This file contains a brief explanation of the different electronic components used in the Rotating Magnetic Setup. These components include the **12V/5A power supply, Arduino UNO R3, Nema 17 stepper motor, DRV8825 stepper driver,** and **Nextion display 2.4 inch (NX3224T024)**. The wiring of these components can be found in the file ”**Wire\_Diagram**”.

**12V/5A power supply**The system is powered by a 12V/5A power supply, which in turn is connected to a 230V mains socket. For safety and convenience, the 230V supply first passes through a three-pin fused switch connector before reaching the power supply.  
To protect the electronics from damaging voltage spikes, a 100μF (rated at 50V) capacitor is placed across the 12V power supply’s positive and negative terminals, mitigating any surge that might otherwise harm the components.   
The 12V output is distributed in two ways: it directly powers the stepper motor and supplies the Arduino UNO R3.

**Arduino UNO R3**The Arduino UNO R3 is used to communicate with the Nextion display and uses the Nextion’s input to drive the stepper motor. The Arduino is programmed using C++ in the dedicated Arduino IDE (https://www.arduino.cc/en/software). The Arduino features an onboard step-down converter that supports up to 12V, allowing it to operate safely while maintaining the ability to upload code via USB. When a USB cable is connected, the Arduino automatically switches to USB power. The Arduino’s regulated 5V output is used to power both the Nextion display and the stepper driver.

**NEMA 17 stepper motor**The NEMA 17 stepper motor is powered directly by the 12V power supply and controlled through a stepper driver. The Arduino UNO sends pulse signals to the stepper driver based on input from the Nextion display, determining the motor's speed and direction. The NEMA 17 can deliver a torque of up to 5.0 kg·cm (0.49 N·m). If higher torque is required, a NEMA 23 stepper motor can be used, but this requires a different stepper driver.

The NEMA 17 generates significant noise and vibrations at low rotation speeds. These can be reduced by enabling microstepping (smaller steps result in fewer vibrations), lowering the current limit on the stepper driver (see next paragraph), and including rubber O-rings in the stepper motor mounting.

**DRV8825 stepper driver**The DRV8825 stepper motor driver receives pulse signals from the Arduino UNO to control the NEMA 17 stepper motor. It supports microstepping up to 1/32 steps and operates at 8.2V to 45V, supplying up to 2.5A per coil with sufficient cooling. The current limit must be manually set using the build-in potentiometer to match the motor's rated current (see https://www.makerguides.com/drv8825-stepper-motor-driver-arduino-tutorial/ for instructions). A heatsink or active cooling is required at high currents (<1 A) to prevent overheating.

**Nextion display 2.4 inch (NX3224T024)**The Nextion 2.4-inch (NX3224T024) display is a resistive touchscreen that operates independently from the Arduino. It communicates with the Arduino via a hexadecimal protocol, sending commands for speed, direction, and the number of turns the stepper motor should complete.

Using a separate UI module reduces processing load on the Arduino and enables independent display operation. The Nextion is programmed using the Nextion Editor, which provides a graphical interface for designing screens and handling interactions (https://nextion.tech/editor\_guide/).

Code uploads require an ADLivery CP2102 USB-to-serial adapter, along with its corresponding driver (https://www.silabs.com/developer-tools/usb-to-uart-bridge-vcp-drivers?tab=downloads). Proper installation of the driver is necessary for successful communication between the computer and the display.