

Noztek Controller Software

Quickstart Guide

Version 2.3 | Extruder & Tolerance Puller Integration

Overview

The Noztek Controller Software is a desktop application that provides unified monitoring and control of your Noztek extrusion line from a single interface. It connects to two machines via USB:

- **Extruder** (Nexus Mk2 / Xcalibur Servo) — temperature control for three heaterbands, screw motor speed control, and real-time motor feedback.
- **Tolerance Puller** — live filament diameter measurement, puller speed monitoring, and production length tracking.

Each device connects independently. You can run the extruder alone, the puller alone, or both together for full-line monitoring.

Requirements

- Windows PC with two available USB ports
- Latest version of the Noztek Controller Software

Getting Started

Launching the Software

Run the application from source or double-click the compiled executable. The main window will open showing the connection panel on the left and the live dashboard on the right.

Connecting the Extruder

1. Plug the extruder into your PC via USB. The COM port should appear in the Extruder dropdown.
2. If no ports are listed, check your USB cable and drivers. Ports refresh automatically on launch.
3. Select the correct COM port from the Extruder dropdown.
4. Click CONNECT. The status LED turns green and the software sends a PC_MODE command to the extruder, transferring control to the PC interface.
5. The extruder is now ready for temperature and motor control.

To disconnect, click DISCONNECT. The software releases PC mode and returns control to the extruder's touchscreen.

Connecting the Tolerance Puller

1. Plug the Tolerance Puller into your PC via a second USB cable.
2. Select the puller's COM port from the Tolerance Puller dropdown. If two ports are available, the software will default the puller to the second port.
3. Click CONNECT. The status LED turns green and data begins streaming immediately at 1 Hz.

The puller connection is listen-only — the software reads data from the puller but does not send any commands to it. All puller control (target diameter, motor start/stop) remains on the puller's own touchscreen.

Note: You cannot assign the same COM port to both devices. If you attempt this, the software will display an error and ask you to select a different port.

First Run: Step-by-Step

This section walks through a complete extrusion session from power-on to running filament. Follow these steps in order the first time you use the system.

Step 1 — Connect the Machines

Connect both the extruder and the Tolerance Puller to your PC via USB, and power on both machines. In the Connection section of the controller software, select the COM port for each machine using its respective dropdown menu and click CONNECT.

If a device does not respond after connecting, try swapping the COM port assignments in the dropdown menus. Windows does not always assign ports in the same order, particularly if cables are plugged in a different sequence.

Step 2 — Set Heaterband Temperatures

In the Temperature Setup section, enter the target temperature for each of the three heating zones:

- **Heaterband 1** — the heating zone nearest the nozzle.
- **Heaterband 2** — the middle section of the barrel.
- **Heaterband 3** — the heating zone nearest the hopper (feed end).

Always refer to the material datasheet or processing guidelines for the correct temperature settings. Incorrect temperatures can result in poor melt quality, degradation, or blockages.

Step 3 — Pre-Warmup

Press START WARM UP in the Warmup section to begin a 20-minute pre-warmup cycle. This ensures that any material remaining in the barrel and nozzle from a previous session is fully molten before the motor is started. Running the screw into cold or partially solidified material risks damaging the screw, barrel, or drive system.

Do not skip or shorten this step, particularly after a cold start or when changing materials.

Step 4 — Start Extruding

Once the warmup timer completes, press RUN in the Run Motor section under Live Parameters. The motor will perform an automatic 5 RPM test run to verify that the screw is rotating correctly and that there are no blockages in the barrel or nozzle. If this test passes successfully, full motor control is enabled in the Speed Control section.

The motor will ramp to the speed shown in the Set RPM box. You can monitor live motor performance — RPM, gearbox RPM, load, and torque — in the Motor Feedback section and on the Motor Graphs tab.

Step 5 — Fine-Tune Temperatures

In the Temperatures section under Live Parameters, you can make micro-adjustments of up to $\pm 5^{\circ}\text{C}$ at a time to each heaterband. Use these to fine-tune your extrusion process once the line is running — for example, to adjust melt viscosity, improve surface finish, or correct diameter drift. Avoid large temperature jumps during production; small incremental changes allow the system to stabilise between adjustments.

Step 6 — Monitor Filament Quality

If the Tolerance Puller is connected, the Puller Graphs tab will show live filament diameter with the tolerance band overlay, and the Puller Feedback section on the dashboard displays the current diameter with colour-coded in-spec/out-of-spec indication. Once the line is stable and producing consistent filament, press RESET STATS & LENGTH on the Puller Stats tab to begin a clean measurement window for your production batch.

Interface Overview

Connection Panel (Left Sidebar)

The connection panel is divided into two sections — Extruder and Tolerance Puller — each with its own COM port dropdown, Connect/Disconnect button, and status LED. A STATUS button at the bottom requests a diagnostic readout from the extruder.

Live Parameters (Dashboard Row)

The live parameters row is divided into three equal sections:

Speed Control	Motor Feedback	Puller Feedback
Set screw RPM (1–150), apply with the APPLY button or use the ± 1 increment buttons. Displays current setpoint status.	Four live readouts from the extruder motor: Motor RPM, Gearbox RPM, Load (%), and Torque (%).	Three live readouts from the puller: Target Diameter (mm), Live Diameter (mm), and Total Filament Length since start or last stats reset.

The Live Diameter display is colour-coded: green when the measured diameter is within ± 0.05 mm of the target, and red when outside tolerance.

Tabs

The tabbed section contains the following tabs:

Tab	Contents
Motor Graphs	Two live rolling charts: Motor RPM and Load/Torque over time.
Temperature Graphs	Three live rolling charts showing actual vs target temperature for Heaterband 1, 2, and 3.
Puller Graphs	Two live rolling charts: Filament Diameter (mm) with target line and ± 0.05 mm tolerance band overlay, and Puller Speed (cm/sec).
Puller Stats	Numeric display boxes showing Target, Last, Mean, Max, Min, Speed (cm/min), and Length. Includes a Reset button.
System Messages	Timestamped log of connection events, errors, and system status messages.
Session Notes	Free-text area for operator notes. Notes are timestamped and persist for the session.

Extruder Operation

Temperature Control

Once connected, the software reads live temperatures from all three heaterbands and displays them in the Temperature Graphs tab. Temperature targets are set on the extruder's own touchscreen before entering PC mode — the software monitors and logs them but does not override them.

The warmup timer in the top-right corner tracks time since heaters were activated, and a stability indicator shows when temperatures have settled within tolerance of their setpoints.

Motor Speed Control

1. Enter the desired screw RPM (1–150) in the Speed Control section.
2. Click APPLY or use the ± 1 buttons for fine adjustment.
3. Motor feedback (RPM, gearbox RPM, load, torque) updates live in the Motor Feedback section and on the Motor Graphs tab.

Setting speed to 0 stops the motor.

Puller Monitoring

The Tolerance Puller streams data at 1 Hz once connected. No setup is required on the software side — target diameter and puller speed are controlled from the puller's own touchscreen.

Diameter Graph

The upper chart on the Puller Graphs tab shows measured filament diameter over time. Three reference lines are overlaid automatically:

- **Target line (dashed green)** — the target diameter as set on the puller's touchscreen.
- **Upper tolerance (dotted amber)** — target + 0.05 mm.
- **Lower tolerance (dotted amber)** — target – 0.05 mm.

This makes it easy to see at a glance whether the filament is within specification.

Speed Graph

The lower chart shows puller speed in cm/sec, converted from the firmware's cm/min reading. Useful for monitoring line stability and correlating speed changes with diameter variation.

Statistics

The Puller Stats tab displays cumulative statistics computed since the last reset:

Statistic	Description
Target	The target filament diameter currently set on the puller's touchscreen.
Last	The most recent diameter measurement.
Mean	The arithmetic mean of all diameter readings since the last reset.
Max	The single highest diameter reading since the last reset.
Min	The single lowest diameter reading since the last reset.
Speed	Current puller speed in cm/min (live, not averaged).
Length	Total filament length pulled since the last reset, calculated from motor encoder data. Displayed in cm below 1 m, and in metres above.

Resetting Statistics

The RESET STATS & LENGTH button on the Puller Stats tab zeroes Mean, Max, Min, and the Length counter. The graphs continue to roll — only the numeric statistics are cleared. Use this when you want a fresh measurement window, for example after the line has stabilised or between production batches.

Data Export

Click Export CSV in the Data Collection section to save a timestamped CSV file containing all collected data from the session. The export includes:

- Temperature data: actual and target values for all three heaterbands, plus heater duty percentages.

- Motor data: RPM, gearbox RPM, load, and torque.
- Puller data: measured diameter (mm), target diameter (mm), puller speed (cm/min), and cumulative length (cm).

Data from all three sources is merged by timestamp using nearest-neighbour matching, so each row contains the most recent reading from each device at that point in time.

Use Clear Data to discard all collected data and start fresh. This also resets the puller statistics.

Tips

- **Let the line settle before resetting stats.** Startup transients (temperature ramp, puller PID settling) will skew your Mean and widen your Max/Min range. Wait until the diameter graph looks stable, then hit Reset for meaningful production statistics.
- **Watch the Live Diameter colour.** Green means in-spec; red means out of tolerance. This gives you an at-a-glance quality check without switching tabs.
- **Use Session Notes.** Document material changes, hopper top-ups, or parameter adjustments with a timestamped note. This context is invaluable when reviewing exported data later.
- **Two USB cables, two ports.** If you unplug and reconnect a device, the COM port number may change. Reconnect in the software after re-plugging.

Troubleshooting

Issue	Resolution
No COM ports listed	Check USB cables are connected. Install Arduino/CH340 drivers if required. Restart the software.
Extruder connects but shows no data	Click STATUS to request a diagnostic readout. Ensure the extruder firmware supports PC_MODE. Check the System Messages tab for error details.
Puller connects but graphs are empty	The puller streams data once per second. Wait a few seconds. If still empty, check the System Messages tab for parse errors — this may indicate a firmware version mismatch.
Port conflict error	You have selected the same COM port for both devices. Choose a different port for one of them.
Diameter reading shows “---”	No data has been received from the puller yet. Verify the puller is powered on and the laser sensor is active.
CSV export is empty	No data has been collected. Connect at least one device and allow it to stream data before exporting.