

Links are provided to AliExpress suppliers. The links (& prices) are valid now, but of course could become dead in the future. Suppliers chosen, offer 'choice' which means when the total order is over £8, shipping is free.

AliExpress is by far the cheapest source for parts. However, they are not good at item descriptions or ensuring the correct part is dispatched. Parts can be sourced on Amazon or Ebay, but prices are higher.

Arduino Nano V3. USB C.

The USB-C option is nice as the USB extension cable (listed further down) can be used. They are available with the header pins soldered (welded) or loose. £2.37

[1-10pcs Type-C USB Nano 3.0 With the bootloader compatible Nano controller for arduino CH340 USB driver 16Mhz ATMEGA328P - AliExpress 502](#)



328P-Welded-TYPE-C USB

Arduino Nano Expansion/prototype board.

Makes wiring easy as all the pins on the Arduino board are taken to screw terminal connectors.

Note: - The listing does not state if this board comes pre-soldered, although the photos seem to indicate that it is. £1.01

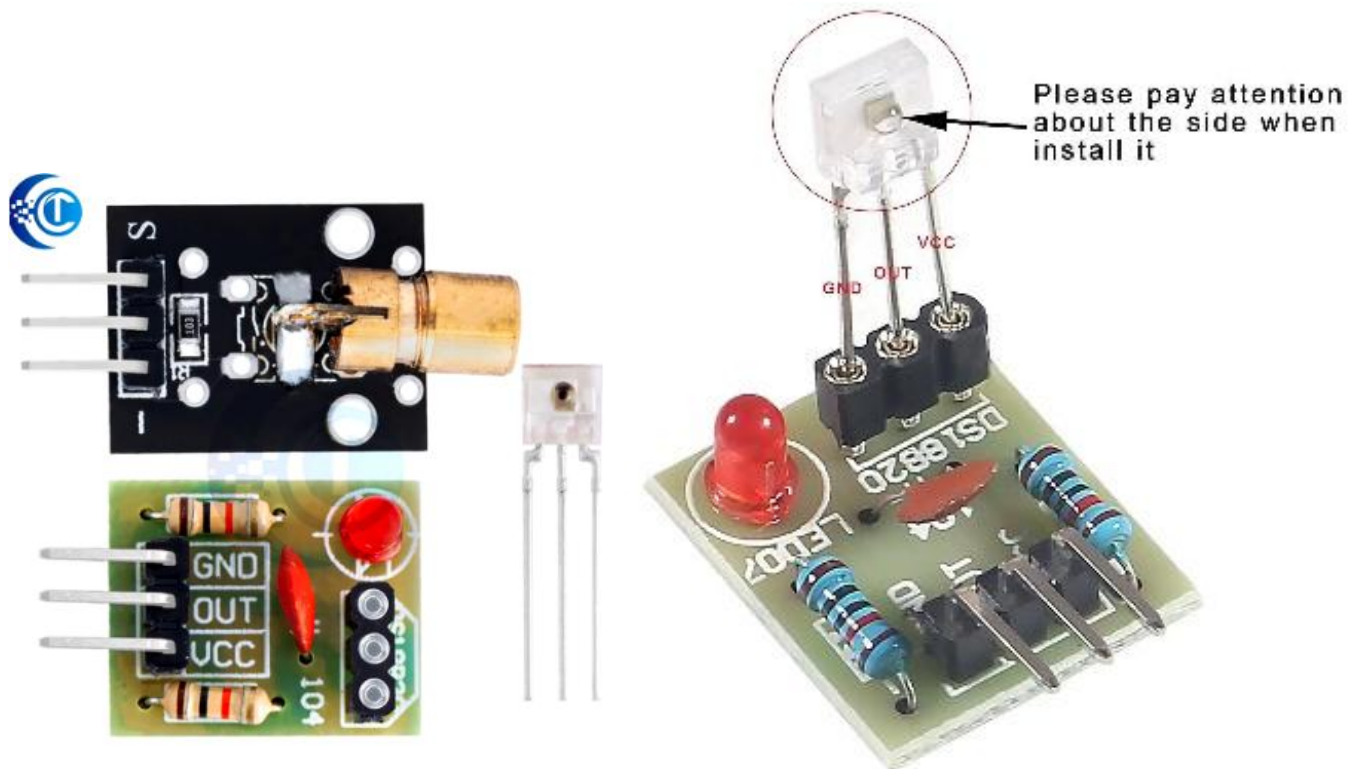
[1-10pcs Type-C USB Nano 3.0 With the bootloader compatible Nano controller for arduino CH340 USB driver 16Mhz ATMEGA328P - AliExpress 502](#)



Laser tx & rx module. Two of each module required.

The sensor is supplied loose. ENSURE YOU INSERT IT THE CORRECT WAY ROUND!!!. Little bubble lens points towards the header pins. £0.79 £0.99

[KY-008 650nm Laser Transmitter Module with Laser Sensor Module Non-Modulator Tube Laser Receiver Module Kit - AliExpress 502](#)



LCD 2004.

Ensure you get a module that includes the IIC or I2C module and is the four line (not two line) display. £3.63

The IIC module can be seen on the lower photo, it is the small dark pcb on the back. (or 'black' in Chinglish :o)

[LCD2004 2004 LCD Module Blue/Green/White Screen 20X4 Character LCD Display IIC I2C Serial Interface Adapter Module for Arduino - AliExpress 502](#)

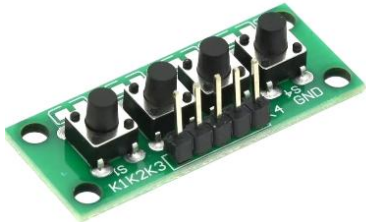


Buttons.

Two buttons are required for Arduino version. There are all sorts of buttons available for you to choose, depending on your final layout of The Shutter Tester. Below are possible options.

This is a very cheap button module, ideal for prototype work and getting things working quickly. This module is not suitable for mounting into a case. One pin on £0.65

[1-10PCS 1x4 4-Button Independent Keypad Module DIY Kit for Arduino Raspberry Pi STM32 Electronics Projects STEM - AliExpress](#)



Loose buttons.

These fit neatly into a project box or the 3d printed case, requiring a 13mm hole to be drilled, or the 3d printed case (which already has 13mm mounting holes). £1.73

Note: - They will require wires to be soldered to the terminals of the buttons.

[6piece Mini 12mm Waterproof M1mentary On/off Push Button Round Switch Pbs-33b Kit White Black Red Yellow Blue Green - AliExpress 502](#)



Wiring for LCD module.

The neatest way is to use a 4 Pin JST XH pre-made connector.

10cm length is fine for the LCD. The 20cm length is cheaper and the extra length maybe useful for other projects. £0.96

[5Sets JST XH2.54 XH 2.54mm Wire Cable Connector 2/3/4/5/6/7/8 Pin Male and Female Plug Socket 10cm 20cm Wire Length 26AWG - AliExpress 13](#)



Wiring for Button module.

The same 4-way JST-XH connectors as used for the LCD, can be used for the button module. Do not use the red wire (to avoid confusion with +5V)

Wiring for Lasers & Sensors

The individual 5V & the 0V pins on the modules can be looped together, either by soldering a wire to the pins or using Dupont or JST XH connectors (Order 3 pin JST HX connectors, four required) and joining them together with terminal block or soldering. £1.70

Be careful as the colours will not match red for +v, Black for 0V etc

[5Sets JST XH2.54 XH 2.54mm Wire Cable Connector 2/3/4/5/6/7/8 Pin Male and Female Plug Socket 10cm 20cm Wire Length 26AWG - AliExpress 13](#)



Multicore Cable.

This connects the Lasers and sensors to the screw-terminal board, 4 core is required. Keep the length between sensors and the screw-terminal board short to avoid voltage drop and interference (40cm should be fine for length). Plenty spare as sold in 5 metre length £1.90

The wire can also be used for 'hook-up' wire if using the loose buttons.

[5/10Meter 22 AWG 2Pin 3Pin 4Pin 5Pin 6Pin Electronic Cable Extension Wire Color Line for 5050 3528 RGBW RGB CCT LED Strip Lights - AliExpress 13](#)



Connector Block. (Optional).

These connectors can be used to avoid soldering. £1.93

Join all of the 5V wires from the sensors & Lasers together and to the multicore cable, using one of these connectors. Doing the same for the 0V wires.

The two individual sensor output wires can also be connected to the multicore cable with these connectors.

connecting

Useful if avoiding soldering.

As the wires used for the project are thin, two or three wires easily fit into each terminal, so 2 or 3 terminal connectors are fine. (The terminals in the connector are all commoned together)

Note: - These connectors are fine for low voltage and current applications, but I would not recommend Chinese knock-offs for house wiring or heavy load applications.

[10-75pcs Orange Universal Type Quick Plug-in Terminals,Electrical Equipment Connectors,Wire Connector Terminals,250V/32A - AliExpress 13](#)

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Rated voltage: 250V
Rated current: 32A

Stranded Flexible Cord (BV)
0.5-2.5"

Single Strand Hard Wire (BV)
0.5-4.0"



USB Cable. (Optional).

If building into a project box (or the 3d printed case, which is designed to fit this cable, with the cut-out pre-made), this is a neat way of bringing the USB connector to the outside of the box. £2.54

[1M 0.5M Panel Mount Type-C USB-C Male To Female Extension Cable With Screw Hole Lock Connector Cable Spacing 18mm - AliExpress 7](#)

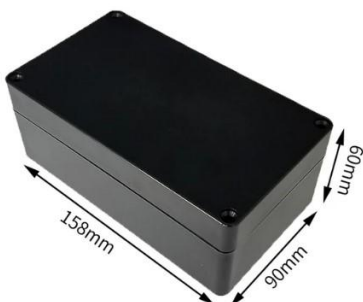


Type-c Male to Female Extension Cable

Project Box. 158-90-60 (Optional).

To house the project. £5.09

[Black Box Outdoor Waterproof Case Plastic Box Electronic Project Case Instrument Waterproof Junction Box Housing - AliExpress](#)



M3 Bolts, Nuts, Washers. 25MM Length Stainless Steel. (Optional)

M3 x 25mm bolts are used to mount the LCD screen into the project box or 3d printed case. They can also be used to mount the Din connector, but 12MM length is better for this. Don't forget to also order washers & nuts.

Nuts & bolt set £1.89

[M2 M3 M4 M5 M6 Nuts and Bolts Set 30](#)

[4 Stainless Steel Hexagon Button Hex Socket Fairing Bolt Assortment Kit Thread Allen Screws](#)

Bolts only

[5-50p ISO7380 M2 M2.5 M3 M4 M5 M6 M8 304 A2 Round Stainless Steel or Black G10.9 Hex Socket screw Button Head Allen Bolt Screws - AliExpress 13](#)

Washers

[GB97 DIN125 A2-70 304 Stainless Steel Flat Washer Plain Gasket M1.6 M2 M2.5 M3 M3.5 M4 M5 M6 M8 M10 M12 M14 M16 M18 M20 M22 M24 - AliExpress 13](#)

Nuts

[100pcs/lot Metric thread DIN934 M2 M2.5 M3 M3.5 M4 M5 M6 Steel Hex Nuts - AliExpress 13](#)

Plug & Sockets. (Optional).

The cable to the sensors can be hardwired directly to the breakout board or plugs & sockets used. £1.04 + £0.99

Six or eight pin connector is recommended, as this is not a common size that may be found in households.

[Solder Connector DIN 3 4 5 6 7 8 Pin DIN Male Female Plug with Plastic Handle + Female Socket Hulled Panel Mount Chassis a1 - AliExpress 13](#)



Shrink Tube. (Optional).

It is useful cut into small lengths of 5mm, and placed along the cables, to hold them into a bunch, for neater wiring.

Also useful for covering soldered joints on wires, if using JST connectors for the sensors, for example, which then need soldering to the multicore cable.

If using the DIN connector above, a short length is placed over the soldered connections, to avoid shorts between pins or should a wire come loose. £1.13

[Black Heat Shrink Tube Kit Thermoresistant Tubing Shrink Wire Wrapping Electrical Connection Cable Insulation Sleeves Protector - AliExpress](#)



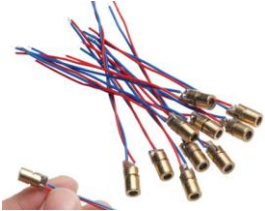
Lifting platform for adjusting height of camera. (3d print files available, to make top, to hold camera)
[Plastic Lift Table Woodworking Carving Laser Level Bracket Plastic or Aluminum Meterial Device Height Adjustment Lift Platform - AliExpress 1420](#)



Additional parts required if using the 3d printed sensor and Laser Enclosures

Lasers. Required for the 3d printed the Laser enclosure. Order the 5v Lasers.

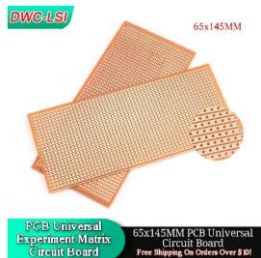
[5pcs Adjustable Laser Diode 650nm 6mm 3/5V 5 Million Watt Red Point Line Laser Diode Module Red Copper Head - AliExpress 1420](#)



Pcb strip-board. Required for the 3d printed sensor enclosure.

This board has each row of holes electrically connected.

[5/10PCS DIY 6.5x14.5 6.5*14.5CM Prototype Paper PCB Universal Experiment Matrix Circuit Board Single Row Continuous Hole - AliExpress 502](#)



0.1uF Capacitors. (104 100NF) Required for the 3d printed sensor enclosure.

[100PCS 100nF 0.1uF 0.1 uF 104 50V 2.54mm Dip Mono Monolithic Capacitors - AliExpress](#)



10k resistors Required for the 3d printed sensor enclosure.

[100PCS/Lot Metal Film Resistor 1/4W 1% 100R 220R 1K 1.5K 2.2K 4.7K 10K 22K 47K 100K 100 220 1K5 2K2 4K7 Ohm Resistance 1R~22M - AliExpress](#)



2mm screw selection box. Used to assemble the case and enclosures.

[800pcs M2\(2mm\) Self Tapping Wood Carbon Steel Phillips Pan Head Self Tapping Screws Assortment Kit M2*4/5/6/8/10/12/16/20mm - AliExpress 13](#)



Additional useful parts

Drill bits for making holes. 3MM for bolts, 13mm for the buttons, 15MM for Din sockets.
Note only required for the project box.

[3-12mm Three-point Woodworking Drill Hole Opener Twist Drill Bit Practical Wood Milling Cutter Multifunctional Drilling Tools - AliExpress](#)

13mm bit.

[10-35mm Woodworking Twist Drill Bit Set Long Four-Slot 6.35mm Shank Carbide Drill Bit Hole Saw For Door Lock Wood Slotting Tools \(aliexpress.com\)](#)

Glue Gun.

Cheap glue gun, but surprisingly it works ok. £2.80

[20W Hot Melt Glue Gun DIY Mini Household Industrial Guns Heat Temperature Thermo EU Electric Repair Tool Use 7mm Glue Sticks - AliExpress](#)

Don't forget the glue :o) £3.33

[T TOVIA 60pcs/120pcs Hot Melt Glue Sticks 7mm Hot Glue Sticks Rod for Craft Album Repair Tools Hot Glue Gun Sticks - AliExpress](#)

Wire Strippers. Model 3001D

The JST HX wires are very thin 22AWG. A good quality wire stripper will be required. An alternate is to use a sharp scalpel or Stanley knife blade. £10.79

[Pro'sKit 8PK-3001D 8PK-3002D high quality electronic wire stripper cutting pliers \(AWG 30/28/26/24/22/20 precision pliers - AliExpress 1420](#)

Stanley knife & plasters trowel.

To safely make square cut-out for the LCD in the project box. Source locally.

Soldering Iron Kit.

Cheap soldering iron kits are available on Aliexpress. I found the tips are very loose & the internet mod is to wrap a strip of aluminium cooking foil around the ceramic heater, to reduce the gap. However, they are rubbish and it is far better to buy a genuine branded product, Weller or Antex (not a cheap knock off)

Solder.

Get lead-based solder 60/40. Lead free solder is awful to work with.

