QUICK REFERENCE · TK06

# Rotary Encoder

Two contacts out of step, and a switch in the shaft.

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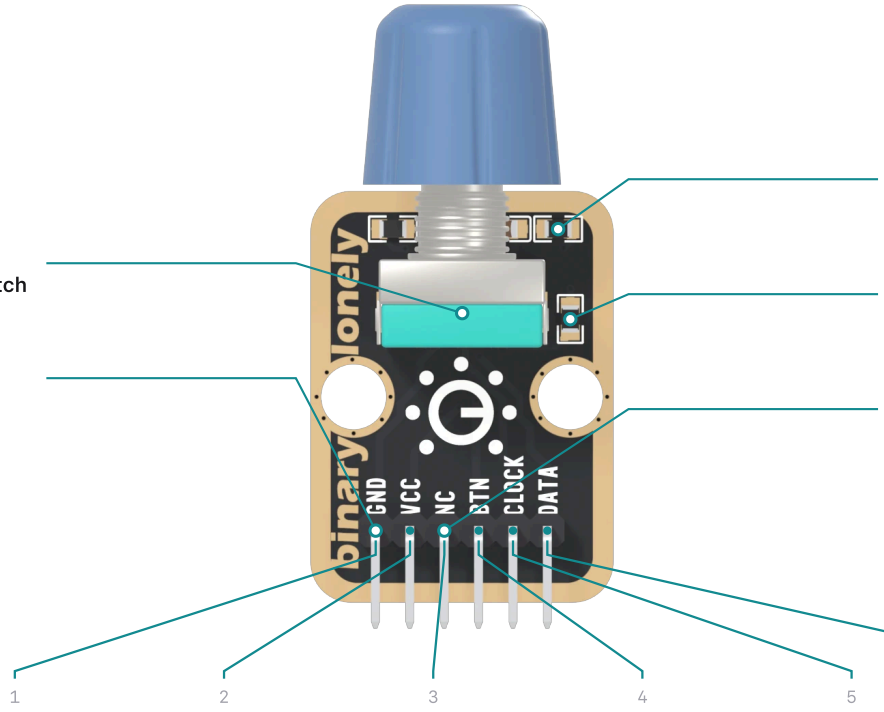
**VCC sets the signals** CLOCK, DATA and BTN all reach VCC through the board. **On an ESP32, ESP32-S3 or Pico, feed VCC from 3V3, never 5V**: 5 V would sit on three 3.3 V inputs.

## Pins, and which to wire

Knob up, header at the bottom. Wire GND, VCC, BTN, CLOCK and DATA; NC is connected to nothing on the board.

**EC11 encoder, push switch**
Most give 20 clicks a turn; count yours.

**GND is the square pad**
Count from it. The back prints no pin names.




**10 kΩ pull-ups, 100 nF**
CLOCK and DATA rest HIGH, go LOW while closed.

**10 kΩ pull-down on BTN**
Pushing the shaft reads HIGH.

**NC**
Connected to nothing on the board.

| Front | GND | VCC | NC | BTN | CLOCK | DATA |
|---|---|---|---|---|---|---|
| Read it | GND | VCC | ● | BTN | CLOCK | DATA |

**Direction = which falls first** CLOCK and DATA are the same signal a quarter-step apart. Read DATA when CLOCK falls: its level gives the direction.

## Three signals, one filter

### CLOCK, DATA

**HIGH** at rest

Each goes LOW while its contact is closed. Turning the knob closes them one after the other.

### BTN

**LOW** at rest

Reads HIGH while the shaft is pushed in. Use INPUT: the board has its own resistors.

### Filter

**1** ms, 10 kΩ and 100 nF

Smooths the contacts' bounce. It helps; software still has to count carefully.

Poll it slowly and a fast turn skips steps: each click is a few milliseconds of signal. Interrupts on CLOCK and DATA, or a state table that only accepts legal changes, count every click.

The 20-clicks figure is typical of EC11 parts, not measured on this one. Which way is clockwise depends on the part: swap ++ and -- if it counts backwards.

## Count clicks, both ways

Arduino IDE · Board: your board · ESP32-S3: USB CDC On Boot: Enabled

```
// Uno: 2, 3. ESP32: 25, 26. ESP32-S3: 4, 5. Pico: 13, 14.
const int CLOCK_PIN = 4, DATA_PIN = 5;
volatile long count = 0;

void onClock() {                  // CLOCK just fell
  if (digitalRead(DATA_PIN)) count++;   // swap ++ and --
  else count--;                         // if it runs backwards
}

void setup() {
  Serial.begin(115200);
  pinMode(CLOCK_PIN, INPUT);      // the board has its pull-ups
  pinMode(DATA_PIN, INPUT);
  attachInterrupt(digitalPinToInterrupt(CLOCK_PIN), onClock,
                  FALLING);
}

void loop() {
  static long last = 0;
  noInterrupts(); long c = count; interrupts();
  if (c != last) { Serial.println(c); last = c; }
}
```

```
1
2
3
2
```

Serial Monitor at 115200: the count, going up one way and down the other.

## Wiring

| | FRONT | UNO | ESP32 | S3 | PICO |
|---|---|---|---|---|---|
| 1 | **GND** | GND | GND | GND | GND |
| 2 | **VCC** | 5V | 3V3 | 3V3 | 3V3 |
| 3 | **NC** | | | | |
| 4 | **BTN** | D4 | GPIO 27 | GPIO 6 | GP15 |
| 5 | **CLOCK** | D2 | GPIO 25 | GPIO 4 | GP13 |
| 6 | **DATA** | D3 | GPIO 26 | GPIO 5 | GP14 |

Hole 1 is the square pad. On an Uno, CLOCK and DATA go on D2 and D3, its two interrupt pins. VCC is 3V3 on every 3.3 V board.

## The switch in the shaft

BTN is a plain push switch: LOW at rest, HIGH while pushed. It bounces like any contact, so accept a change only after 20 ms of stillness. Pushing can also nudge the knob one click; ignore turns while it is held if that matters.

## When it does not work

### The count never changes

VCC is not connected, or CLOCK and DATA are on other pins than the sketch's. Count from the square pad: GND, VCC, NC, BTN, CLOCK, DATA.

### It counts backwards

Normal: which contact leads depends on the part. Swap ++ and -- in the sketch.

### A fast turn skips clicks

Polling in a busy loop misses edges. Use the interrupt version, or read both pins with a state table.

### One click counts two or four

Your sketch counts every edge. Most EC11 parts rest after a whole cycle: divide by the steps per click you count.

### The button reads HIGH always

BTN is wired to VCC, or VCC to BTN. Check the header order against the table.

### It jitters between two numbers

The knob is resting between clicks, or bounce reached the counter. A state table ignores impossible steps.

## Specifications

| | | | |
|---|---|---|---|
| **Encoder** | EC11 type, horizontal, push switch | **Pull-ups** | 10 kΩ on CLOCK and DATA |
| **Filter** | 100 nF on each, 1 ms | **Switch** | 10 kΩ pull-down, HIGH when pushed |
| **Supply** | 3.3 V or 5 V, the same as your board | **Header** | 6 pins, right-angle, 2.54 mm |
| **Size** | 22.4 × 30.4 mm, knob past the top edge | **Height** | 15.4 mm to the top of the knob |