

Torsional Machine GUI – User Guide

Version 1.0

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1. Overview

This guide is intended for users of the Low-Cost Torsional Testing Machine GUI. It explains how to operate the software to control tests, collect data, and manage outputs effectively.

2. System Requirements

- Operating System: Windows 10 (64-bit) or newer
- Hardware: PC or Laptop with USB-A port
- Connection: USB to Arduino Uno
- To download and access the executable:
 - Visit the following OneDrive link: [TorsionalMachineGUI](#)
 - Navigate to the “**dist**” folder. The application executable is located there
 - Download the executable file and run it on a compatible Windows machine

3. Key Features

GUI Controls:

- Set Angle of Twist, Speed of Rotation, and Direction (CW/CCW)
- Manually enter Calibration Factor
- Start, Stop, and Tare the test
- Real-time data display: Angle, Torque, Time
- Switch between Table View and Graph View
- Export results as a .csv file

4. How to Download the Application

1. Go to the OneDrive link: [TorsionalMachineGUI](#)
2. Open the “**dist**” folder
3. Download the executable file: *TorsionalMachineGUI.exe*
4. Run the file on a compatible Windows machine

5. Using the GUI

Step 1: Launching the Application

Double-click the application executable to open the GUI. The Arduino Status Indicator (LED) should turn green upon successful connection.

Step 2: Input Test Parameters

1. Angle of Twist: Enter the target angle (in degrees).
2. Speed of Rotation: Enter a value between 1.5 and 71 degrees/min. Values outside this range will prompt an error.
3. Direction of Twist: Select Clockwise (CW) or Counterclockwise (CCW).
4. Calibration Factor: Manually enter if recalibration is necessary.
5. Click the Set button to confirm values.

Step 3: Sensor Tare

Press the Tare Torque button to calibrate the torque sensor to 0.01 N·m.

Note: The torque sensor has a physical upper limit of 150 N·m, but the software enforces a safety cap of 145 N·m. No torque reading or test condition should exceed this value.

Step 4: Start Test

Press the Start Test button to begin. The system starts recording:

- Angle (deg)
- Torque (N·m)
- Time (s)

Step 5: Monitor Live Results

Choose Graph View to visualize:

- Angle vs. Torque
- Time vs. Torque

Use Switch to Table to view raw data in a table format, updating every 400 ms.

Step 6: End Test

Press the Stop Test button to cease motor activity and stop data collection.

6. Saving and Resetting Data

Save Data

Click the Save Data button.

Enter file name and save location in the dialog window.

Data is saved as a .csv file (compatible with Microsoft Excel 2024).

A confirmation message will display upon successful save.

Clear Table/Graph

Press the Erase Table/Graph button to remove current session data.

Warning: This action is irreversible.

7. Validation Rules & Constraints

Parameter	Constraint
Torque	Max 145 N·m (Sensor limit: 150 N·m)
Speed of Rotation	1.5 to 71 degrees/min
Data Save Format	.csv
Data Logging Interval	Every 400 ms

8. Typical Workflow

1. Launch GUI
2. Enter parameters
3. Tare sensor
4. Start test
5. Monitor results
6. Stop test
7. Save or clear data

9. Troubleshooting Tips

- Connection Fails: Ensure USB cable is properly connected. Replug if needed.
- Invalid Input: GUI will prompt errors for values outside allowable ranges.
- No Graph/Table Update: Ensure test is started and connection to Arduino is active.
- Cannot Save File: Verify the destination path has write permissions.

10. Safety & Security Notes

- Application only accesses local file systems when saving files.
- Avoid abrupt USB disconnection during tests.
- System must be used under supervision as per department protocols.