/micros(); "Enabled"
46         digitalWrite(3, HIGH);
47         while((millis() - begin_millis) < 20){
48           digitalWrite(3, HIGH);
49         }
50         digitalWrite(3, LOW);
51         while((millis() - begin_millis) < 38){
52           digitalWrite(3, LOW);
53         }
54         digitalWrite(3, HIGH);
55         while((millis() - begin_millis) < 38){
56           digitalWrite(3, HIGH);
57         }
58         begin_millis = millis();
59         digitalWrite(4, true);
60         digitalWrite(0, true);
61         while((millis() - begin_millis) < 20){
62           digitalWrite(4, true);
63           digitalWrite(0, true);
64         }
65         digitalWrite(4, false);
66         digitalWrite(0, false);
67         while((millis() - begin_millis) < 38){
68           digitalWrite(4, false);
69           digitalWrite(0, false);
70         }
71         input_1_vorig_bool = input_1_bool;
72     }
73 }
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```

## ATTINY45 program (only rotary encoder)

```
/*
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 *
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 * SOFTWARE.
 */

#define A_INPUT 1
#define B_INPUT 2
#define R_UIT 3
#define L_UIT 4
#define L_R_UIT 0

bool input_1_bool;
bool input_2_bool;
bool input_1_vorig_bool;
unsigned long begin_millis;

void setup() {
  pinMode(A_INPUT, INPUT);
  pinMode(B_INPUT, INPUT);
  pinMode(R_UIT, OUTPUT);
  pinMode(L_UIT, OUTPUT);
  pinMode(L_R_UIT, OUTPUT);
}

void loop() {
  input_1_bool = digitalRead(A_INPUT);
  input_2_bool = digitalRead(B_INPUT);
  delay(2);
  if(input_1_bool == digitalRead(A_INPUT)){
    if(input_1_bool != input_1_vorig_bool){
      if(!input_1_bool && (!input_2_bool)){
        begin_millis = millis();
        digitalWrite(R_UIT, true);
        digitalWrite(L_R_UIT, true);
        while((millis() - begin_millis) < 10){
        }
        digitalWrite(L_R_UIT, false);
        while((millis() - begin_millis) < 20){
        }
        digitalWrite(R_UIT, false);
        while((millis() - begin_millis) < 38){
        }
      }
    }
    if(!input_1_bool && input_2_bool){
      begin_millis = millis();
      digitalWrite(L_UIT, true);
      digitalWrite(L_R_UIT, true);
      while((millis() - begin_millis) < 20){
      }
    }
  }
}
```

```
    }  
    digitalWrite(L_UIT, false);  
    digitalWrite(L_R_UIT, false);  
    while((millis() - begin_millis) < 38){  
    }  
}  
input_1_vorig_bool = input_1_bool;  
}  
}  
}
```



## ATTINY84 program (rotary encoder with push button)

```
/*
 * MIT License
 *
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 *
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 * OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE
 * SOFTWARE.
 */

/*
 * ATTINY84
 */

#define A_INPUT 10
#define B_INPUT 9
#define SWITCH 8
#define R_UIT 3
#define L_UIT 4
#define MILLIS_UIT 5

bool input_1_bool;
bool input_2_bool;
bool input_1_vorig_bool;
bool input_sw_bool;
bool input_sw_vorig_bool;
unsigned long begin_millis;

void setup() {
  pinMode(A_INPUT, INPUT);
  pinMode(B_INPUT, INPUT);
  pinMode(SWITCH, INPUT);
  pinMode(R_UIT, OUTPUT);
  pinMode(L_UIT, OUTPUT);
  pinMode(MILLIS_UIT, OUTPUT);
}

void loop() {
  input_1_bool = digitalRead(A_INPUT);
  input_2_bool = digitalRead(B_INPUT);
  delay(2);
  if(input_1_bool == digitalRead(A_INPUT)){
    if(input_1_bool != input_1_vorig_bool){
      if(!input_1_bool && (!input_2_bool)){
        begin_millis = millis();
        digitalWrite(R_UIT, true);
        digitalWrite(MILLIS_UIT, true);
        while((millis() - begin_millis) < 10){
        }
        digitalWrite(MILLIS_UIT, false);
        while((millis() - begin_millis) < 20){
        }
        digitalWrite(R_UIT, false);
      }
    }
  }
}
```

```

    while((millis() - begin_millis) < 38){
    }
}
if(!input_1_bool) && (input_2_bool)){
    begin_millis = millis();
    digitalWrite(L_UIT, true);
    digitalWrite(MILLIS_UIT, true);
    while((millis() - begin_millis) < 20){
    }
    digitalWrite(L_UIT, false);
    digitalWrite(MILLIS_UIT, false);
    while((millis() - begin_millis) < 38){
    }
}
input_1_vorig_bool = input_1_bool;
}
}
input_sw_bool = digitalRead(SWITCH);
delay(2);
if(input_sw_bool == digitalRead(SWITCH)){
    if(input_sw_bool != input_sw_vorig_bool){
        if(input_sw_bool){
            digitalWrite(MILLIS_UIT, true);
            delay(30);
            digitalWrite(MILLIS_UIT, false);
            delay(8);
        }
        input_sw_vorig_bool = input_sw_bool;
    }
}
}
}

```

## ESP32 test program 2 inputs

Connect IC pin 2 of ATTiny45 to GPIO26 of ESP32

Connect IC pin 3 of ATTiny45 to GPIO27 of ESP32

```
#define PLUS_INPUT 26
#define MIN_INPUT 27

int totaal_int = 0;
bool int_bool = false;

void setup() {
  Serial.begin(230400);
  pinMode(PLUS_INPUT, INPUT);
  pinMode(MIN_INPUT, INPUT);
  attachInterrupt(PLUS_INPUT, totaal_plus, RISING);
  attachInterrupt(MIN_INPUT, totaal_min, RISING);
}

void loop() {
  if(int_bool){
    Serial.println(totaal_int);
    int_bool = false;
  }
}

void totaal_plus(){
  totaal_int ++;
  int_bool = true;
}

void totaal_min(){
  totaal_int --;
  int_bool = true;
}
```

## ESP32 test program 1 input

Connect

IC pin 5 ATTINY45 to GPIO26 ESP32

or

IC pin 8 ATTINY84 to GPIO26 ESP32

```
#define PLUS_MIN_INPUT 26

int totaal_int = 0;
int verschil_millis;
bool int_bool = false;
bool switch_bool = false;
bool tijd_gestart_bool = false;
unsigned long isr_begin;

void setup() {
  Serial.begin(230400);
  pinMode(PLUS_MIN_INPUT, INPUT);
  attachInterrupt(PLUS_MIN_INPUT, totaal_plus_min, CHANGE);
}

void loop() {
  if(int_bool){
    Serial.println(totaal_int);
    int_bool = false;
  }
  if(switch_bool){
    Serial.println("switch");
    switch_bool = false;
  }
}

void totaal_plus_min(){
  if(digitalRead(PLUS_MIN_INPUT)){
    isr_begin = millis();
    tijd_gestart_bool = true;
  }
  else{
    if(tijd_gestart_bool){
      verschil_millis = millis() - isr_begin;
      if( verschil_millis < 15){
        totaal_int ++;
        int_bool = true;
      }
      if((verschil_millis > 15) && (verschil_millis < 25)){
        totaal_int --;
        int_bool = true;
      }
      if(verschil_millis > 25){
        switch_bool = true;
      }
      tijd_gestart_bool = false;
    }
  }
}
```

github

<https://github.com/thieu-b55/EC11-rotary-encoder-the-easy-way>

have fun,

thieu