

Operating instructions



Laumat
GmbH

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Based on software version 4.16
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3 Introduction

Welcome

This manual describes the software installation and commissioning of an XWinder machine, and is a supplement to the information under

<https://xwinder.com/BUILD/>

This requires registration with XWinder on the website.

We recommend that you consult all the XWinder videos together with the manual, enclosed on the USB stick.

Laumat's supplementary manual focuses on achieving correct commissioning for a first winding and also points you to practical tips.

4 Safety instruction

Risks in operation and safety measures

Wrapping long hair

On the winding object and the associated drive mechanism, there is a risk of hair getting caught in it and being wound up.

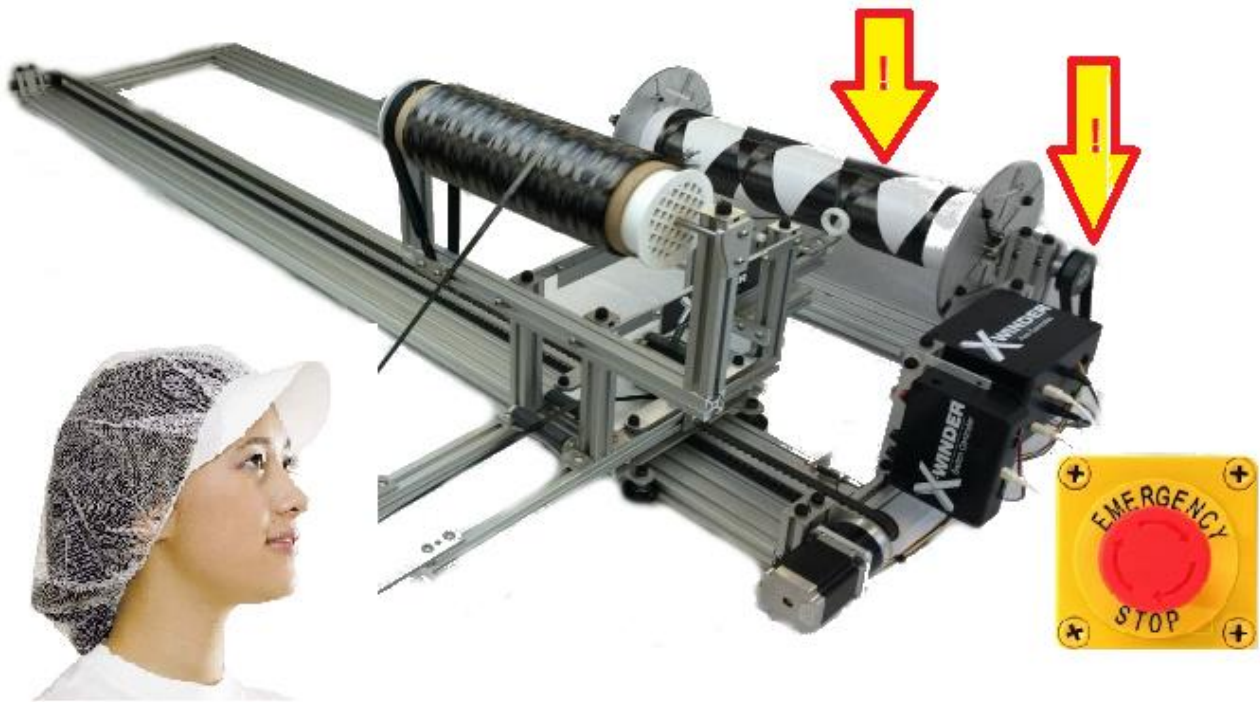


Figure 1: Danger: Winding up hair

Safety measures:

- Always wear a hair net when you have long hair.
- The emergency stop for interrupting the power supply to the electronics must be fixed in the accessible area.

Finger jamming

There is a risk of pinching fingers at several positions on the machine.

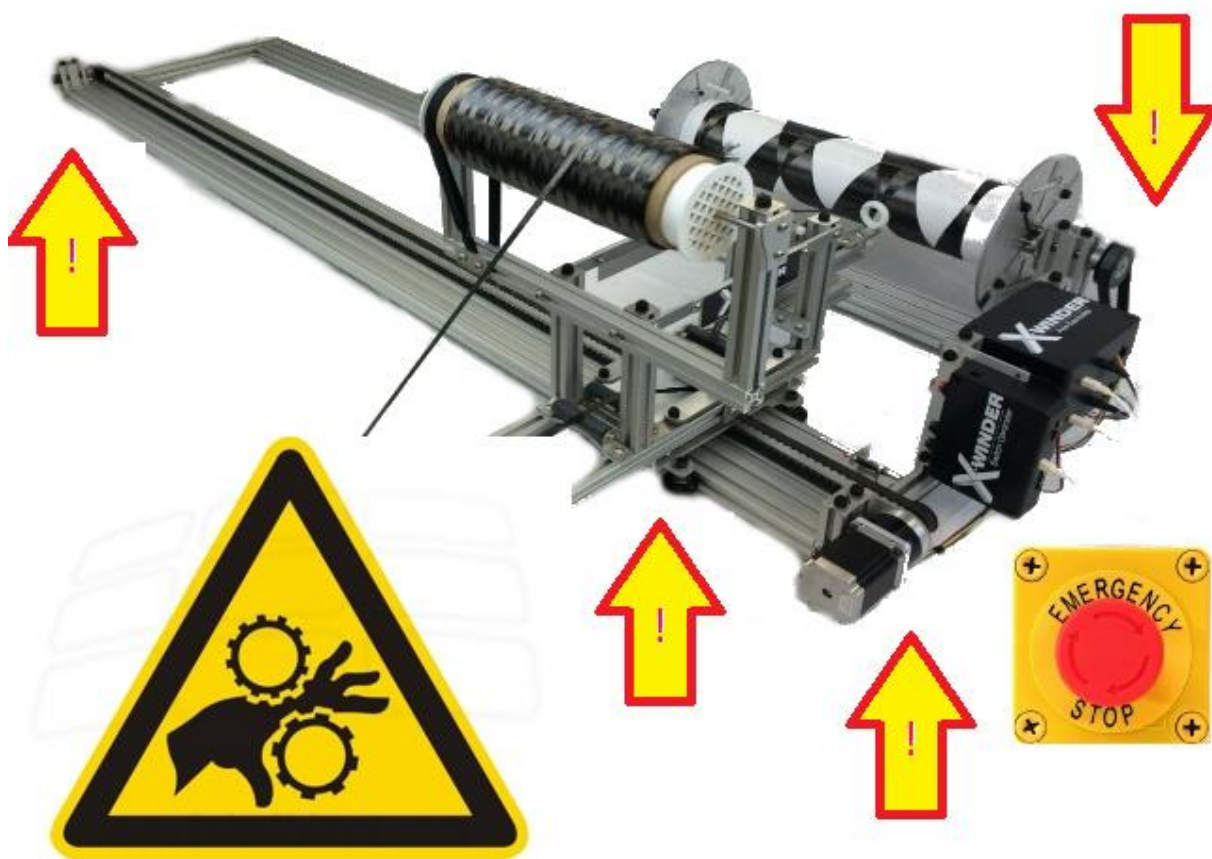


Figure 2: Danger: jamming fingers

Safety measures:

- The forces of the stepper motors are appropriately dimensioned in the XWinder Executor software so that no damage occurs to fingers if they get caught in the mechanics. Do not deviate from these values in the current settings or reduce the values if there is sufficient force. In case of customer modifications (amplification) of the drives, additional protective measures against jamming of fingers must be provided. (Access protection)
- The emergency stop for interrupting the power supply to the electronics must be fixed in the accessible area.

Splash of binder

The application of the binder and the rotation of the wrapping object can cause splashes of binder and cause eye injuries.



Safety measures:

- Always wear protective goggles when wrapping with binder.

Skin irritations

The materials may cause skin irritation on contact.



Safety measures:

- Wear protective gloves in each case.

Operation by trained staff without interference

XWinder may only be operated under the following circumstances:

- Observance of the safety instructions
- No operation by minors
- No operation under the influence of drugs or alcohol
- No bridging of safety units such as emergency stop

5 Installing software, step by step

Download the XDesigner software from <https://www.xwinder.com/BUILD/> as an EXE file or use the installation from our USB stick.

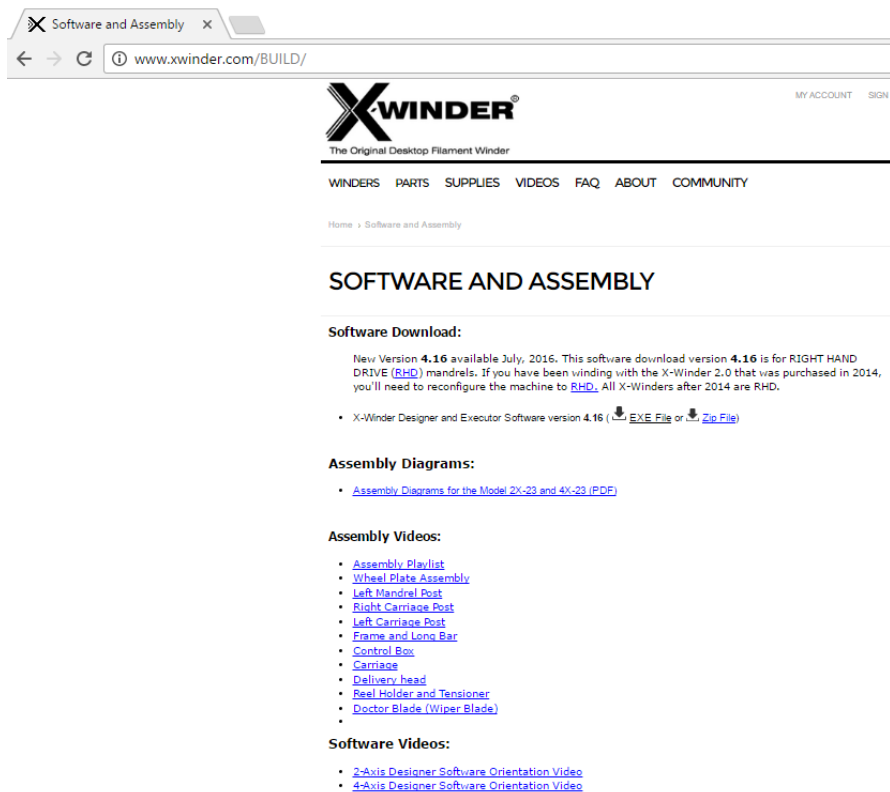


Figure 3: Download page XWinder

Software installation

Start the installation by running the XWinder_Install_v416.exe.

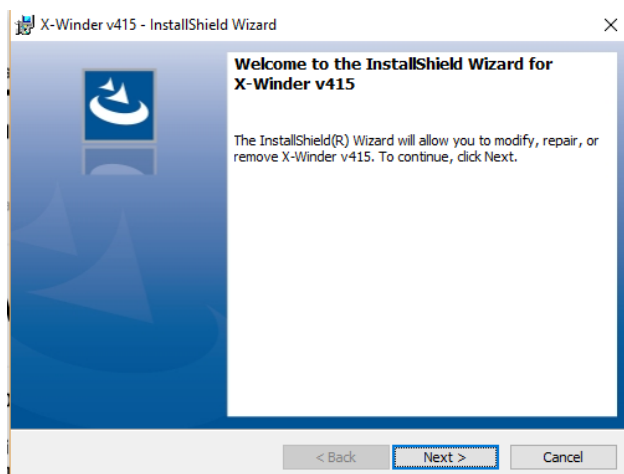


Figure 4: Installation window Info

The installation routine informs you that the installation will now be started. Start the installation with Next>.

If you already have an installation of XWinder on your computer, you will be offered the choice to uninstall or repair it.

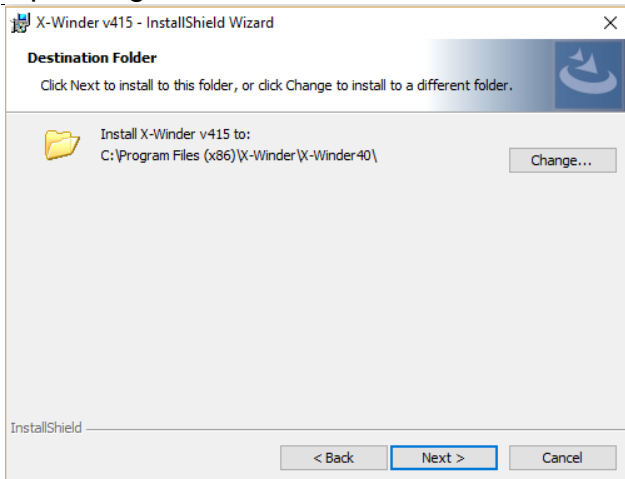


Figure 5: Installation window path

Select the appropriate installation path and continue the installation with Next.

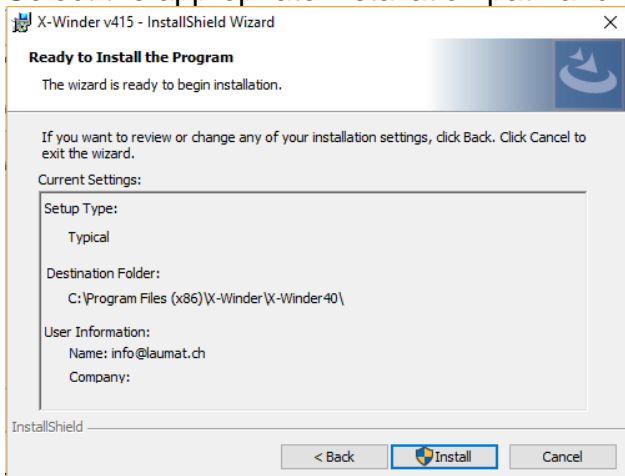


Figure 6: Installation window summary

The installation routine provides you with a summary of all parameters. Carry out the installation through **Install**.

Depending on this, a warning appears from Windows that software is being installed in administration mode. Confirm this security warning.

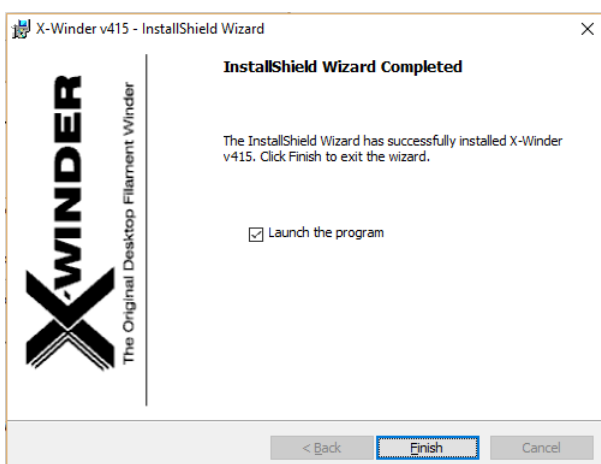




Figure 7: Installation success message

After successful installation, the corresponding confirmation appears.

6 Software XDesigner and XExecutor

Software Basics

The XWinder software consists of the following 2 components:

-  XWinder Designer: This software is used to create the mechanical definition of the roving and the calculation of the winding. Comparable to a slicer in 3D printing. The final result is a so-called G code with a sequence of movements and actions.
- Settings:
 - Mechanics Dimensions
 - Component
 - Material
 - Ends
 - Winding levels
 - Pre-windings
 - Windings
 - Shrink wrap
 - Hot air dryer drain
 - Start winding process (Start XWinder Executor with current G code)
-  XWinder Executor: This software is used to control the machine.
 - Setting the motor currents
 - Definition of which output stage is for which stepper motor
 - Running G Code

As a rule, the XWinder Executor is started from the XWinder Designer.

The software must be set in XWinder Designer and in XWinder Executor to enable correct operation.

Software basic settings XWinder Designer

6.1.1 Settings and speed

After the first start of XWinder Designer, there are preset values that need to be adjusted.

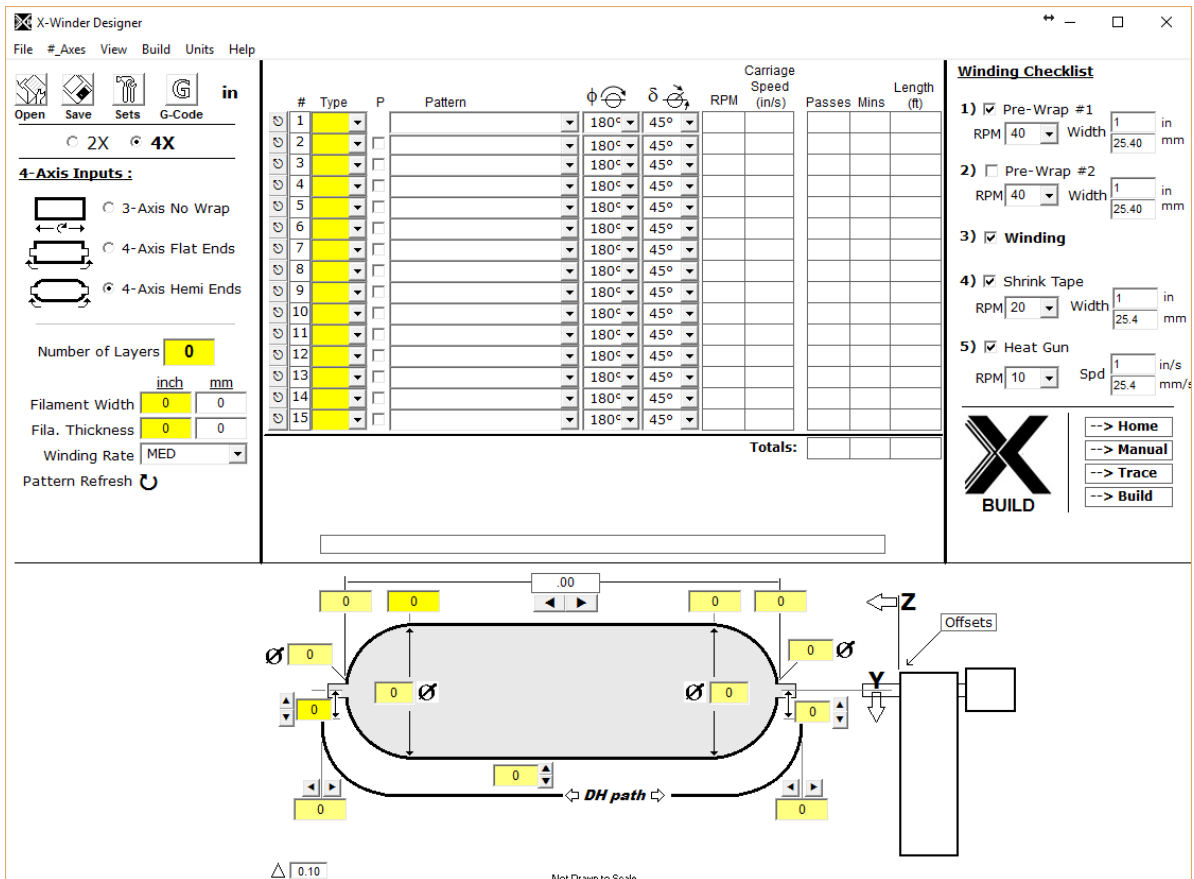


Figure 8: View of XWinder Designer after first start-up

Open File >> Settings for the XWinder Designer settings.

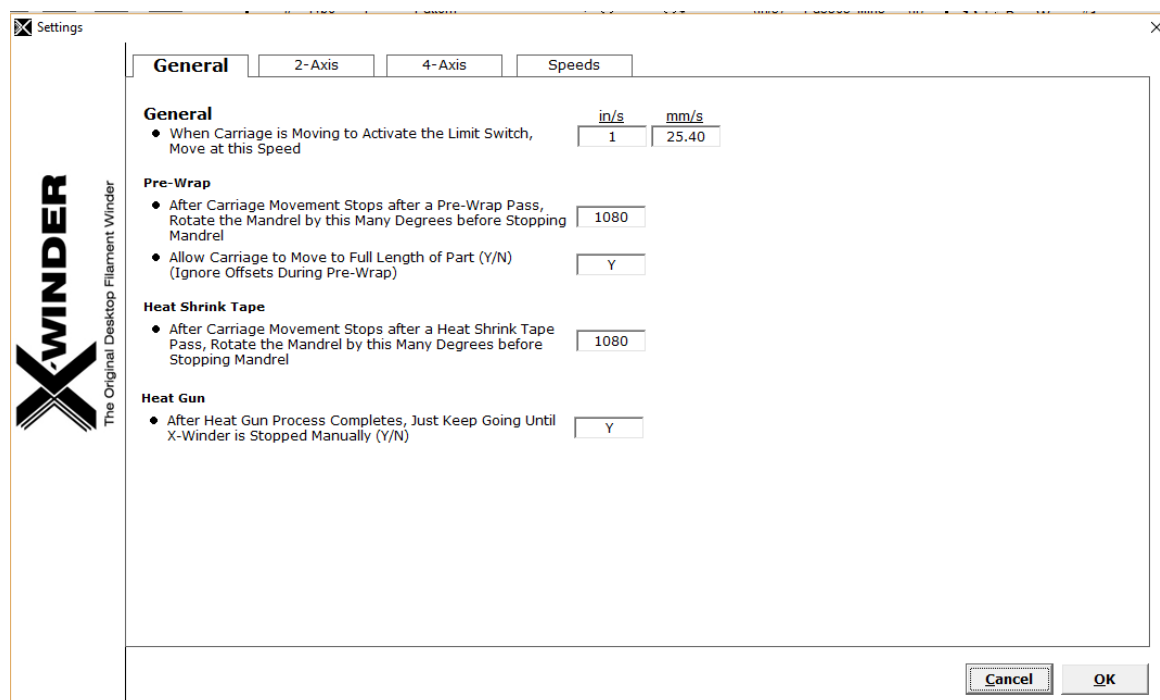


Figure 9: Settings General

Register General

- General: Speed at which the axes travel to the switch.
Default value of 1 in/s and 25.4mm/s are ideal.
- Pre Wrap:
 - Number of degrees of rotation after the end of the pre-wrap process.
 - Proceed all the way without offset during pre-wrap
- Heat shrink: In heat shrink, move all the way without offset
- Heat Gun: Y = Carry out curing with hot air gun infinitely, until manual interruption.

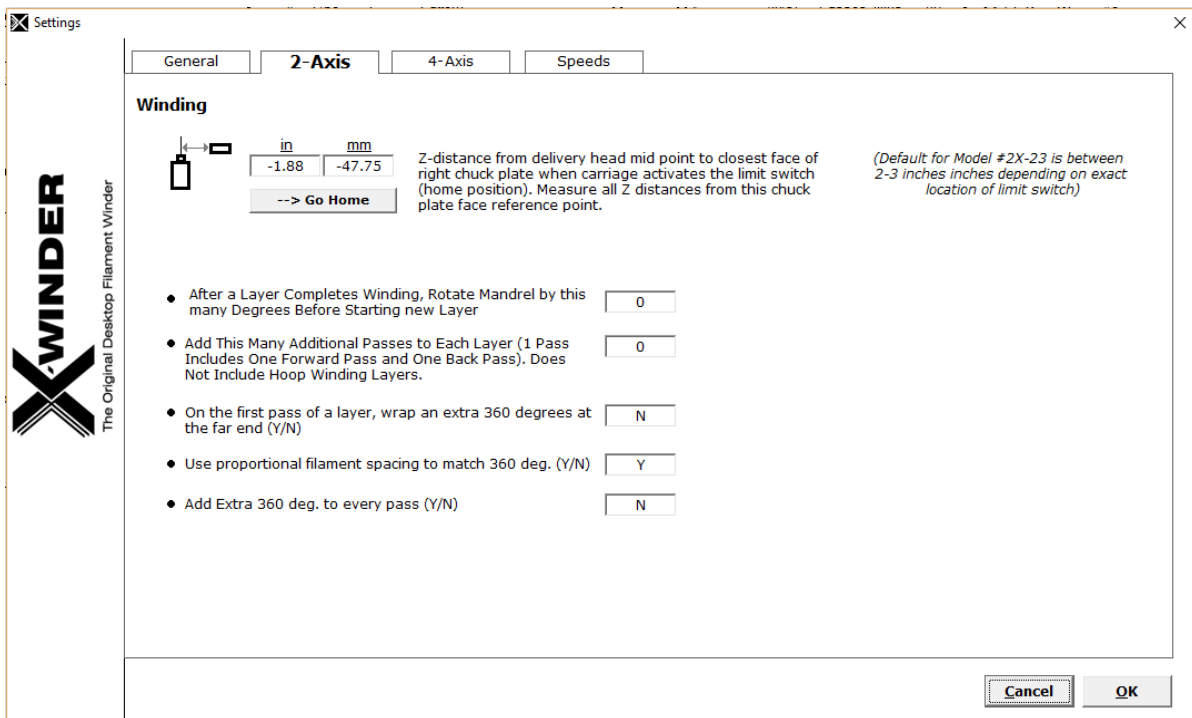


Figure 10: Settings 2 Axis

Register 2-Axis

- Z Distance. Distance between carriage slide and reference switch. **Attention! Value must be negative!**
- After level completion, number of angles before starting a new level.
- Additional Passes: Number of additional windings per level
- On the first pass of a layer, wrap an extra 360 degrees at the far end.
On the first pass of each layer, create an extra wrap at the far end.
- Use proportional filament spacing to match 360 deg. Use proportional filament spacing to match 360 deg.
- Add Extra 360 deg. To every pass. Add an extra turn to every wrap.

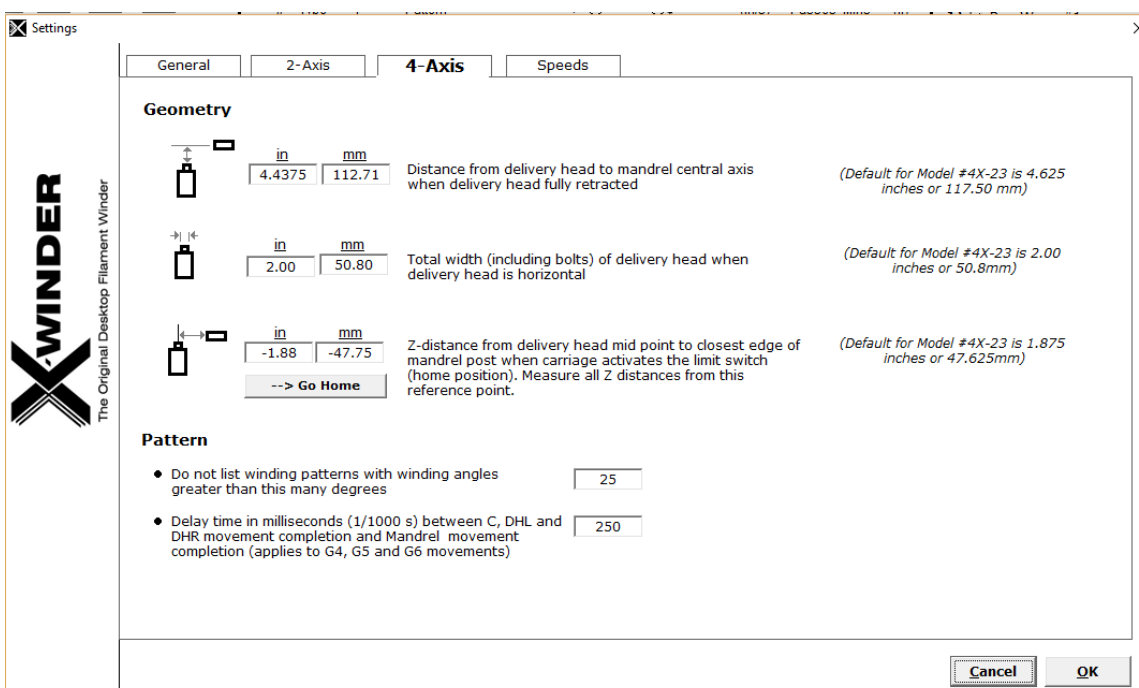


Figure 11: Settings 4 Axis

Register 4-Axis

- Distance from guide head to mandrel centre line when guide head is fully retracted.
- Guide head width
- Z-distance from the reference switch to the next point on the mandrel. **Important! Value must be negative.**
- Pattern: Do not offer patterns with angles greater than this value.
- Pause in milliseconds between movements

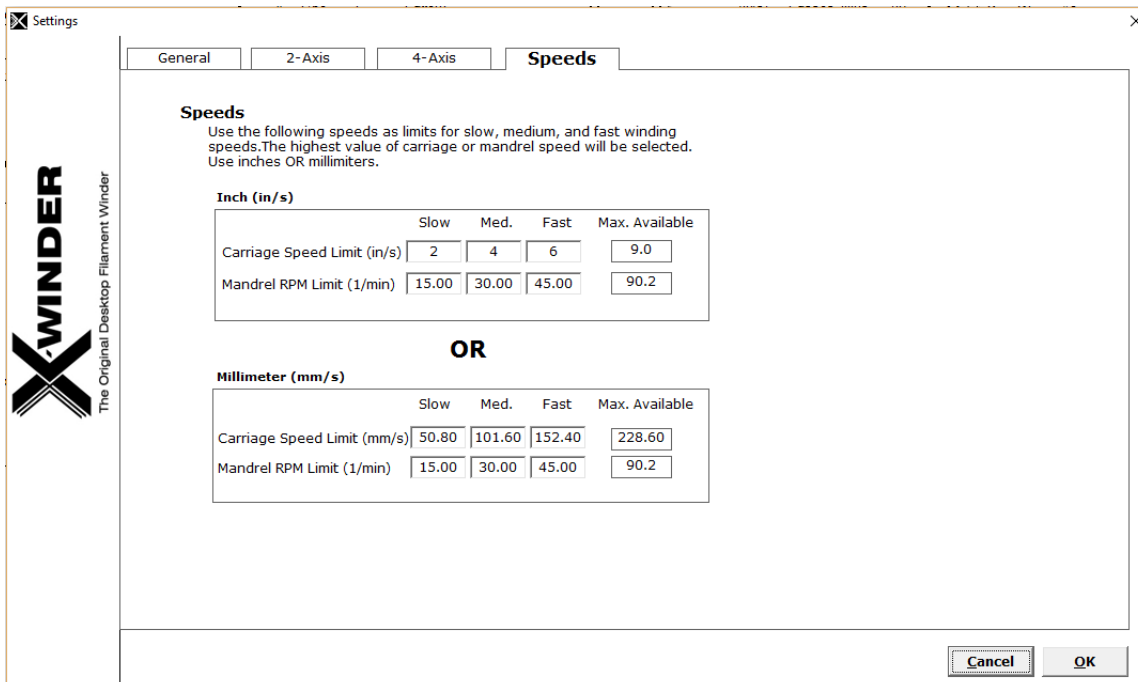


Figure 12: Speed settings

Register Speeds:

- Speeds

6.1.2 Conversion to mm

SOFTWARE STATE 4.16: Winding in inch mode is better in 4 axis Hemi mode than in mm mode. **Stay in inch mode if possible!**

The control panel **in**, to the right of the G-code button, is used to change to mm.

The conversion must be confirmed with a warning notice.

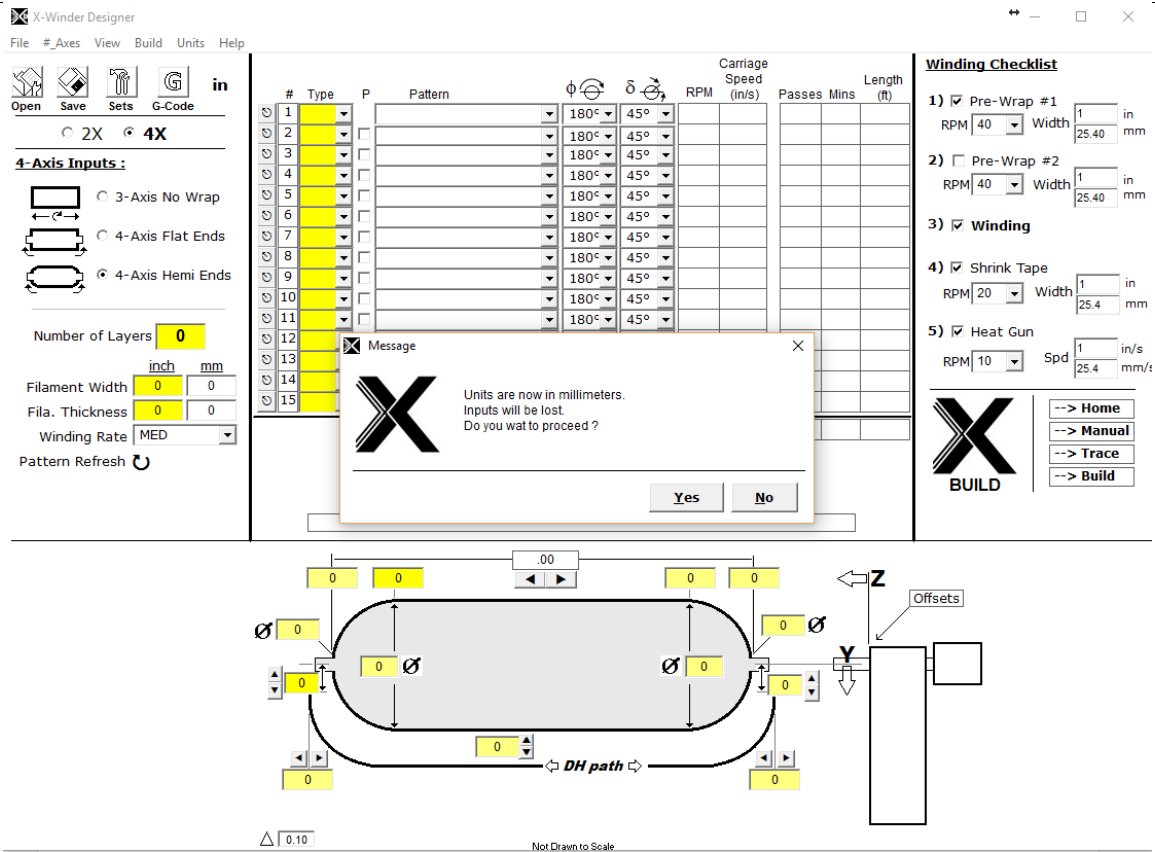
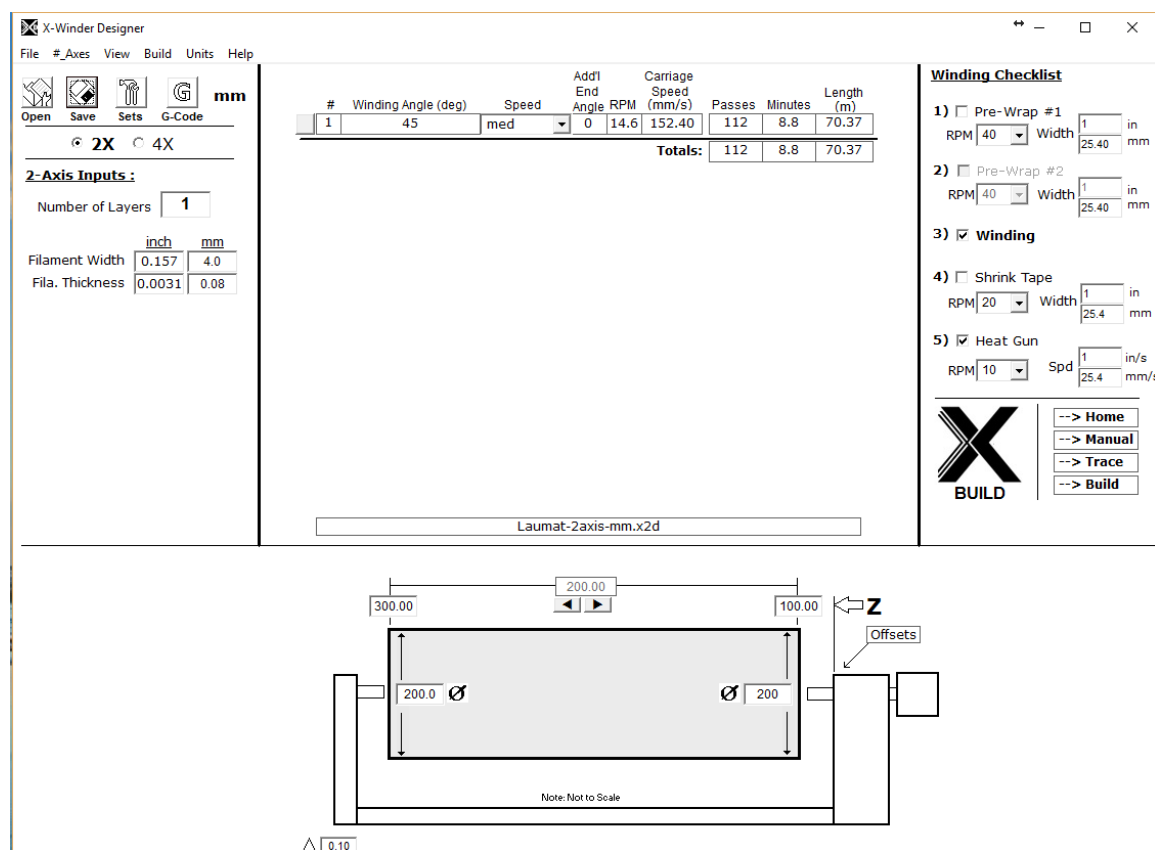


Figure 13: Changeover mm warning message

Create a new 2 axis file with the following setting:



The file Laumat-4axis-flat-mm.x4d from our website can alternatively be opened to switch to mm mode.

Important: Then save the current file (with mm setting) and restart the XWinder software. XWinder always loads the last saved file at start-up, switching to mm.

Basic settings XWinder Executor

Prerequisite: The mechanics are set up and the USB devices are connected.

Start the XWinder Executor software from the Manual → panel on the right-hand side of XWinder Designer.

Initially, no USB devices are configured to the axes.

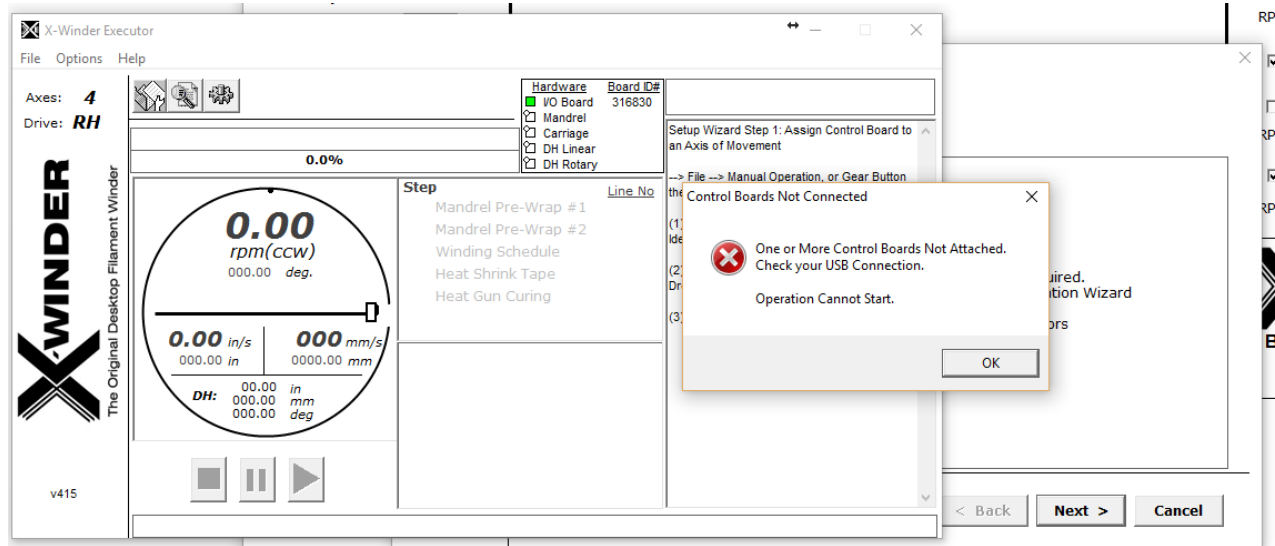


Figure 14: Executor without USB configuration

The parameters are set with the wizzard.

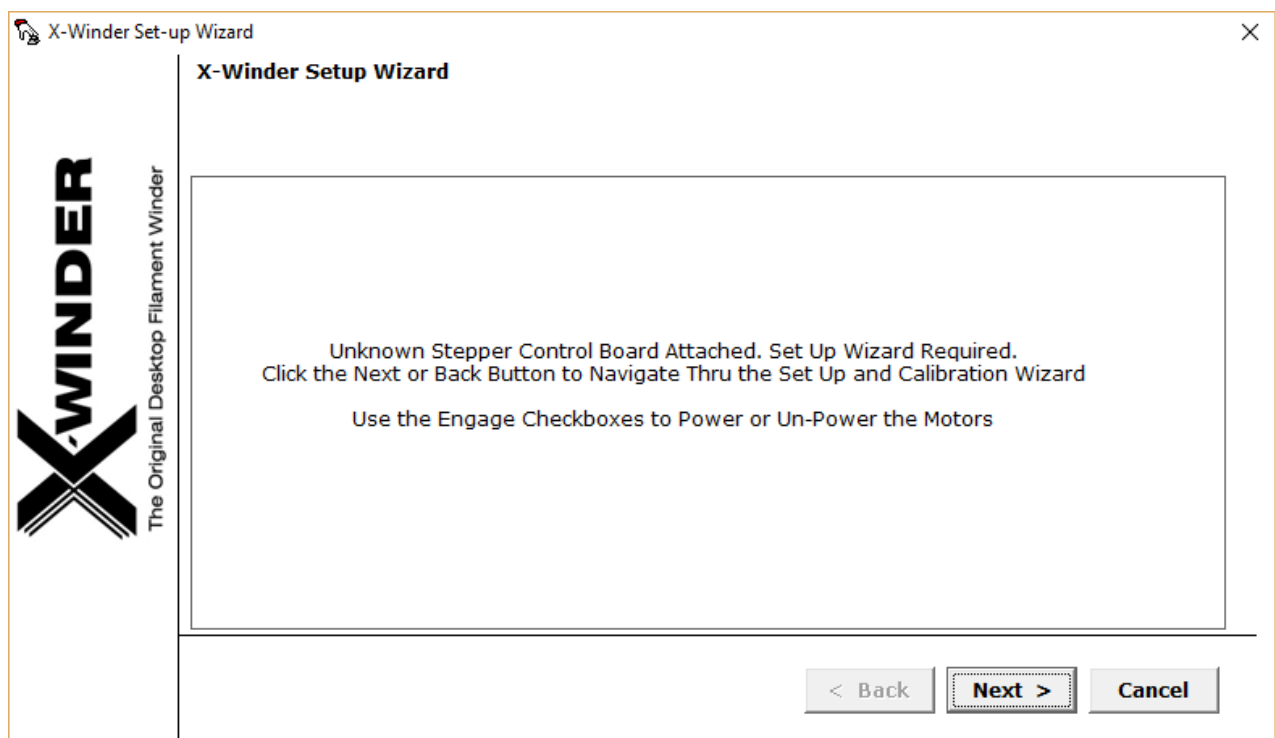


Figure 15: Wizzad Start

For 4-axle models, the assembly must be done for right-handers.

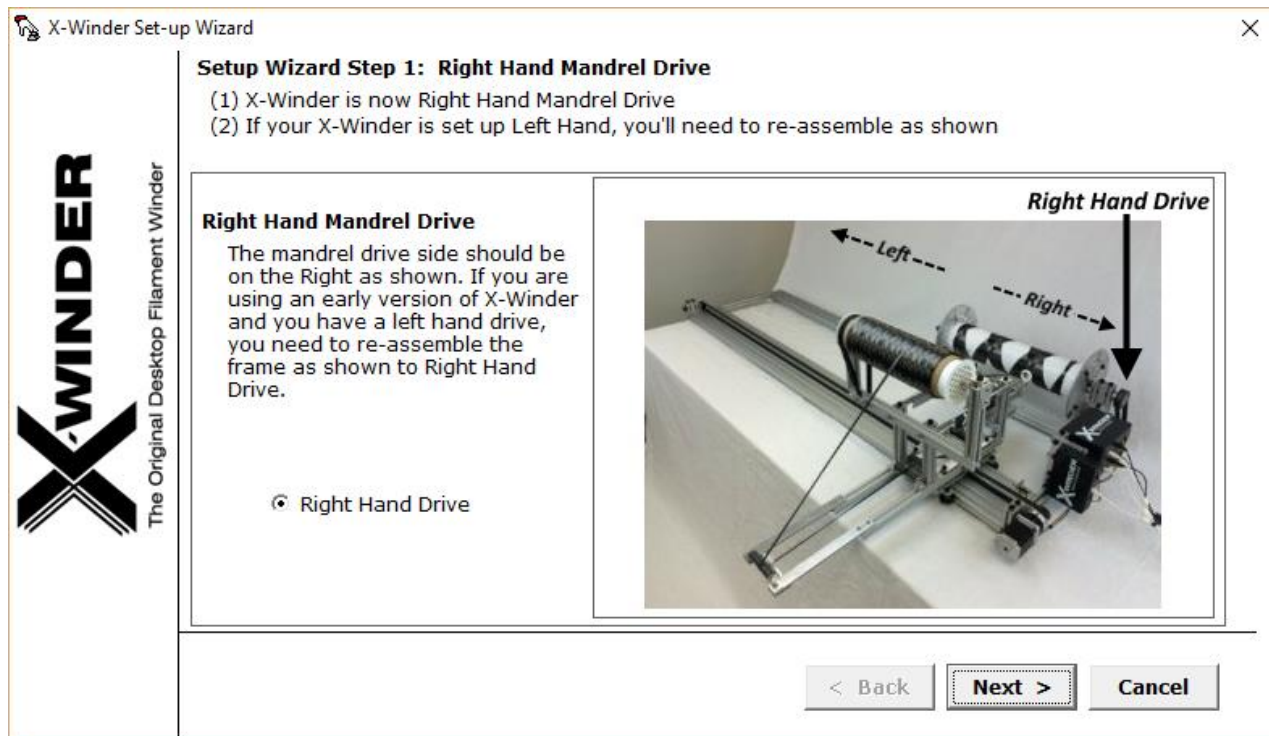


Figure 16: Right-handed setup

The up to four stepper motor modules are assigned to the corresponding axes. Select one ID each at Select... and test with the manual operation whether the assignment is correct.

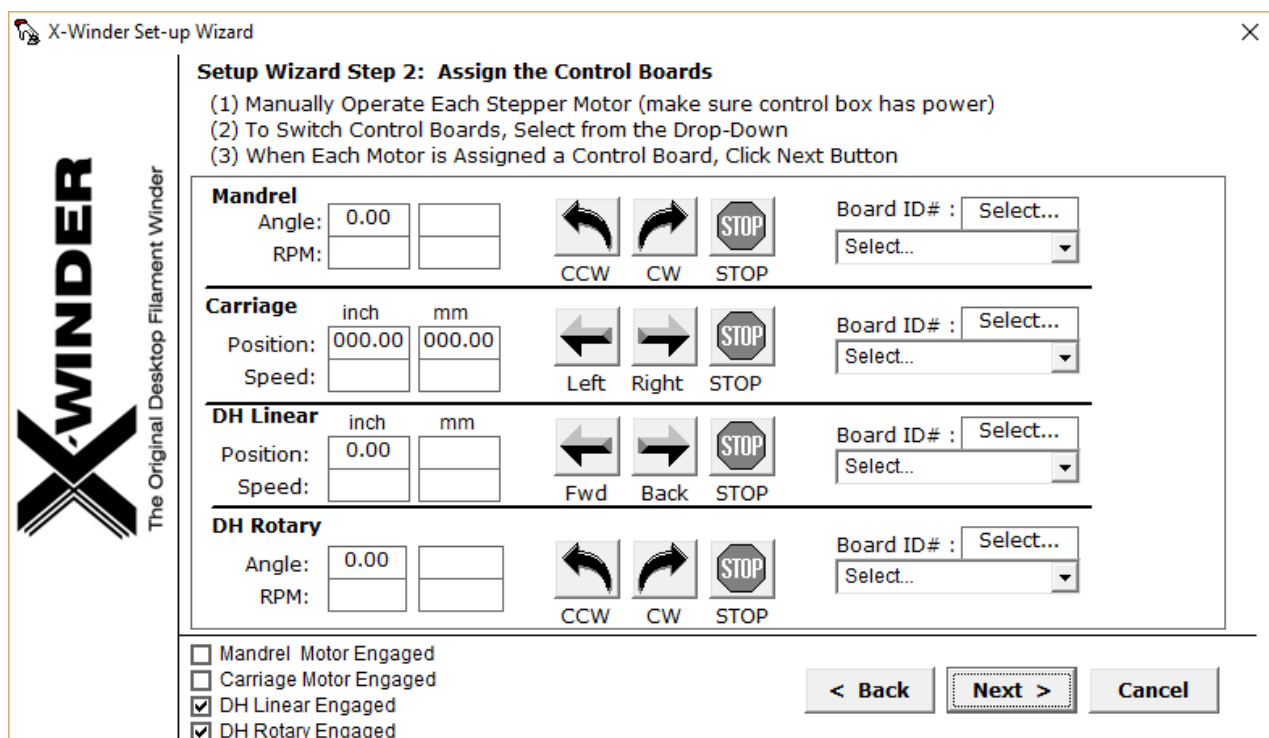



Figure 17: Stepper motor assignment

X-Winder Set-up Wizard X



The Original Desktop Filament Winder

Setup Wizard Step 2: Assign the Control Boards

(1) Manually Operate Each Stepper Motor (make sure control box has power)
(2) To Switch Control Boards, Select from the Drop-Down
(3) When Each Motor is Assigned a Control Board, Click Next Button

Mandrel					Board ID# :
Angle:	0.00				345271
RPM:		CCW	CW	STOP	345271

Carriage					Board ID# :
Position:	inch: 000.00 mm: 000.00				344974
Speed:		Left	Right	STOP	344974

DH Linear					Board ID# :
Position:	inch: 004.52 mm:				345997
Speed:		Fwd	Back	STOP	345997


DH Rotary					Board ID# :
Angle:	0.00				345227
RPM:		CCW	CW	STOP	345227

☒ Mandrel Motor Engaged
☒ Carriage Motor Engaged
☒ DH Linear Engaged
☒ DH Rotary Engaged

< Back
Next >
Cancel

Figure 18: USB ID assigned to the axes

X-Winder Set-up Wizard X



The Original Desktop Filament Winder

Setup Wizard Step 3: Mandrel Gearing Ratio

(1) Select the Option that Applies
(2) If you are not sure, select Determine Manually (takes about 5 minutes)

☒ Standard Mandrel Gearing (Gear Ratio = 6.8000 : 1, Max RPM = 88.20)

☐ Non-Standard Mandrel Gearing. Enter Gearing Ratio :1

☐ Determine Manually (None of the above - 5 minute process)

☒ Mandrel Motor Engaged
☒ Carriage Motor Engaged
☒ DH Linear Engaged
☒ DH Rotary Engaged

< Back
Next >
Cancel

Figure 19: Gear setting for mandrel

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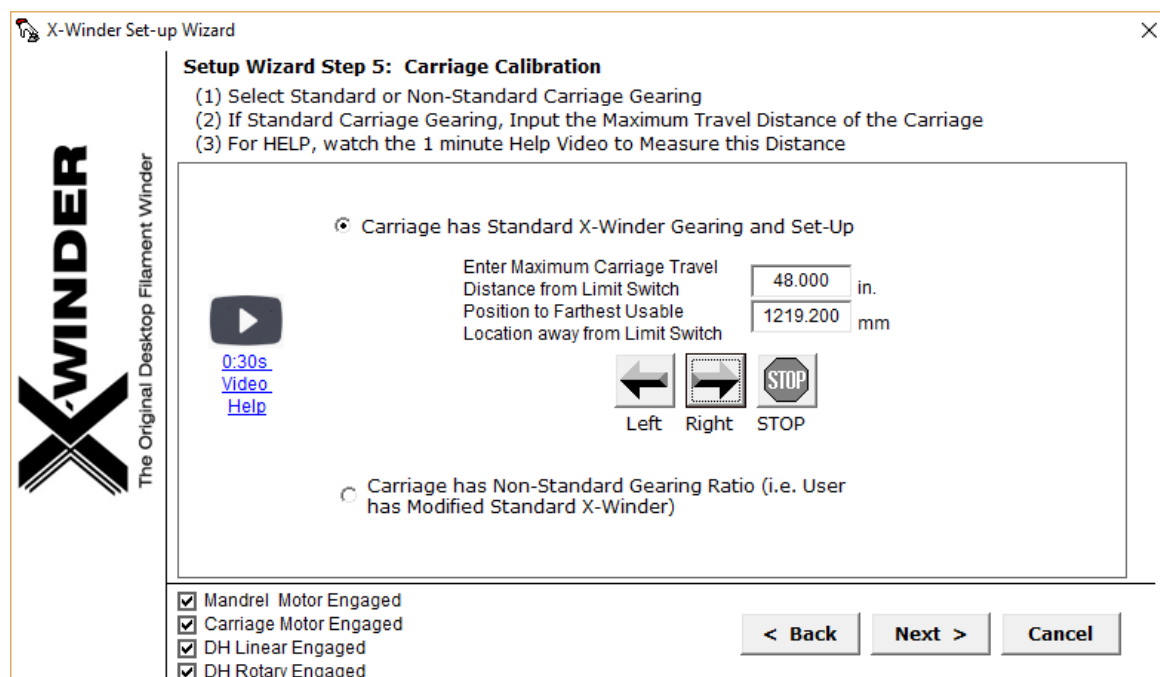


Figure 20: Carriage gear setting

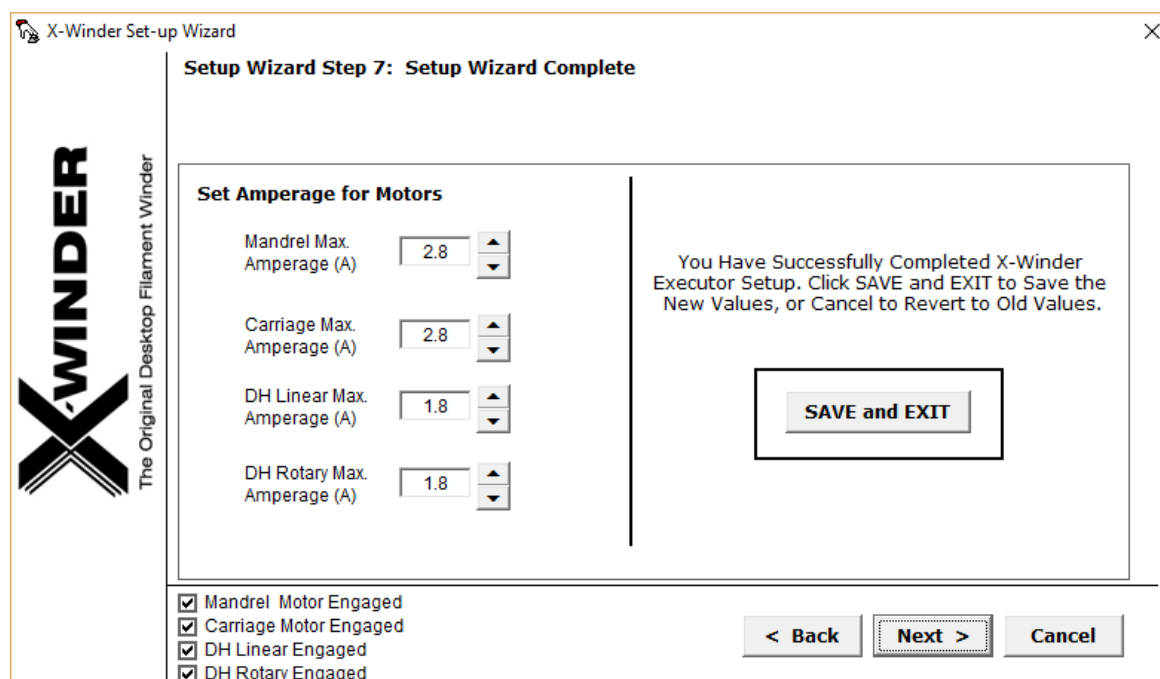


Figure 21: Current setting stepper motors

IMPORTANT: The stepper motor current setting must be done correctly.

To prevent injury from pinching, reduce the current of the mandrel and carriage to 1.8A.

You can only increase the current if the winding diameter is large or the clamping force is high.

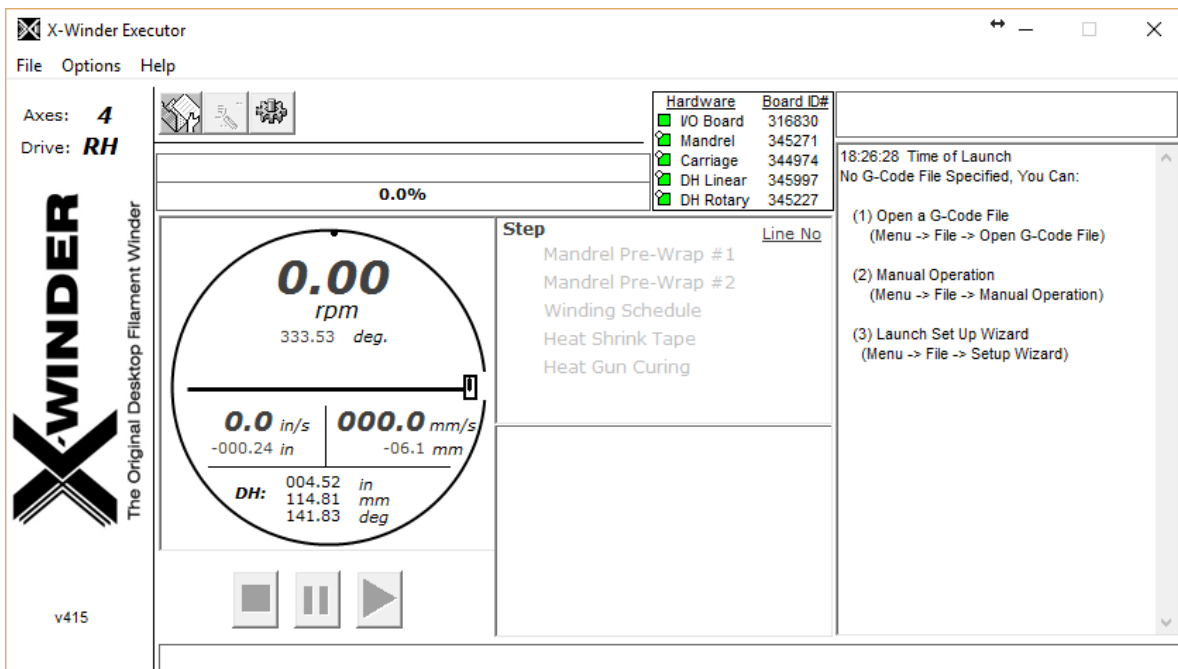


Figure 22: Hard with assigned board IDs

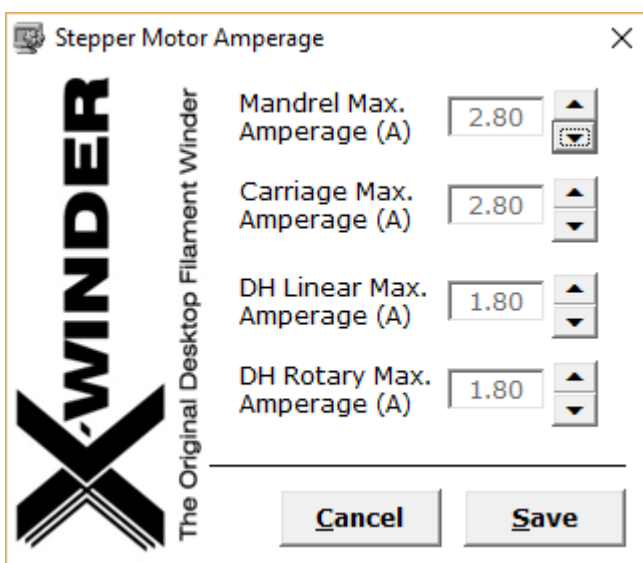
Check that the reference switches match the corresponding axes.
The reference switches are shown as a red symbol on hardware.

SOFTWARE STATE 4.16: The current setting can be adjusted with the symbol "A".

By clicking on the "Stepper Motor Amperage", the stepper motor current can be adjusted subsequently.

To prevent injury from pinching, reduce the current of the mandrel and carriage to 1.8A.

You can only increase the current if the winding diameter is large or the clamping force is high.



First windings without material

To get familiar with the parameters of XWinder, the first windings are made without material "in the air".

6.1.3 First winding 2 axis

The first test is to test the movement in 2-axis mode. This test should also be carried out with 4-axis machines. The DH linear and DH rotary head do not move on the 4-axis machine.

Create a 2 axis file with the following content:

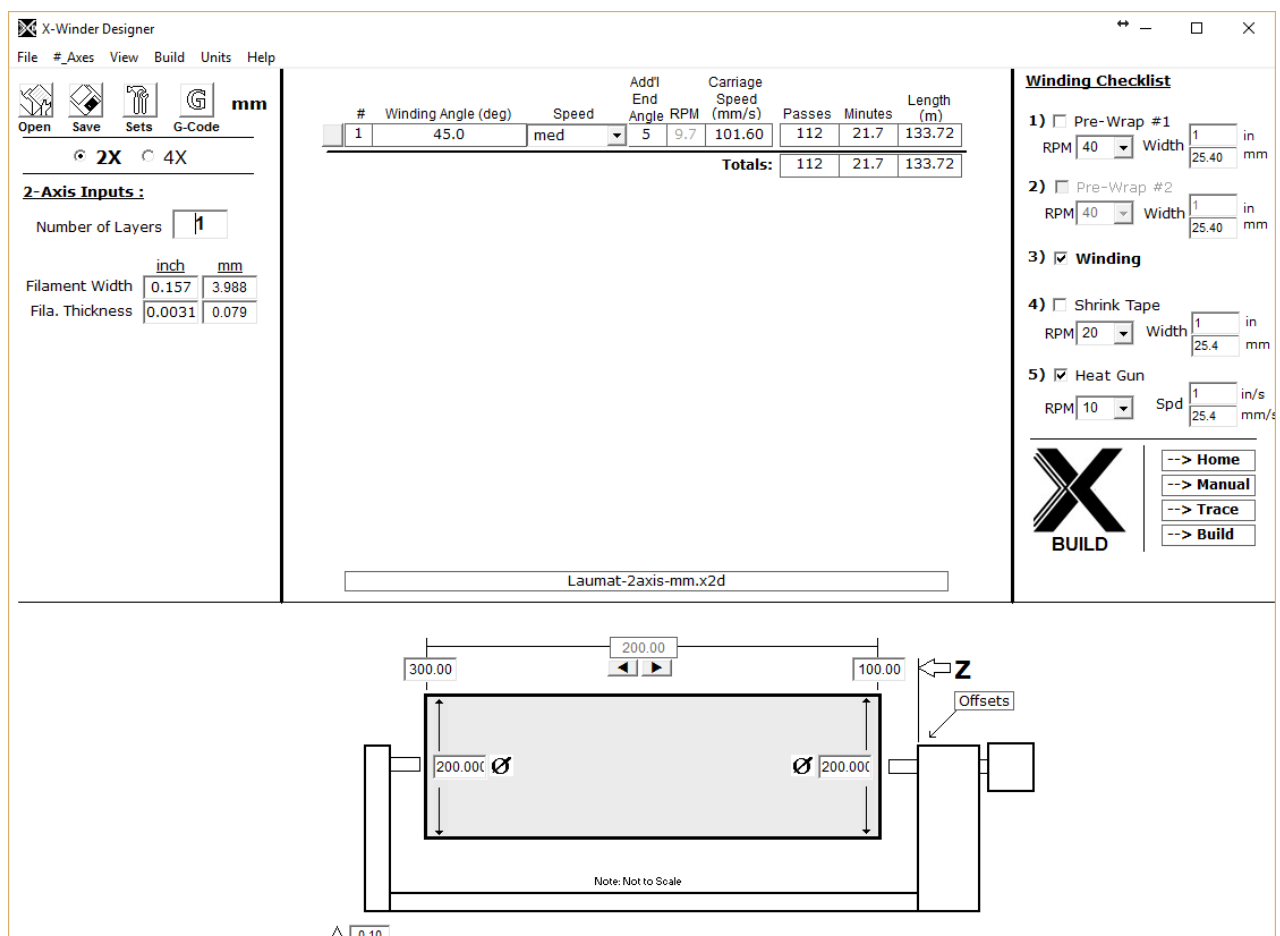


Figure 23: Demo setting 2 axes

The file Laumat-2axis-mm.x2d from our website can be opened alternatively.

Start Home→

The carriage moves to the switch and stops.

Start the wrapping process with Build→.

The following procedure is started in the XWinder Executor:

- Movement to the reference switches
- Movement to the starting point
- Pause (to fix wrapping material)
- Start winding with the PLAY control button using the mouse or by means of the button on the reference switch electronics.

6.1.4 First winding 4 axis with flat end

As a second test, a winding with 4 axes with flat ends is wound.

Note: The 3 Axis No Wrap with Rotation Axis only cannot be wrapped ideally. Do not use this mode from our experience. The filament can only be transferred uncontrolled at the end. Add the 2 axis winding head to your 4 axis machine and wind 2 axis with the eyelet.

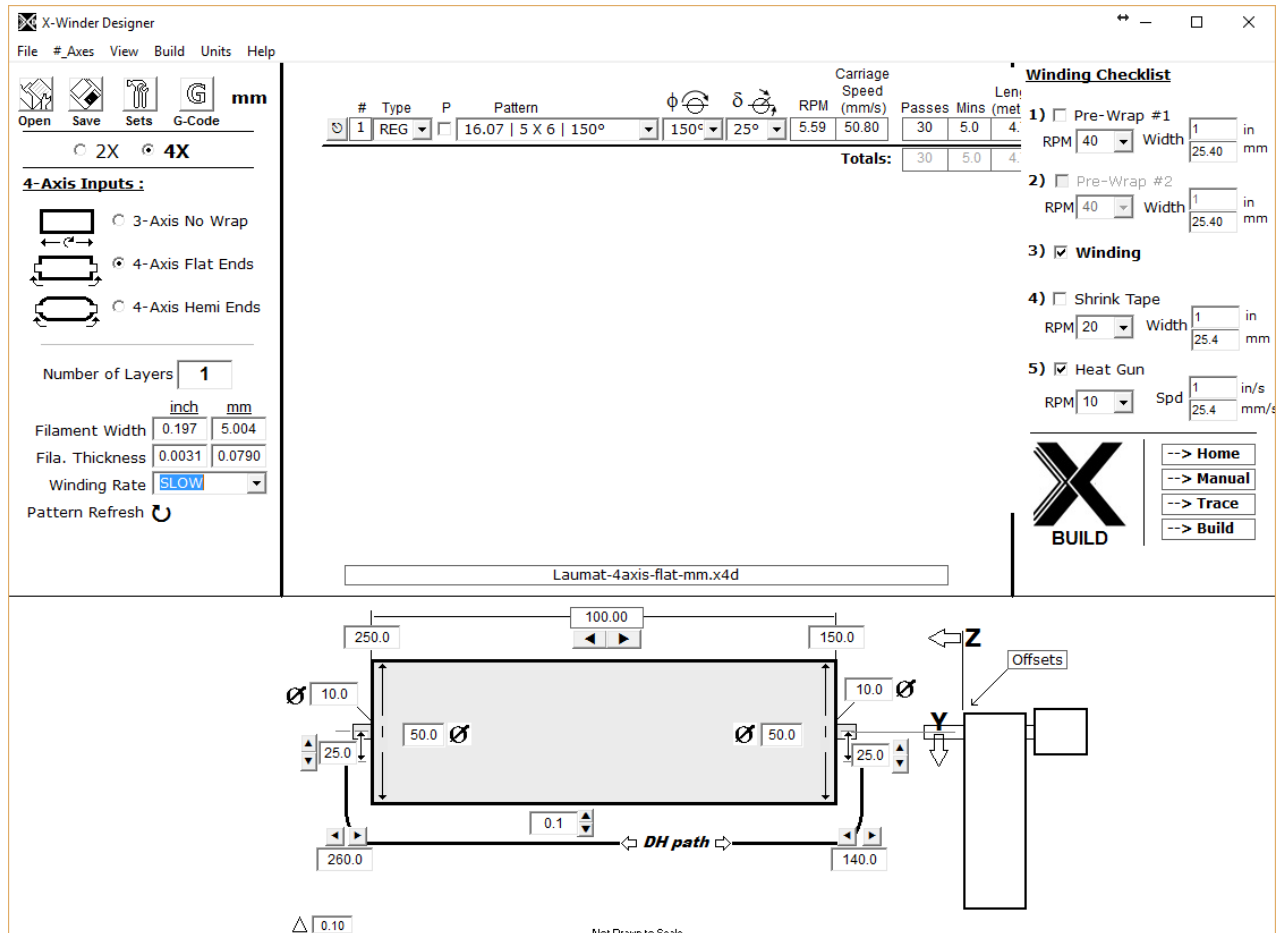


Figure 24: Demo setting 4 axes with flat ends

The file Laumat-4axis-flat-mm.x4d from our website can be opened alternatively.

Start the winding with Build→.

The following procedure is started in the XWinder Executor:

- Movement to the reference switches
- Movement to the starting point
- Pause (to fix wrapping material)
- Start winding with the PLAY control button using the mouse or by means of the button on the reference switch electronics.

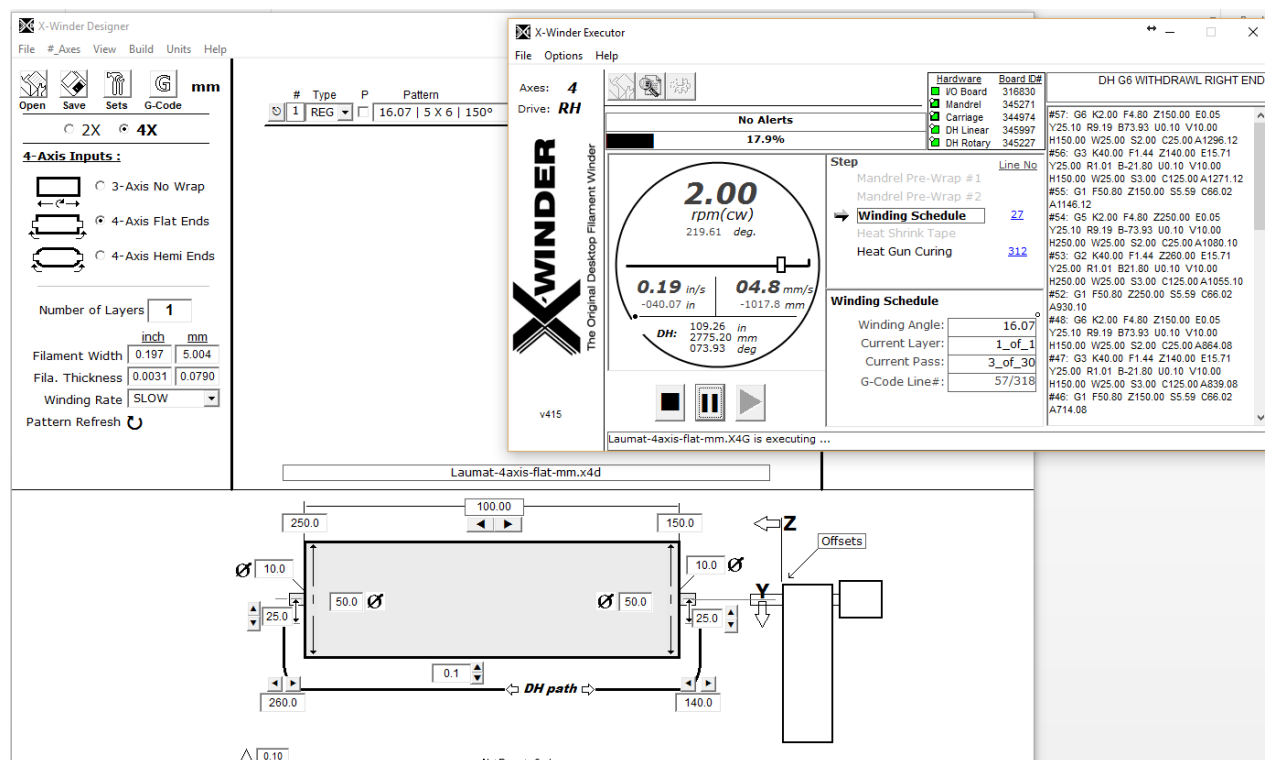


Figure 25: Winding demo setting 4 axes

During the winding process, the procedure is displayed in the executor.

6.1.5 First winding 4 axis round ends

As a third test, a winding with 4 axes with round ends is wound.

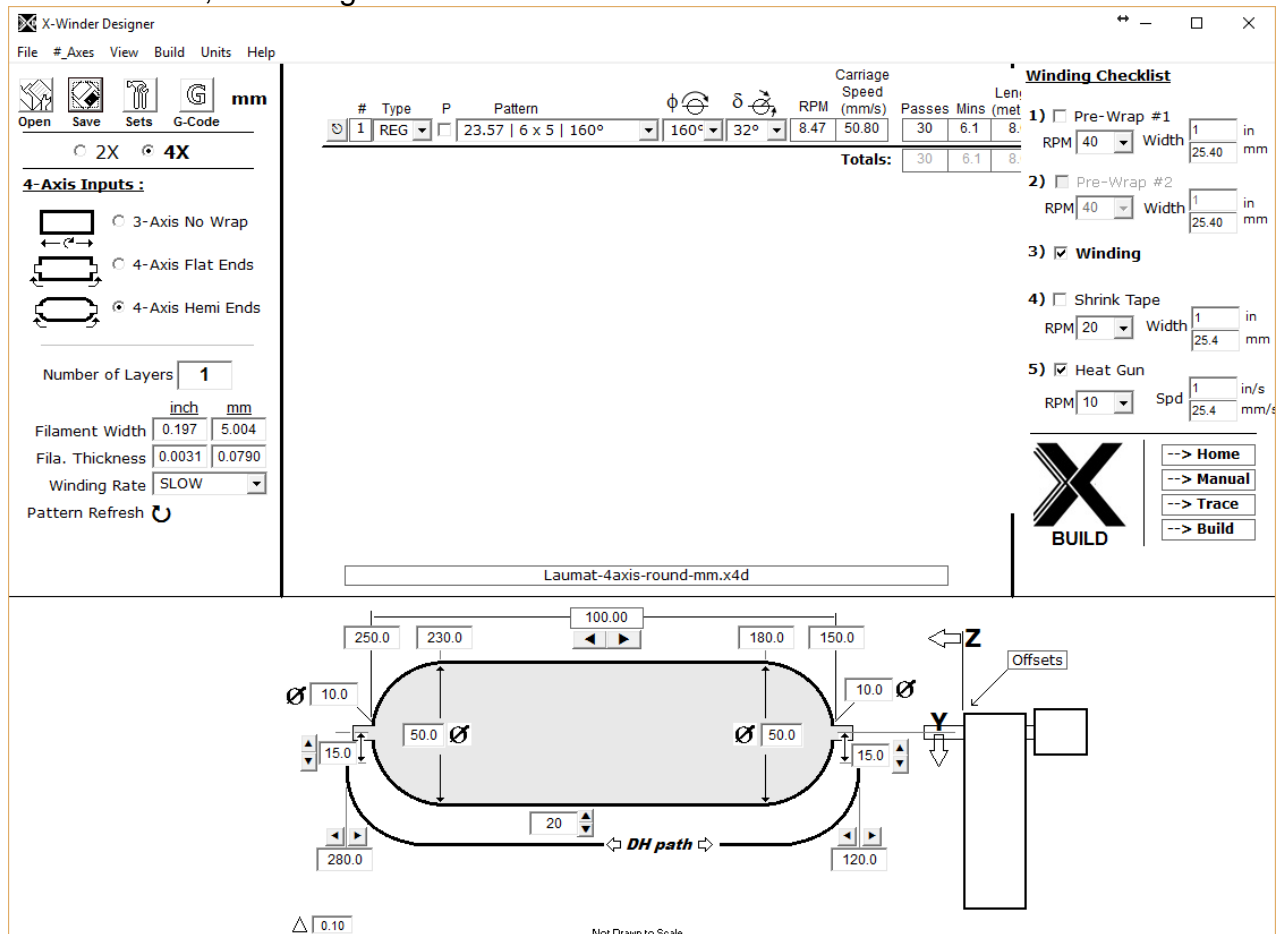


Figure 26: Demo setting round ends 4 axes

The file Laumat-4axis-round-mm.x4d from our website can be opened alternatively.

Start the winding with Build→.

The following procedure is started in the XWinder Executor:

- Movement to the reference switches
- Movement to the starting point
- Pause (to fix wrapping material)
- Start winding with the PLAY control button using the mouse or by means of the button on the reference switch electronics.

7 Mechanical structure

Original documents can be found here: <https://www.xwinder.com/BUILD/>

Supplementary notes on assembly. Laumat specific improvements.

Overall view machine



Mounting base frame

Mount the rods with the corresponding panels as shown below. Note the position of the pre-drilled holes. Use the supplied washers under the screws in the long profiles.



Holes

Figure 27: Mounting base frame

Mandrel assembly

D: Mount the mandrel holder from below with screws through the holes. Secure the screws from below with the two clamping washers supplied. In addition, secure this bracket from above against twisting with a bracket. As the screws are long, please insert an additional washer. Motor cable downwards.



Angle and washer

Figure 28: Mounting mandrel

Mounting mandrel counterpart

Fix the mandrel counterpart with two brackets and screws with washer.

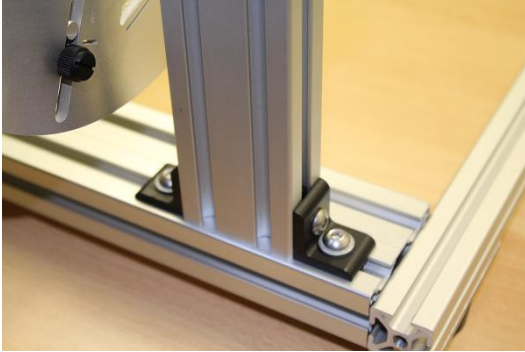


Figure 29: Mounting mandrel counterpart

Mounting motor slide 90°

Mount the motor for the carriage (Carriage) 90° horizontally opposite the original instructions. Motor cable downwards.

This allows the belt to be tightened more and lies more horizontally.

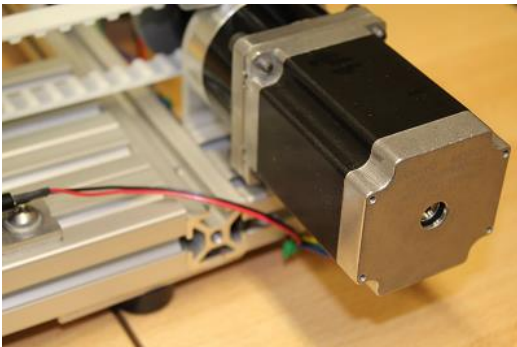


Figure 30: Assembling the motor slide by 90

Mounting carriage with other toothed belt tension

Tension the toothed belt horizontally according to the picture with the additional components. **The toothed belt must be tensioned as much as possible by hand.** Only then build the components on top of it.

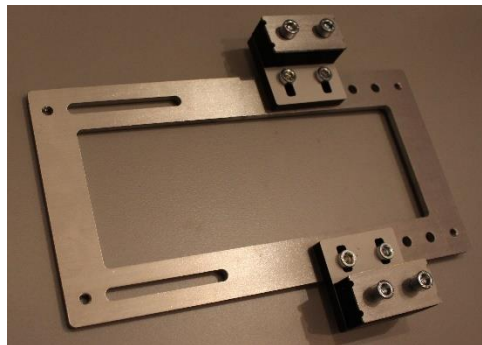


Figure 31: Toothed belt tension

Mounting reference switch slide

Mount the reference switch for the carriage.
Our reference switch is mechanically stronger.

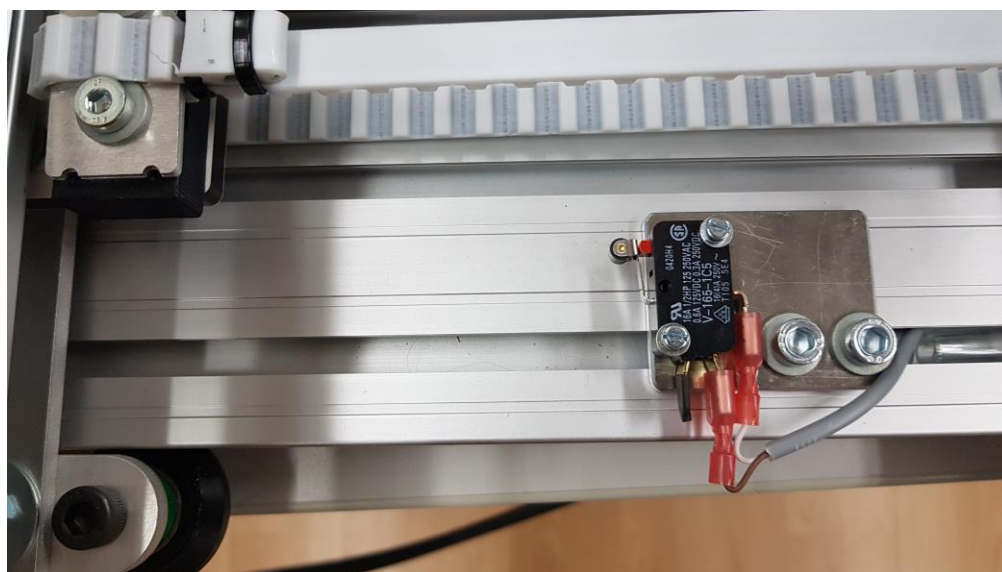


Figure 32: Mounting the reference switch slide

Assembly of protective covers for toothed belt

Fit the toothed belt covers as shown.

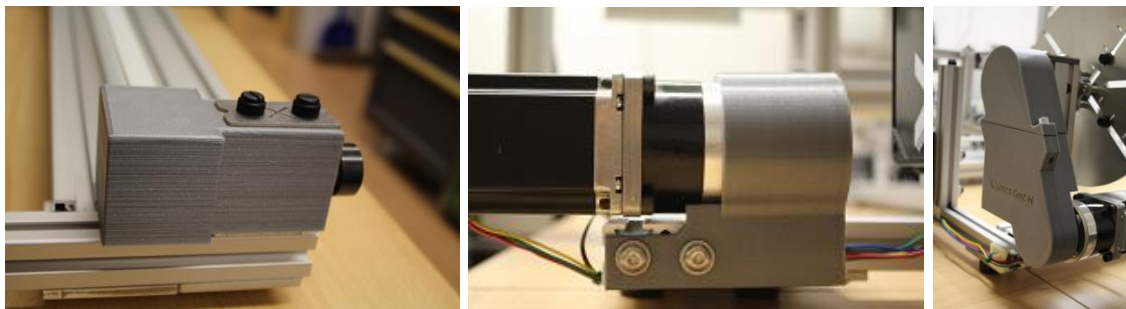


Figure 33: Covers

Mount the rotation head correctly

After homing, the concave roller must be horizontal. The lug for the reference switch is then vertical. Make sure that you mount this roller holder accordingly.

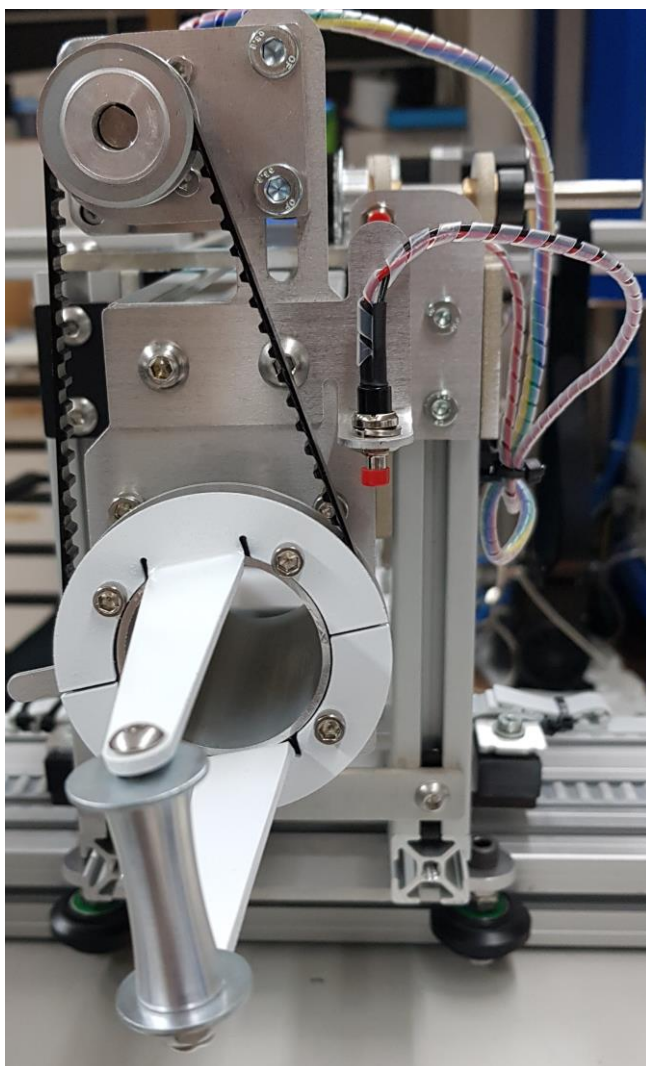


Figure 34: Mounting the rotation head

Mount linear head

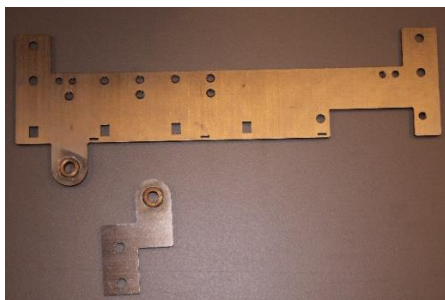
Fit the toothed belt with the T-slot nut so that the push button fixes the toothed belt. With the original aluminium washer, the timing belt often slips out sideways.



Figure 35: Mounting the rotation head

Bronze tins small

The small bronze DH bushings are used by us because the original bore does not fit. If the bronze bushings are supplied loose, they were supplied to fit.



Emergency stop option

Option: Use of the emergency stop switch. Connect between power supply and machine.
EMERGENCY STOP IS NECESSARY FOR CE!



Mount the emergency stop on the top stepper motor control unit.



8 Wiring

IMPORTANT!!! NEVER plug or unplug the stepper motor cables under power!!! This may damage the electronics.

Connect the reference cables according to the illustration.

DHL (Delivery Head Linear) (Feeding head linear)

DHR (Delivery Head Rotation)

CAR (Cariage) (Sledge)

