1. WHAT IS THE ATC KIT:

The ATC, or Automatic Tension Control, is an external device that can be added to your Tonewinder unit to control the tension of the wire in your coil in real time. The ATC consists of a stepper motor that connects or separates two felt discs between which the winding wire is located. Depending on the tension reading and the target to be reached, it presses or loosens the discs against the wire to reach the target, following a specific PID program.

The ATC can be set to a constant wire tension across the entire coil, or even to ramp the wire tension (up or down) during the turns of your pickup, with an accuracy of one gram.

Estimated installation time for this kit is less than 2 hours.

WARNING: Once this upgrading procedure is initiated, you can hold it and restart it whenever you wish, but the winder will remain inoperative until you have completed the full upgrading procedure.

2. PURPOSE:

This document describes the process followed to update a Tonewinder unit with the ATC (Automatic Control Tension) kit.
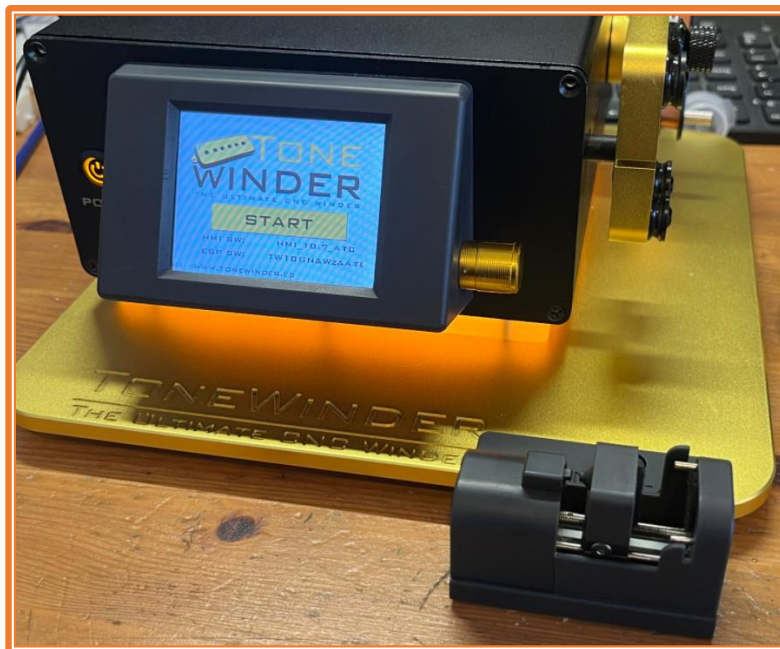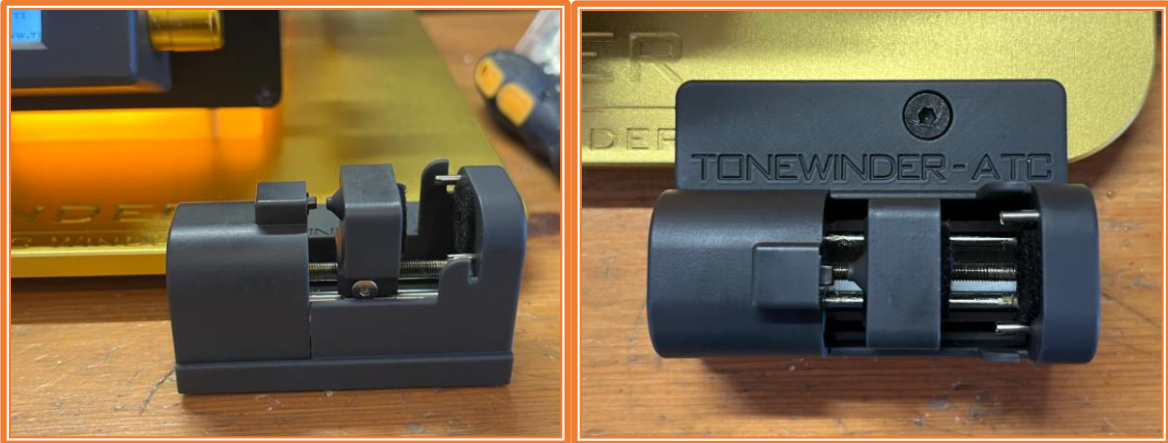

Figure 1: ATC installed in Tonewinder unit.

Figure 2: Detail of the ATC device.

Figure 3: Picture of the ATC Kit.

3. SCOPE:

This upgrade kit can only be installed in TW1.2 versions:

Figure 4: Tonewinder 1.1 (S/N from 001 to 030)   Figure 5: Tonewinder 1.2 (Serial number from 031)

NOTE 1: if you have any doubt about your version, email us to confirm.

NOTE 2: Can be also installed in TW 1.1 versions, but not directly due to the need for a special mod. If you are interested, email us.

4. ATC UPGRADE KIT PARTS:

The ATC upgrade kit contains:

- ATC assembly, which includes a stepper motor, home sensor and holder with cover, all are assembled and tested ready to use. Also includes 1xM4 screw to install it.
- Driver TMC2226 (3 units), modified and calibrated to each stepper motor.

5. SOFTWARE VERSION:

For proper functioning of the winder, you need to update these software versions:

- **Microcontroller ESP32 Software: 10.7_ATC or higher.**
- **Touch Screen HMI Software: 10.7_ATC or higher.**

You can download the zipped folder called "TONEWINDER 10.7 ATC SOFTWARE" from our website, www.tonewinder.es , in the "DOWNLOADS" section, where you will find all the files and software that you need to upgrade your unit:
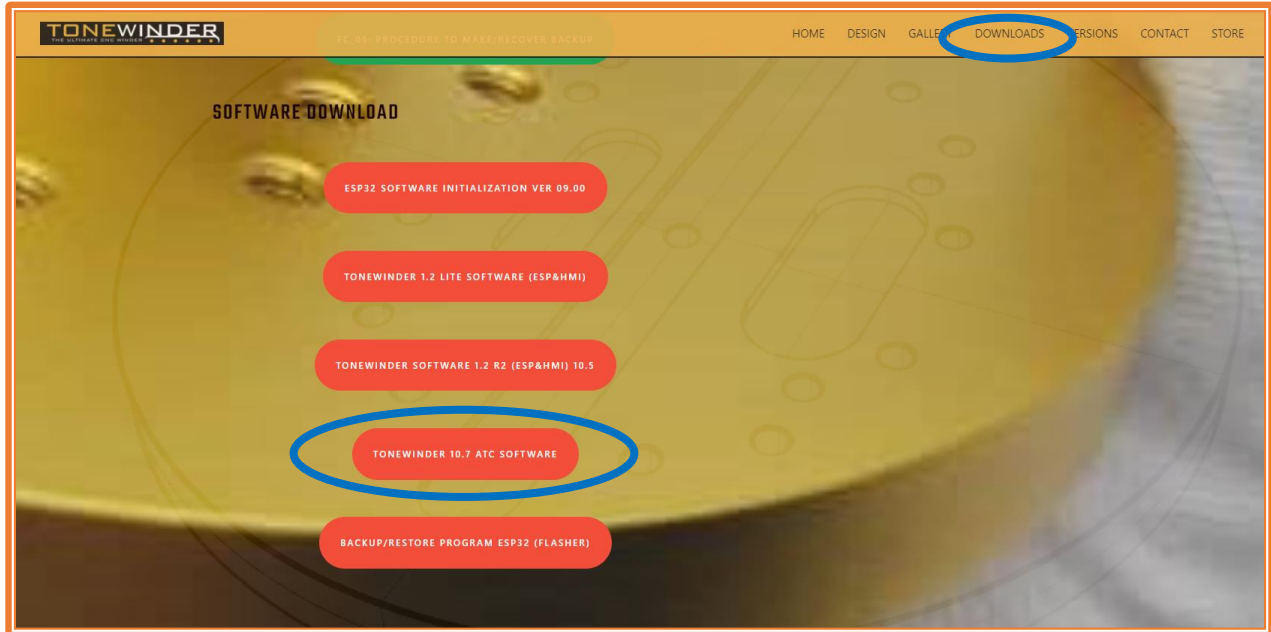

Figure 6: Download "TONEWINDER 10.7 ATC SOFTWARE" folder.

Unzip this file in C:\ (for example). After unzipping this file you'll find all these folders inside:
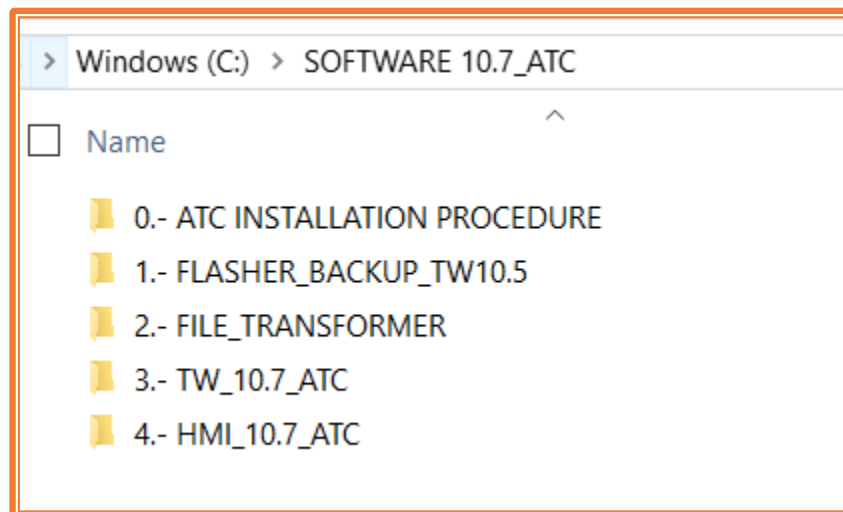

Figure 7: Folders inside of "SOFTWARE 10.7_ATC".

The usefulness of each folder is as follows:

0.- ATC INSTALLATION PROCEDURE:

      Inside this folder, you will find a copy of the latest procedure for installing ATC on your TW 1.2 unit (see FC_13_ATC KIT INSTALLATION IN TW 1.2_rev3.pdf).

1.- FLASHER_BACKUP_TW10.5:

      Here you will find the files needed to make a mirror copy of your current ESP32 microprocessor.

2.- FILE_TRANSFORMER:

      This program (Tonewinder_10_7_ATC_FILETRANSFORMER.bin) modifies the structure of your current memories or presets, to add the wire tension parameters (by default the initial tension will be set to 15 grams and the final tension to 20 grams). So you will not lose your current memories.

3.- TW_10.7_ATC:

      Inside this folder, you will find the ESP microcontroller software (TW 10.7_ATC.bin).

4.- HMI_10.7_ATC:

      Inside this folder, you will find the touch screen software (HMI 10.7_ATC.tft).

Those software versions should be uploaded **before** installing the hardware of the ATC kit.

6. <u>INSTALL THE ATC KIT:</u>

      Here are the steps to follow to install this new kit:

➢ **STEP 1**: Make a backup (mirror copy) of your current ESP memory. To carry out this task, enter in the "1.- FLASHER_BACKUP_TW10.5" folder, described in the previous section. With this program, you will be able to create a mirror copy of your current ESP, just in case you have an issue during the updating process.

      Connect the winder to your PC using a USB C cable (The power supply plug must be disconnected from the winder), and the touch screen will light up.

      Then, select the COM port where the winder is connected (if you have any doubt regarding which port it is using, you can open the "Computer Management" program and list the COM ports, to find in which port your winder is connected (USB-SERIAL CH340(comX)):
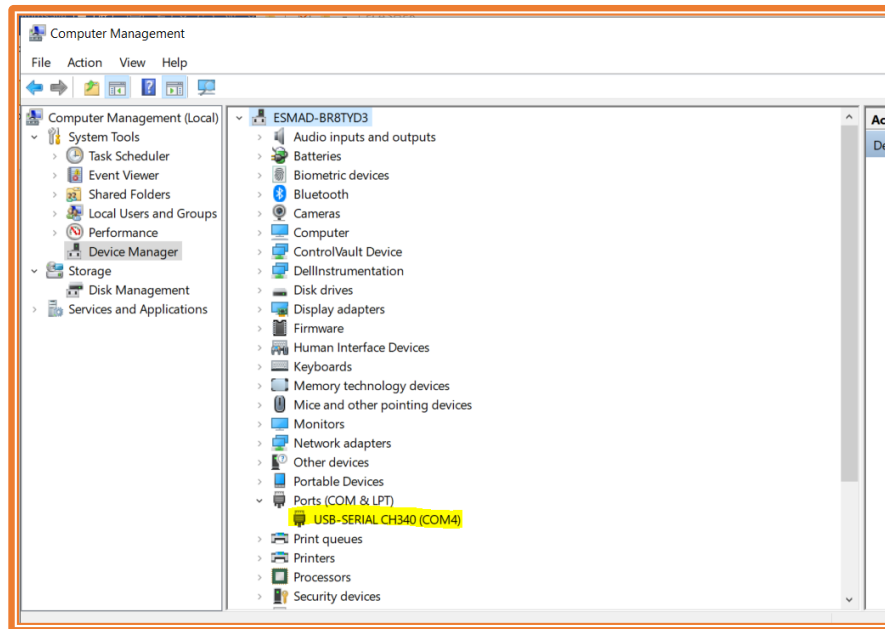
Figure 8: Computer management program.

Once you know which port it is using, run the file "**DownTonewinderFLASH.bat**" located in this folder, and follow the instructions.

If all goes well, you will see a progression during it makes a copy into your PC.

When the procedure is finished, you will see a new file in the folder which is called "**tonewinderMemory_FLASH.bin**", and this is your mirror copy, so you should keep it in a safe place.

➢ **STEP 2**: Before proceeding, you must keep the current "**offset value**" that is set in your winder. Later you will need it to write in the ESP microcontroller, in case it has been reset during the software upgrade.
To do this, disconnect the USB-C cable from your unit, connect the power supply plug, and switch on the winder.
Then, navigate to the "BASIC PARAMETERS" Screen and keep the "Offset" value.
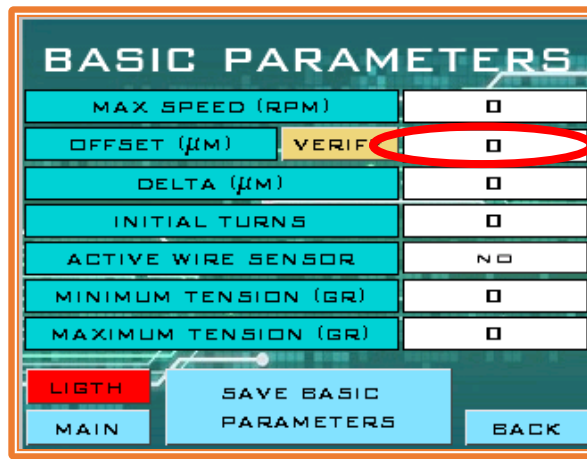
Figure 9: Basic parameters screen.

NOTE: in case you have not recorded this data, there is a procedure in the manual to recalibrate it.

➢ **STEP 3**: Upgrade the ESP32 Microcontroller software with "Tonewinder_10_7_ATC_ FILETRANSFORMER.bin", located in the second folder (2.- FILE_TRANSFORMER).

Switch on the winder (connected to the power supply), and go to the "SOFTWARE UPDATE" section. Enter your wifi network name and password, and press 'Connect'. Once the microcontroller has connected to your computer, it will show you the IP address so you can connect to it (for example 192.168.1.150). Press the big button to open the connection between your winder and your PC.

Figure 10: Press the button to open the Tonewinder connection.

Then, write this IP address in your Internet navigator address field and press enter:
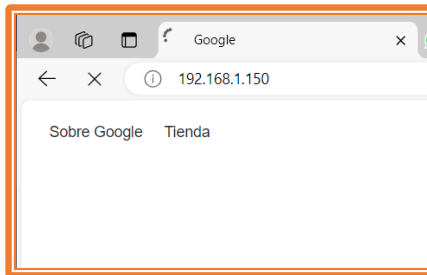
Figure 11: Write the IP address of your winder in your navigator.

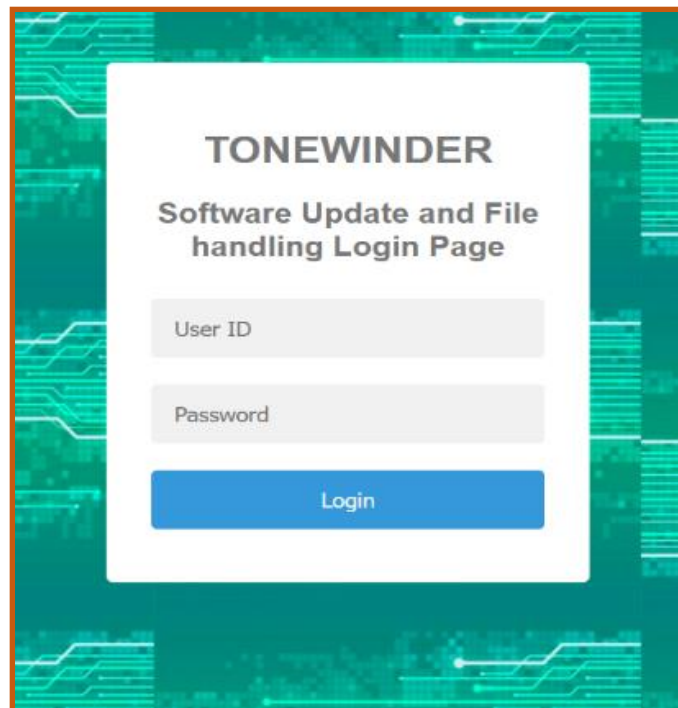When the winder connects with your PC, you will see this screen:

Figure 12: Basic parameters screen.

Use "**admin**" as the User ID, and "**tonewinder**" as the password, and press "Login".

Select the first option "1.- Tonewinder Software Upgrade", and choose the file to update "Tonewinder_10_7_ATC_FILETRANSFORMER.bin", located in the path C:\SOFTWARE 10.7_ATC\2.- FILE_TRANSFORMER.

Once the software is loaded (it should take a couple of minutes), you will see again the "WIFI" Screen, to connect again with your wifi network, to upload the final software.

If you have any doubts about the upload software procedure, please see section "6.5.6.5.-Software update", in the manual.

NOTE: This program prepares your ESP to upload correctly the correct version of the ATC software, and modify your existing memories, adding the wire tension values, so you will be able to use them when the process has been completed.

➢ **STEP 4**: Upgrade the ESP32 software with the latest version for ATC (10.7_ATC or higher). You can find it in the third folder "TW 10.7_ATC", following the same procedure as the previous step.

WARNING: Please note that after loading the new software, the logic of the motors is reversed, so when the microcontroller is initializing, the guider arm will start to move to the right. At this point you must switch off the unit before it reaches the end.

➢ **STEP 5**: Turn the power off and remove the power cord from the winder. Also, remove the four screws from the top cover. Then carefully remove the top cover from the winder and place it on the bench close to the winder as the Gaussmeter sensor is still connected to the circuit board.

Figure 13: Remove the top screws from the front and rear cover (x4).

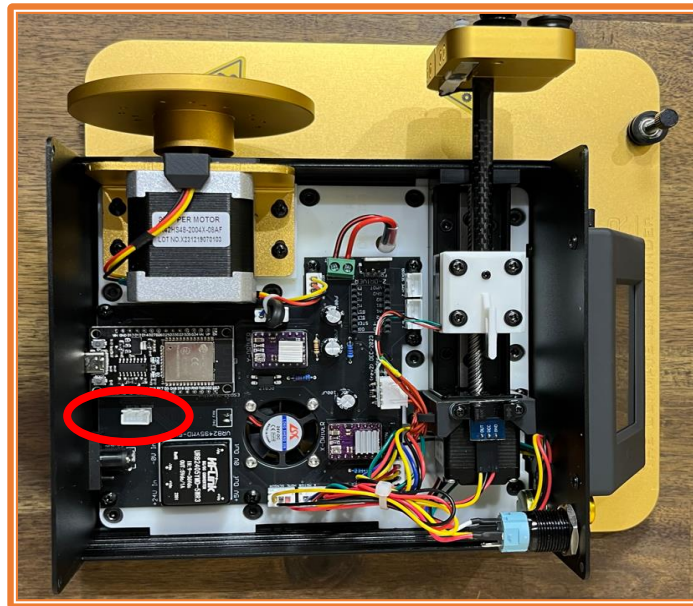> ➢ **STEP 6**: Disconnect the cable from the Gaussmeter sensor and remove the top cover.

Figure 14: Disconnect Gaussmeter sensor wire from the PCB.

> ➢ **STEP 7**: Drill a 12 mm (1/2 inch) hole, from inside to outside, to prevent aluminum powder from coming into contact with the printed circuit board. We suggest drilling first with a 3 mm (1/8 inch) mill and then drilling with 6mm (1/4 inch), then 9mm (3/8 inch), and finally drilling with 12 mm (1/2 inch), in this place.
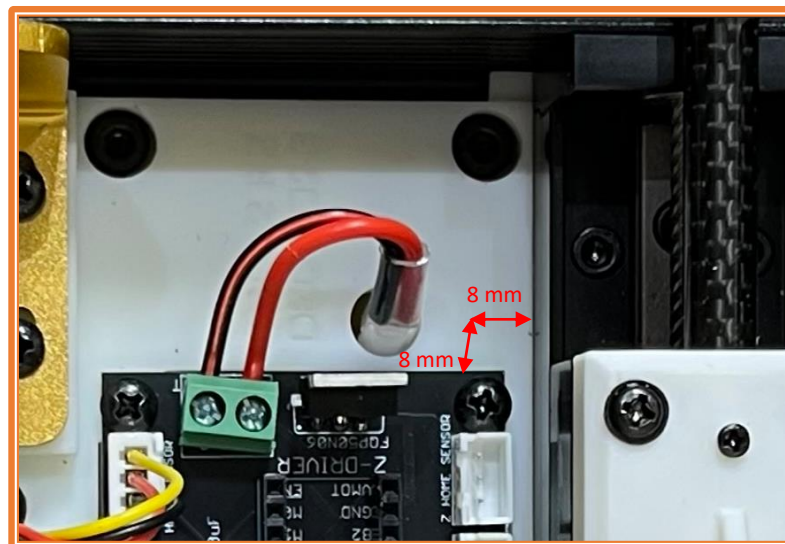

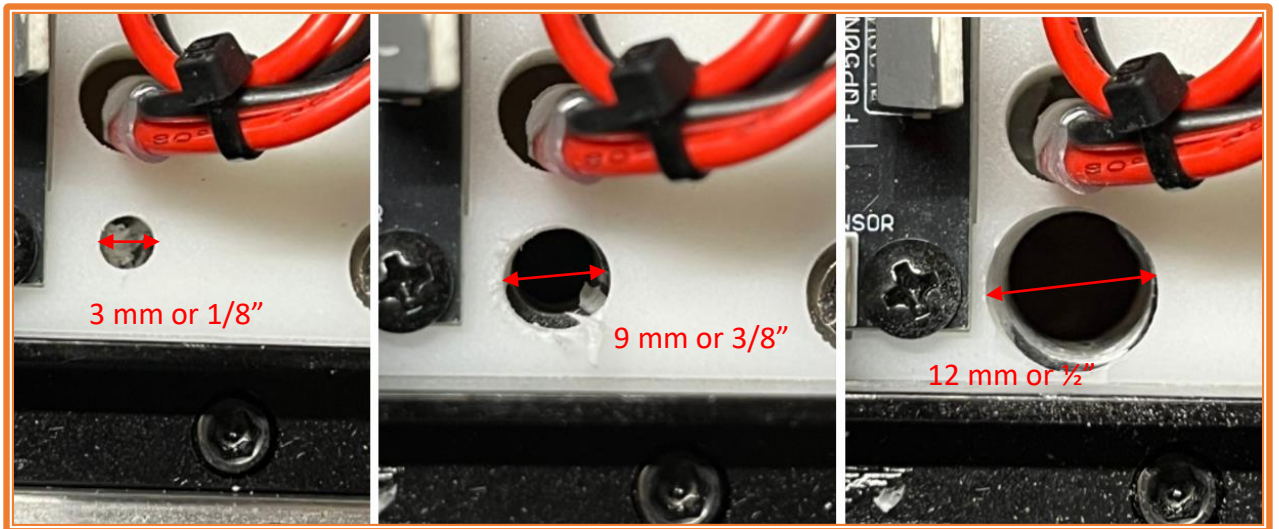Figure 15: Perforation point (8 mm= 0.314 inch)

Figure 16: Diameter of boreholes.

➢ **STEP 8**: Make sure that the outer aluminum edge is free of burrs that could damage the cables to be installed. Also, blow as possible inside the winder (PCB), in order to prevent a shortcut.

Figure 17: Use a file or sandpaper to smooth the edge of the hole.

> ➢ **STEP 9**: Remove the stabilizer screw and the felt disc glued to the base. Then install the ATC by screwing the M4 black screw.

Figure 18: ATC installed with M4 black screw.

> ➢ **STEP 10**: Insert the ATC wires from the bottom of the base into the inside of the winder. Insert the 4-wire cable first. You may have to bend the 4-wire connector a little to get it in.
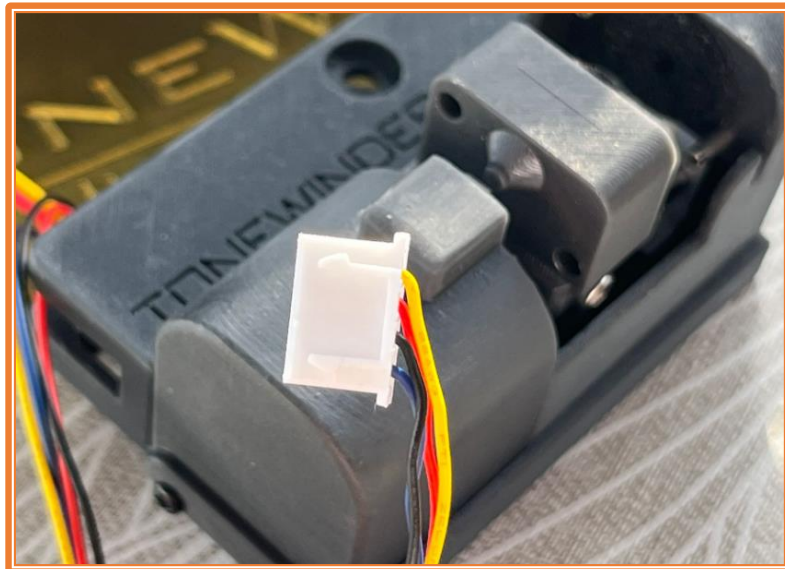

Figure 19: 4-wire connector bending.

NOTE: In case you have an ATC with 4-pin supplement cable, disconnect the supplement cable from the cable motor before you insert the cable into the hole.
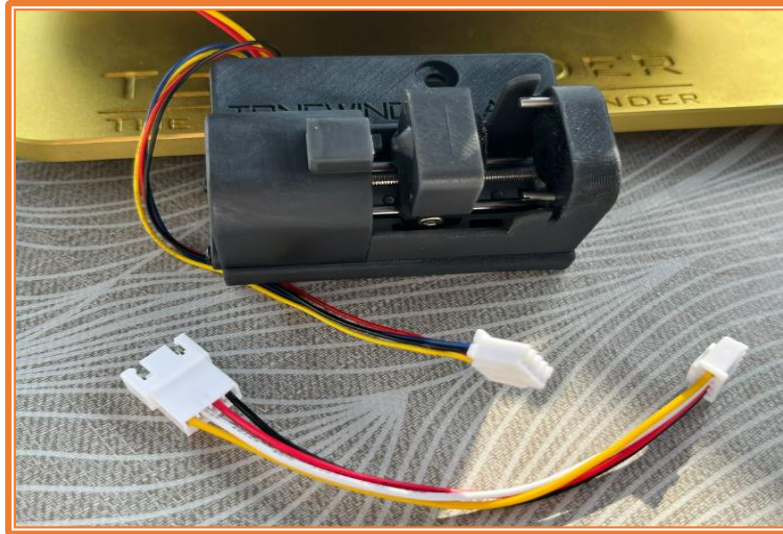

Figure 20: Disconnect the supplement cable before inserting the cable into the hole.

Once the motor connector is inside the winder you can reconnect the supplement cable in order to reach the PCB connector.

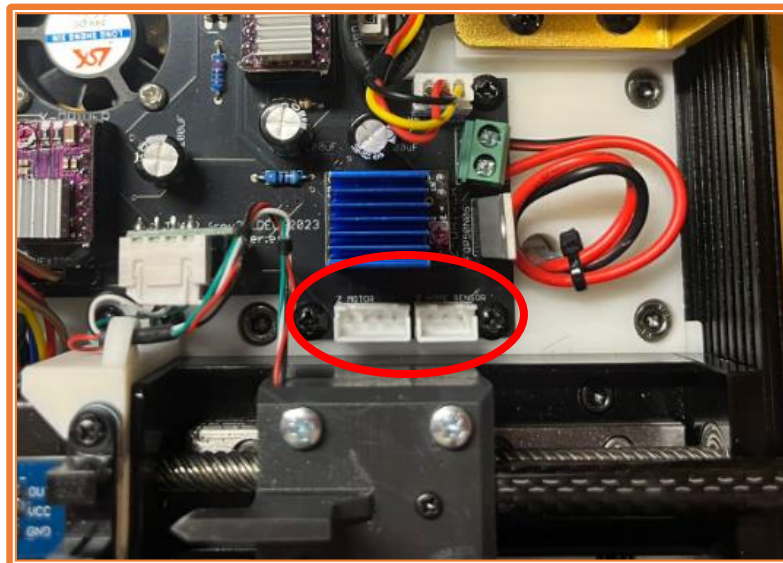➢ **STEP 11**: Connect them to the PCB in these male connectors:
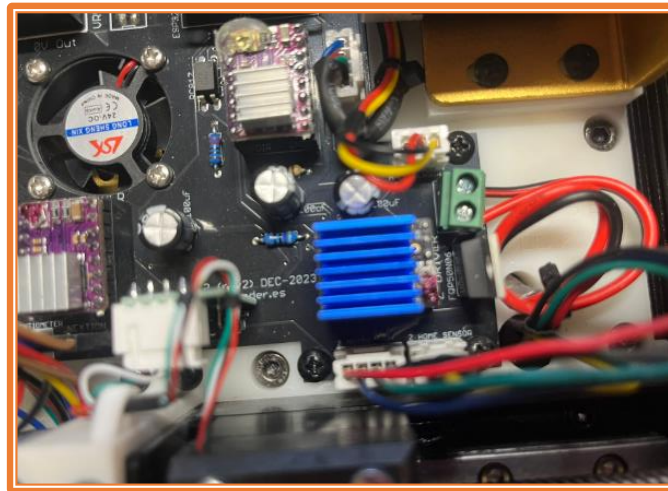

Figure 21: Connection point.

Figure 22: Stepper motor and Z Home sensor connected.

➢ **STEP 12**: Install the supplied motor drivers (take care about the direction of the drivers, otherwise you can burn the ESP or the driver itself). These drivers **are labeled as X, Y, and Z,** and you must fit in their position because they have a specific current for each stepper motor:
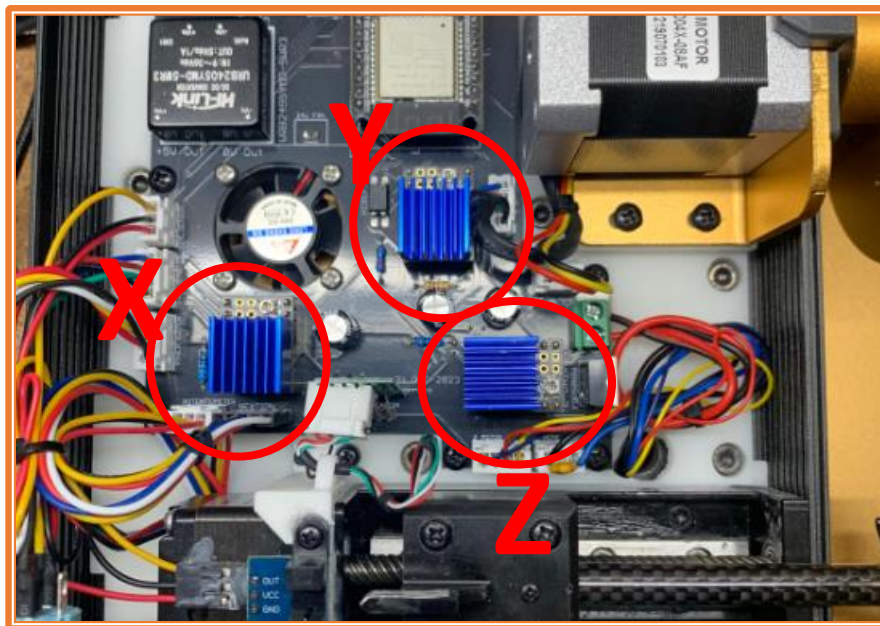

Figure 23: Motor driver installation.

NOTE: These drivers are adjusted to a specific current/voltage for each motor (600 mV for motor X, 800mV for motor Y and 200 mV for motor Z). At the end of this procedure, you will find out how to measure and adjust these voltages.

➢ **STEP 13**: Switch on the winder. In the initialization process, the guiding arm shall be moved first looking for the home position, and then the ATC motor shall be moved until it touches the home switch. Then, if all go fine, the blue light on the base must light up.

NOTE: In case the initialization process is not completed and the base light does not come on, check if the ATC motor moves during the process and triggers the home sensor. In case it does not move, operate the home sensor (by pressing the mini-switch) and check that the initialization process is completed. In this case, there must be something wrong with the motor connections (4-pin connectors). Review 4-pin connectors.

➢ **STEP 14**: Remove the Wire tension screw in the arm (also the M2 Rod screw), and replace it with the stabilizer screw that you removed before. **Just screw it several turns (3 or 4), in order to keep the lower tension as low as possible**.

Figure 24: Replace the Tension screw (left) with the Stabilizer screw (right).

➢ **STEP 15**: Upgrade the touchscreen software with the file "HMI 10.7_ATC.tft", located in the folder "4.- HMI_10.7_ATC". Save this file on a micro SD card (with less than 32 Gb) using a computer with Windows S.O.. Insert the micro SD card into the touch screen, facing the contacts to you (follow section 6.5.6.7 in the manual):

6.5.6.7 Touch Screen Software Update:

The touchscreen software update is performed using a **microSD, max 32Gb,** card through the slit located under the screen. **Only a Windows OS can be used to save and update this software**.

Download the updated version of the **Nextion software** program in the download section of http://tonewinder.es.

NOTE: the downloaded file is compressed (zip), and you must decompress it before use it. The extension of this file is .tft.

Copy the program to an empty **microSD** card. With **Tonewinder** turned off, insert the **microSD** card into the ready-made socket under the display (**Contacts facing to you**). Make sure the card has been adjusted correctly (you will feel a soft resistance when the card is seated, making a final click). Then operate the **Tonewinder** power switch.

The guide arm will be moved first to the starting position and then to the zero position. This movement is normal.

The update screen should show the progress of the program load and, after a few seconds, the screen will show the successfully updated status.

Remove the **microSD** card by pushing it lightly and then remove it completely.

Figure 25: Touch screen software update.

NOTE: In case you only have a MAC to carry out this step, please let us know (email) and we will send you a valid way to save this file on the SD card using a MAC.

➢ **STEP 16**: Switch on the Tonewinder and wait until the touch screen software update is finished:
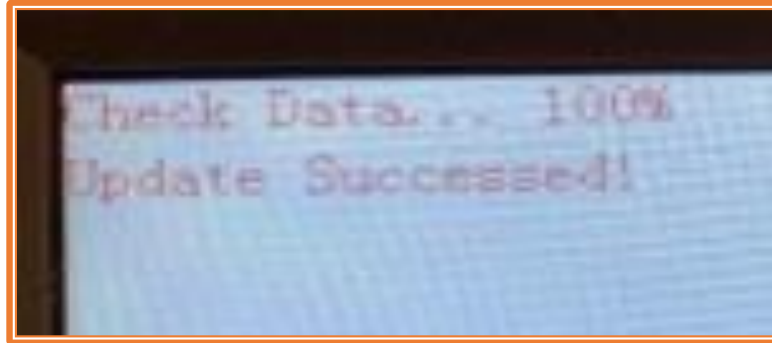

Figure 26: Touch screen software update.

Once you see this screen, switch off the winder and remove the SD card.

➢ **STEP 17**: Go to MAIN MENU>SETTINGS>BASIC PARAMETERS, and set the Offset to your previous value (also the delta), in case it is modified.

7. HOW TO SET UP AND USE THE ATC FOR THE FIRST TIME:

Here are the steps to follow to set up and use the ATC:

➢ **STEP 1**: Place the wire into the ATC according to these pictures. Both of them are valid:

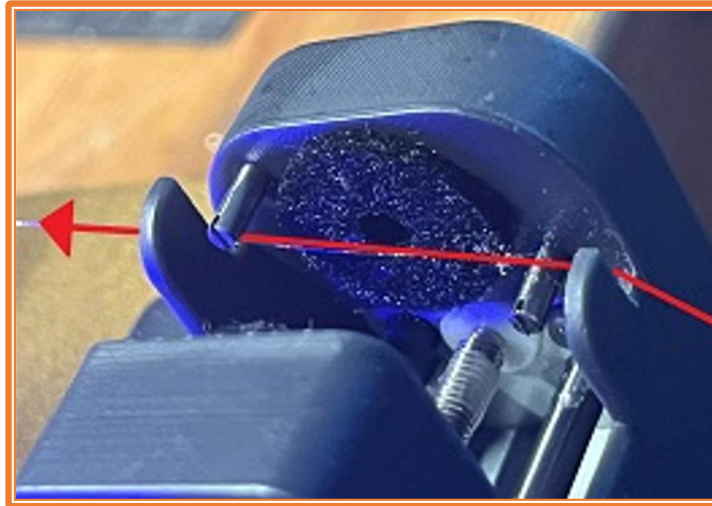Figure 27: Wire routing on the ATC (First way).

Figure 28: Wire routing on the ATC (Second way).

➢ **STEP 2**: Place the wire into the arm as usual way, but using the stabilizer screw instead of the wire tension screw. **Just tight the stabilizer screw several turns (3 or 4)**, in order to keep the lower tension as low as possible.
Then, pull from the pulley that is located in the Stabilizer Screw, and place the wire as shown in the following picture:
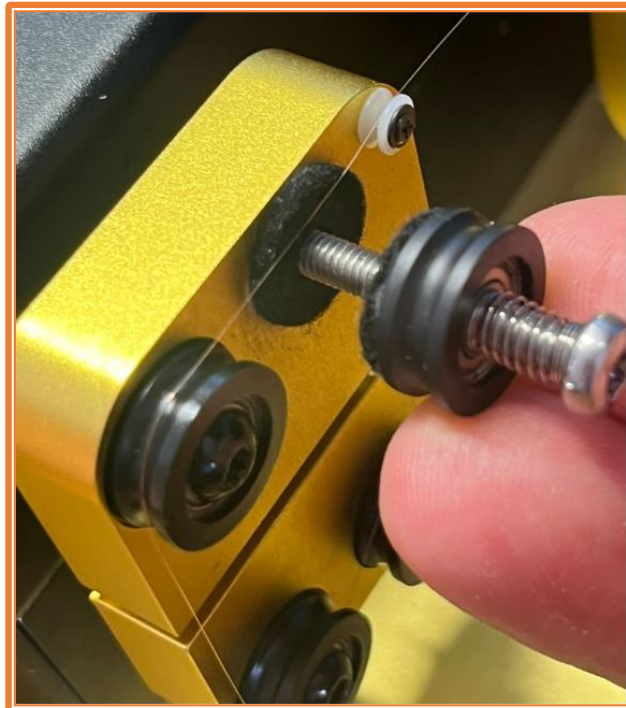

Figure 29: Pull from the pulley and place the wire touching the felt pad.

Once the wire is placed correctly, release the pulley and let it press the wire slightly. The wire must be placed between the felt discs:
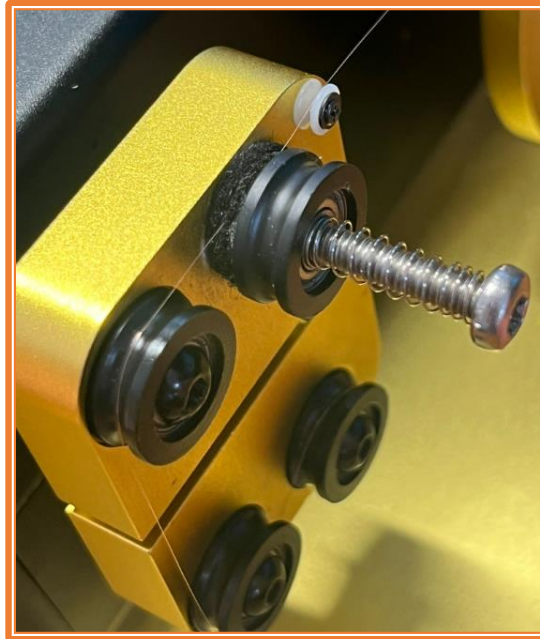

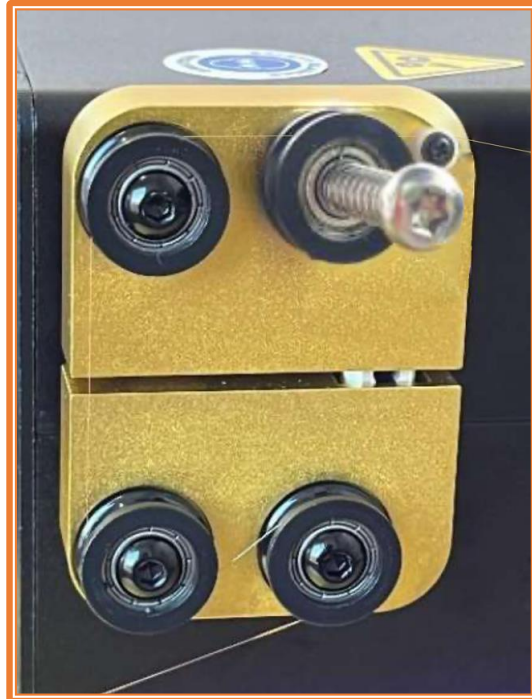Figure 30: The wire must be located between the felt discs.

Figure 31: Wire routing on the guider arm.

> ➢ **STEP 3**: Place the bobbin on the disc and close the ATC by pressing the button, in order to squeeze the wire into felt discs:
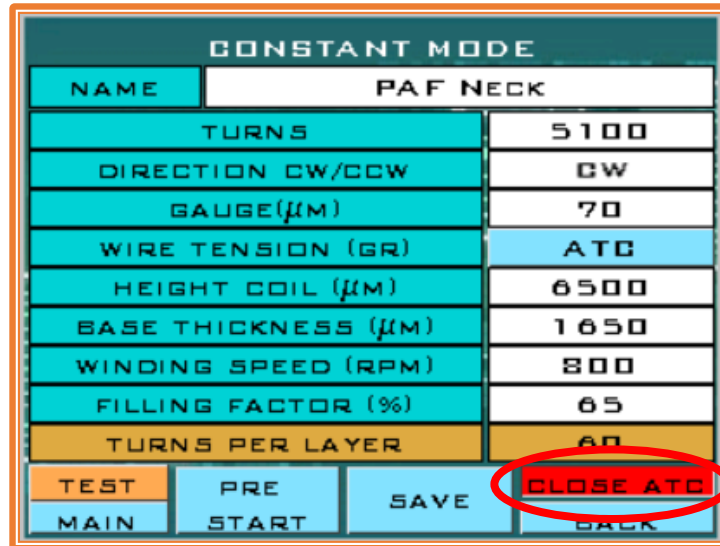

Figure 32: The button to close or open the ATC.

> ➢ **STEP 4**: Set the target wire tension before the run by pressing the "ATC" button. Setting both fields with the same value means that tension will remain constant during the whole run. You can make a ramp up or ramp down just by increasing or decreasing the final tension value:
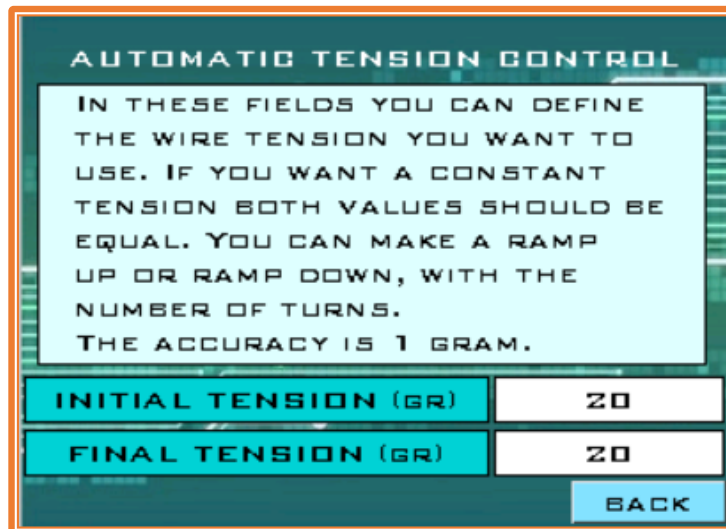

Figure 33: Initial and final tension value.

➢ **STEP 5**: Run the pickup by pressing the "Pre-Start" button. If all is fine, you will see the wire tension value in real-time during the initial turns, and the ATC will adjust the tension to the target initial tension.

Figure 34: Wire tension during initial turns.

➢ **STEP 6**: After the initial turns have been finished, you will be able to start the bobbin, and you will see the target wire tension and real wire tension in real time:

Figure 35: Real-time information during the run.
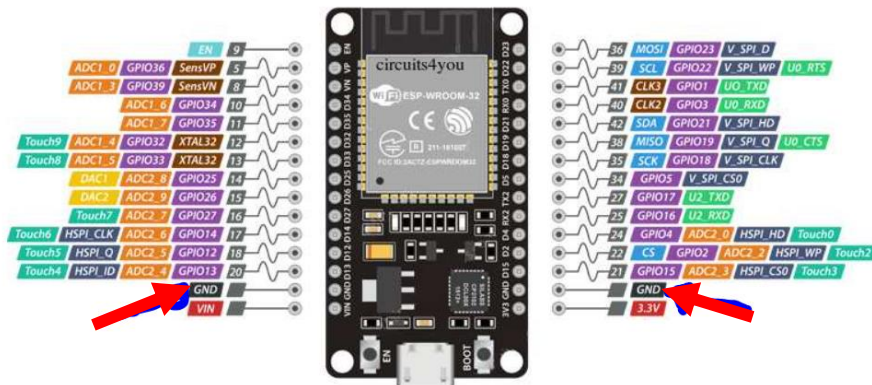
8. ADJUSTING THE CURRENT DRIVER:

Since each motor needs a different current, each driver needs to be adjusted to a specific value.

- Motor X (Guider Arm) = 600 mVdc

- Motor Y (Plate) = 800 mVdc

- Motor Z (ATC) = 200 mVdc

To measure or modify these values, you need a multimeter, and select VDC scale (less than 2 VDC). Then, with the top cover removed, turn on the winder and wait until the initialization process has been finished (remember to wait until motors X and Z move to the home position, and the blue light on the base must light up).

Once the winder is on standby (the light is blinking slowly), you can measure the voltage in the drivers.

Use the black probe of the multimeter and touch one point of ground (GND) in the ESP microcontroller:

And touch the mini potentiometer of the driver with the red probe:
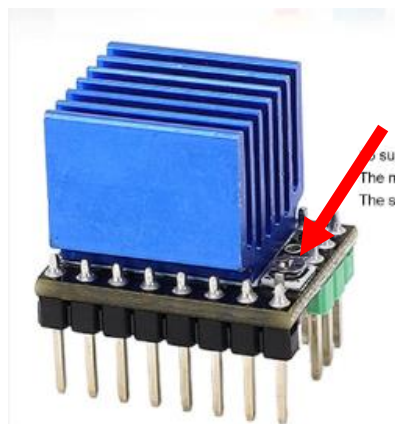
Adjust the tension by moving the potentiometer (CW=decrease and CCW=increase).

NOTE: be careful when measuring this voltage (which is a proportional measure of the current that is passing through the motor), because if you do so without the initialization process being completed, you may burn out the driver, and it will have to be replaced.

9. CONTACT FOR SUPPORTING:

If you face any kind of problem during this procedure, please contact us by email:

info@tonewinder.es