# Open-Source Syringe Pump

(developed by Andrey Samokhin in 2018)
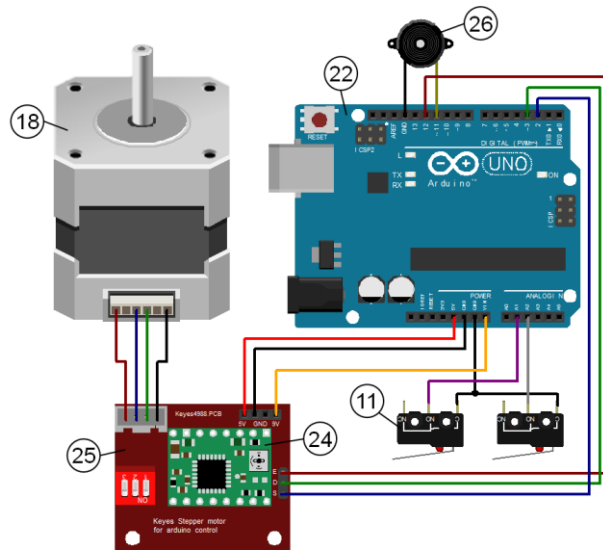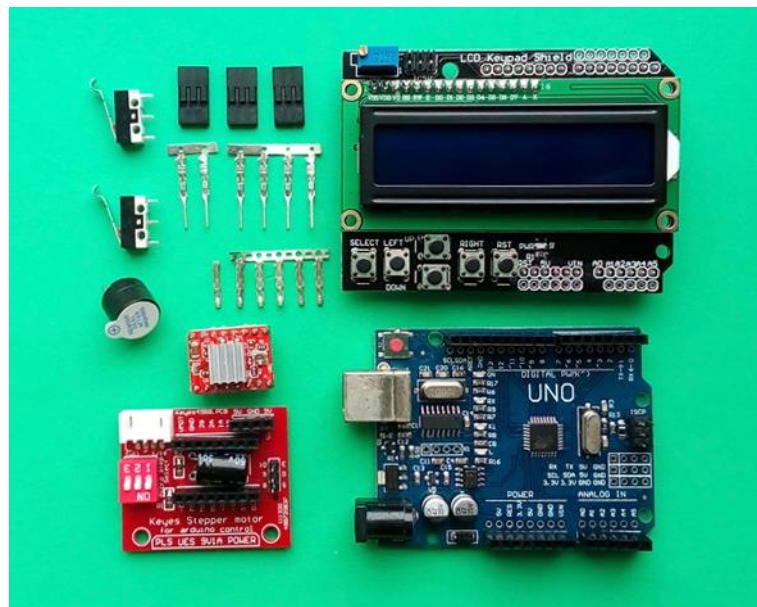
# Assembly Instructions

(Version 1.0a)

Fig. 1. Electrical circuit.



Fig. 2. Electronic components.

**Step 1.1** (if necessary, change the basic settings in the Arduino sketch)

```
/*********************************************************************
        BASIC SETTINGS
*********************************************************************/

// Stepper motor
#define NOFMICROSTEPS 16       // The number of microsteps per step
#define NOFSTEPSPER360 200     // The number of steps per revolution
#define MAXRPM 240             // Maximum RPM (rotations per minute)
#define INVERTDIRECTION true // If the carriage moves in the opposite direction, change to 'false'

// Leadscrew
#define MMPER360 2             // Leadscrew pitch, mm per revolution

// Arduino pins
#define STEP_PIN 2             // STEP pin (A4988)
#define DIRECTION_PIN 3        // DIR pin (A4988)
#define ENABLE_PIN 12          // EN pin (A4988)
#define ENDSTOP_PIN1 A1        // Endstop pin (forward movement)
#define ENDSTOP_PIN2 A2        // Endstop pin (backward movement)
#define BUZZER_PIN 11          // Buzzer pin
#define BUTTONS_PIN A0         // Button pin (lcd keypad shield)


/*********************************************************************/
```
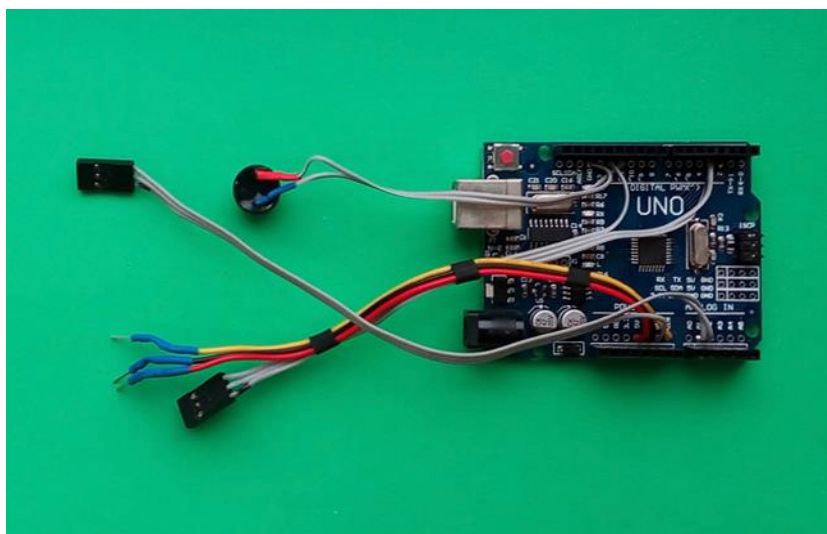
**Step 1.2** (upload sketch to Arduino) Detailed
instructions are available at this link.

**Step 1.3** (solder wires and crimp connectors, refer to electrical circuit)

| PART # | PART NAME | QTY |
|--------|-----------|-----|
| 22 | Arduino UNO | 1 |
| 26 | Active Buzzer (D=12mm) | 1 |
| 37 | Dupont Connector (Female) | 6 |
| 38 | Dupont Connector (Male) | 3 |
| 39 | Dupont Housing (3P) | 2 |
| 40 | Connector Wires | – |

**Step 1.4** (solder wires and crimp connectors, refer to electrical circuit)

| PART # | PART NAME | QTY |
|--------|-----------|-----|
| 11 | Endstop Switch | 2 |
| 38 | Dupont Connector (Male) | 3 |
| 39 | Dupont Housing (3P) | 1 |
| 40 | Connector Wires | – |
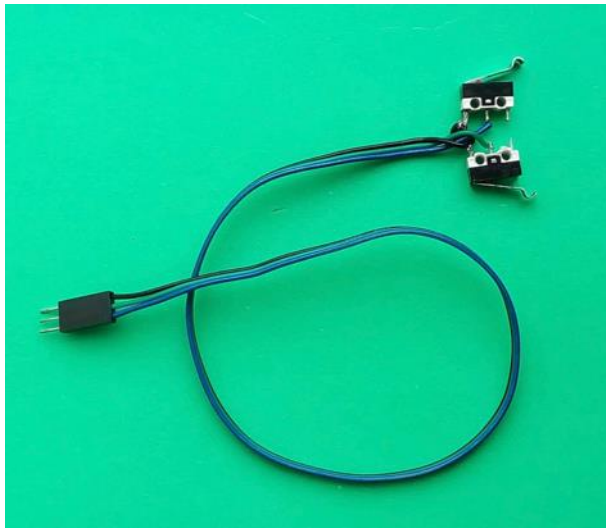


**Step 1.5** (plug A4988 driver into the shield and set all DIP switches to ON)

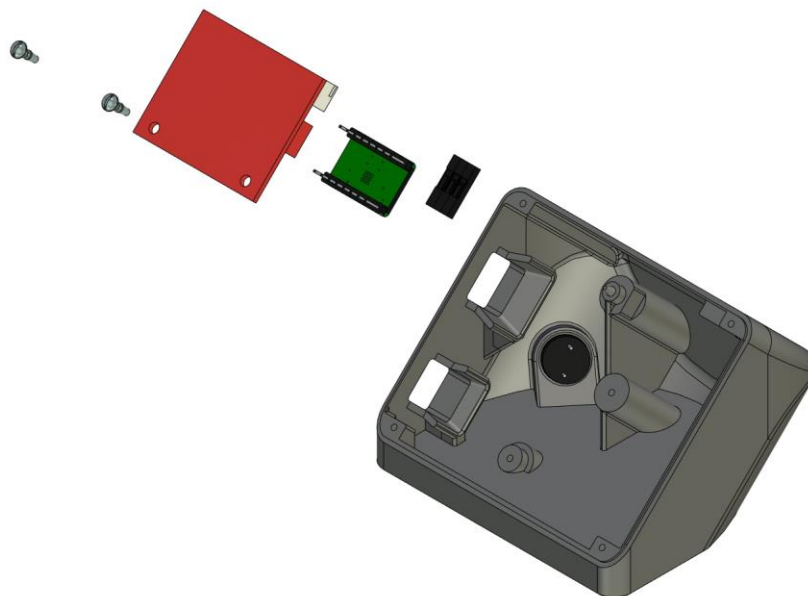| PART # | PART NAME | QTY |
|--------|-----------|-----|
| 24 | Stepper Motor Driver (A4988) | 1 |
| 25 | Control Shield for A4988 | 1 |



**Step 1.6** (set output current limit on A4988)
Detailed instructions are available at this link.

**Step 1.7** (connect all electronic components together; connect stepper motor and endstop switches; plug in 12 V power supply; make sure that pump works)
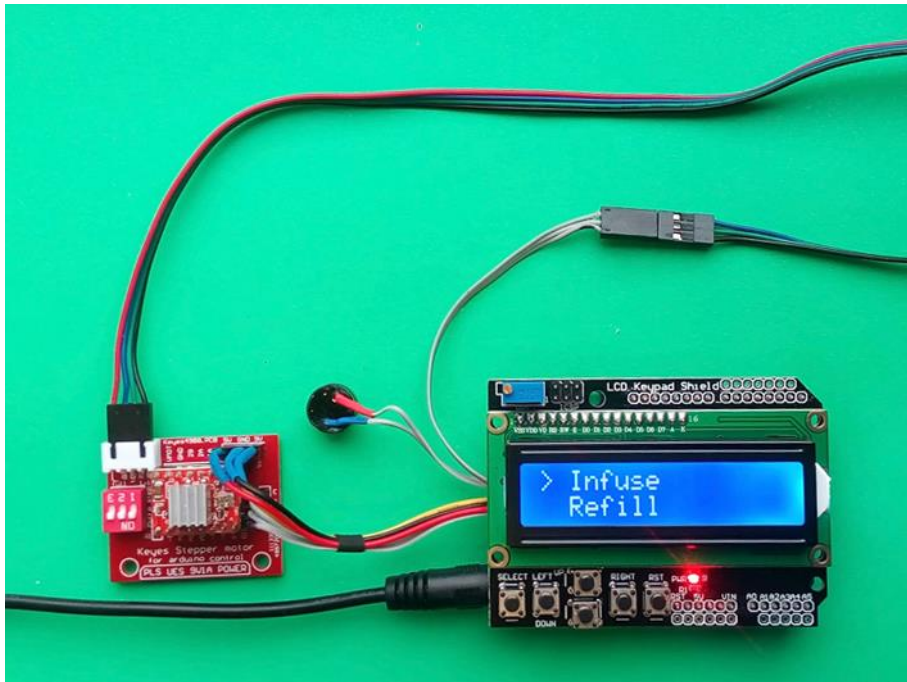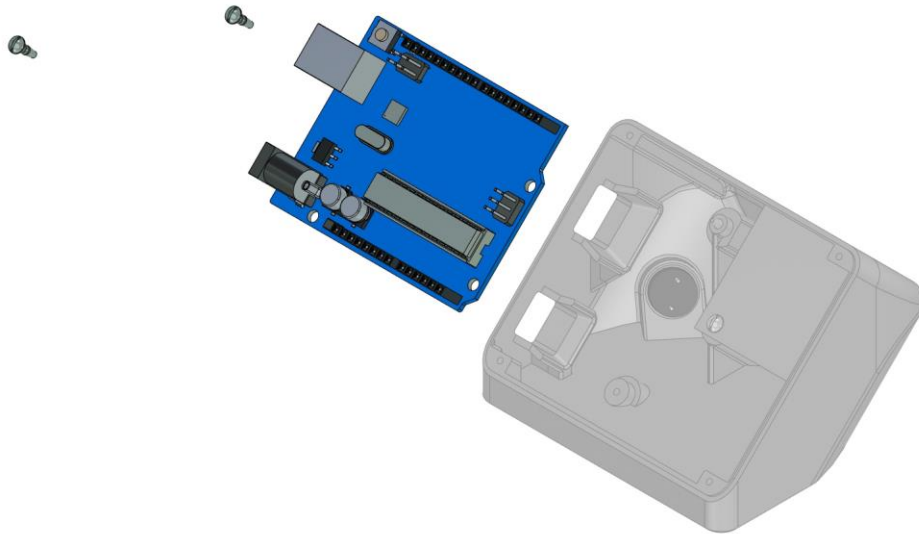


**Step 1.8** (place active buzzer, Dupont housing, and shield with A4988 into the case)

| PART # | PART NAME | QTY |
|--------|-----------|-----|
| 19 | Case (Base) | 1 |
| 35 | Self-tapping Screw 2x8 | 2 |

## Step 1.9 (place Arduino UNO into the case)

| PART # | PART NAME | QTY |
|--------|-----------|-----|
| 35 | Self-tapping Screw 2x8 | 2 |

## Step 1.10 (plug LCD Keypad Shield into Arduino UNO)

| PART # | PART NAME | QTY |
|--------|-----------|-----|
| 23 | LCD Keypad Shield | 1 |
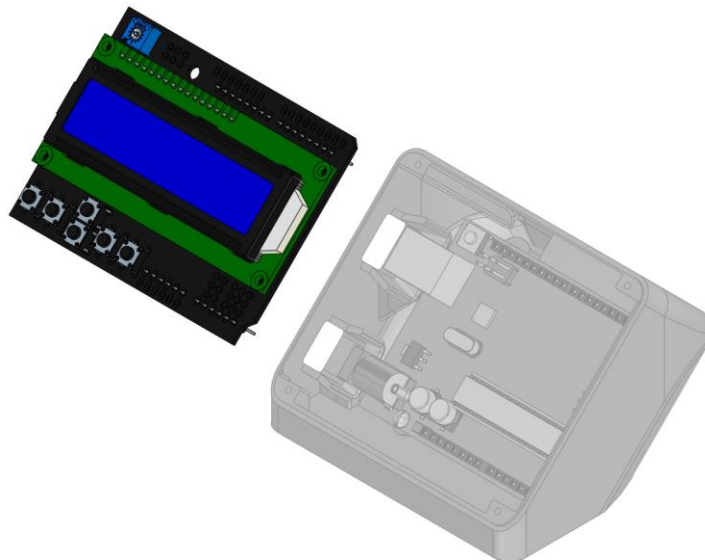
# Step 1.11 (install buttons and top cover)

| PART # | PART NAME | QTY |
|--------|-----------|-----|
| 20 | Case (Cover) | 1 |
| 21 | Buttons | 1 |
| 36 | Self-tapping Screw 2x10 | 4 |