

STOP!

**BEFORE USING,
READ
THE
INSTRUCTIONS!**

Really, It's important

NQALHA

Not Quite A Lathe, Handwork Assistant Personal Safety

Glassworking is inherently dangerous

You can be killed or seriously injured by hot glass and glassworking torches. Before using the NQALHA, you must be experienced in dealing safely with hot glass and glassworking torches. If you are new to glasswork, you must start by learning how to safely perform the basics by hand. It's highly recommended to take lessons from a competent teacher. If a teacher isn't available, there are books and videos available from many sources that demonstrate safe glassworking techniques

Once you are familiar with safe hand work, you can transition to using the NQALHA

YOU MUST TAKE FULL RESPONSIBILITY FOR YOUR SAFETY WHEN USING THE NQALHA!

YOU MUST RELEASE MPM&E AND MIKE PETERSON FROM ALL LIABILITY ASSOCIATED WITH USE OF THE NQALHA!

IF YOU DON'T AGREE TO THESE CONDITIONS, YOU MUST RETURN THE NQALHA FOR A REFUND

You must be aware of these safety related issues before using the NQALHA

Electromagnetic locks

The locking mechanism is based on electromagnets. If power is lost, they will release and the NQALHA will no longer hold position. The NQALHA uses a spring counterbalance, so if power is lost with nothing held in the rollers, it should approximately maintain its position. If an object is held in the rollers, and power is lost, the object will fall

This behavior can be mitigated by the use of an Uninterruptable Power Supply, available at most electronic/computer stores for very low cost. A UPS is not provided with the NQALHA, but the APC Back UPS 6, model number BE425M, at www.apc.com, \$50, is a good choice

Rapid rotation

The NQALHA is capable of rapid rotation. This can be a desirable feature for some types of glasswork when the glassworker has the skill to manage centrifugal force. It can also cause a piece of hot glass to rotate dangerously fast, possibly causing hot glass to fly toward the glassworker

When the on/off button is pressed for the first time after power is applied, the NQALHA starts at a slow rotation speed. It is necessary to rotate the thumbwheel speed control to enable high speed motion. If high speed motion is not needed, it can be disabled in software

Workpiece holding

The workpiece is held by a lever operated clamp mechanism. Whenever a workpiece is loaded and clamped in place, the glassworker must verify that the workpiece is securely fastened before starting work

The heavy steel base is an effective counterweight, but it does NOT balance the NQALHA in all extreme arm positions. Before using the NQALHA, carefully move the head through the full range of motion needed for the work being done. If you see signs of tipping, use a clamp or counterweight to secure the NQALHA. Another option is to use a screw-down adaptor plate to affix the NQALHA securely to the workstation

To avoid breaking the NQALHA

Range of motion

The horizontal arm axes are limited to 180 degrees of motion. Exceeding the limit can break the steel flex conduit and the wires. Future versions will have hard stops to prevent this, but the first production units require the user to observe the wiring and not overstress it

Wiring

Even though the wire routing was carefully designed, and many of the wires are protected by flexible steel conduit, the wiring can still be damaged by abuse. Before using the NQALHA, look at all of the wires as the head is moved and understand where they move and how they flex. If anything looks like it's being pinched, stretched or excessively flexed, contact MPM&E for assistance. Also, be aware of anything on your bench that might snag or break the wires.

While working, be careful to keep the conduit out of the direct torch flame. In testing, the wiring proved to be durable and able to withstand a lot of radiant heat, but it cannot withstand the full heat of a glassworking torch for more than a very short time

Don't break the clamp

NEVER tighten the clamp when there is no workpiece inserted and the clamp is at the bottom of its travel. Doing this will damage the clamp

Be extra careful and observant

This is an early version of the design. Although prototypes have been tested for many months and the NQALHA was constructed with great care, it is still a new design. If anything appears dangerous or unexpected, immediately stop using the NQALHA and contact MPM&E for assistance

Operation

The NQALHA has several controls. On the wood handle, at the bottom left, is a lever used to release the magnetic locks. To the right of the wood handle is an aluminum piece with two buttons and a thumbwheel. The button facing the glassworker is the front button, the other one is the back button. Below the front button is a thumbwheel. A footpedal is also provided, connected by a cable and 1/4 inch plug. Before using the NQALHA with hot glass, hold the handle, press the lever, move the head through its range of motion and use all of the controls until you are comfortable that you understand their function

Electromagnetic locks

The NQALHA is locked into position by electromagnets. The locking is not strong, the glassworker can overpower it at any time, but it locks securely enough for most normal glasswork

The NQALHA has two independent sets of locking electromagnets, horizontal and vertical. Vertical locking is always used. It supports the workpiece. Horizontal locking is optional. The back button enables or disables horizontal locking. When horizontal locking is enabled, both vertical locking and horizontal locking are controlled by the lever. When horizontal locking is disabled, vertical locking is controlled by the lever and the horizontal axis is free to move

When the lever is pressed, all locks are released. Make sure that your hand is in place, grasping the handle securely and ready to take control, before pressing the lever

Drift and lock collars

Even though the drive rollers are manufactured to very tight tolerances, they aren't perfect. Neither are the o-rings, the clamp or the workpiece. As a result, the workpiece will drift slowly along its axis when rotating

For short duration use, like flaring a tube, drift will not be a problem

For longer duration work, drift can be managed using these strategies:

Mark the workpiece to allow you to see the drift. As it drifts, reverse rotation to reverse the drift

Push a maria on the workpiece, and locate it between the two right side drive rollers

Use a lock collar. Three custom lock collars, 10, 12 and 25.4mm are included. MPM&E sells other sizes of expensive, custom handmade plastic lock collars. They work well, but many other options are available. Lock collars are a common, off the shelf item at industrial suppliers (In the industrial world, they're called Shaft Collars). Some are even available at local hardware stores. The best source is www.ruland.com/shaft-collars.html

Springs

The NQALHA comes with two sets of springs, regular and strong. This allows for 3 combinations of spring force, depending on workpiece weight and user preference

Modes of Operation

The NQALHA has three modes of operation, Rotation, Positioning and Step. They are selected by the toggle switch, located on the aluminum box at the left side of the handle. When the switch is up, Rotation mode is selected. When the switch is down, Positioning or Step mode is selected as described below

Rotation Mode

The front button is the on/off button that starts and stops rotation

When the button is first pressed, the workpiece rotation starts at low speed. After stopping and restarting, rotation resumes at the previously selected speed unless the button was pressed during high speed rotation. If the front button is pressed to stop rotation during high speed operation, the rotation will resume at low speed when the button is pressed again. This is an important safety feature that ensures that high speed rotation will never start unintentionally

When the motors are off, they are free to rotate. If desired, the workpiece can be manually rotated with minimal resistance

The footpedal controls pause and reverse

When the pedal is pressed, rotation is paused. When it's released, rotation resumes in the reversed direction. The pedal can be pressed and released quickly to reverse without pausing

The thumbwheel controls rotation speed

Moving your thumb toward the heat shield increases speed while moving your thumb toward the handle decreases speed

Positioning Mode

Positioning Mode is the default mode selected when the toggle switch is down

Pressing the footpedal starts rotation, releasing the pedal stops it

The thumbwheel controls rotation speed

Moving your thumb toward the heat shield increases speed while moving your thumb toward the handle decreases speed

Pressing the front button reverses direction

Pressing the front button while holding down the footpedal changes to Step Mode

Step Mode

Pressing the footpedal commands the rollers to rotate one step

Pressing the front button reverses direction and commands the rollers to rotate one step in the new direction

Step mode is complex since it depends on the mathematical relation between the diameter of the drive roller and the diameter of the workpiece. This can be confusing, and the final user interface is still under development. Even after the interface details are worked out, it will never be absolutely precise, due to the variation in workpiece diameter, the compression of the o-rings and the manufacturing tolerance of the drive wheels. Step mode may be removed in future versions due to its complexity and inability to provide exact precision

Step size can be set in three ways:

The NQALHA is delivered with its software set for a 12mm workpiece. When a 12mm workpiece is used, the footpedal and front button can be used to set the step size. Press and hold the footpedal. Then press the front button to select the number of divisions per rotation. One press results in one full rotation of a 12mm piece per footpedal press. Four presses results in one quarter of a rotation per footpedal press

If the piece is a different size, the thumbwheel can be used to select step size

If you want to precisely specify a workpiece diameter and fractional division, you must use the USB computer interface

Pressing and holding the pedal changes to Positioning Mode

Saved speeds and rotation direction

Each mode maintains its own values for speed and direction. When the mode is changed, speed and direction resume at the values selected before the mode was changed

Shutdown

The NQALHA does not have a power switch. To turn off the magnets and motors, press and hold the front button for several seconds. After shutdown, pressing any button or lever resumes normal operation

Don't get discouraged

Like learning to play a new instrument, the NQALHA takes time to learn. Many experienced glassworkers struggle with it the first time they use it. Think of it like a guitar player, learning to play the saxophone. If you find that your handwork technique doesn't translate to the NQALHA, experiment with alternate techniques. The NQALHA master technique has not been invented yet. All of the early users are refining and inventing techniques as they gain experience. Many of the early users have speculated that the NQALHA could change how glass is worked

Maintenance

It's highly recommended to have a set of ball-end, T-handle hex drivers. This one, Allen 56656G at www.allenhex.com is a good choice, but there are many other options. Periodically, check all screws to make sure they are tight. Pay particular attention to the screws at the pivot points

The silicone o-rings are standard, off the shelf parts. If they are damaged, they can be easily replaced. They are sold by McMaster Carr, www.mcmaster.com, Square-Profile High-Temperature Silicone O-Ring, 1/8 Fractional Width, Dash Number 220, P/N 1182N22

Warranty, Support and Parts

I'm still working on the precise language of the warranty, but here's the general idea in simple words

The NQALHA has a "lifetime" warranty (my lifetime, I'm 65). As long as I'm able, I'll do whatever I reasonably can to support users of the NQALHA. I love glass. I love art. I look forward to working closely with artists as they make amazing creations with my invention

Any part that's defective in design or fabrication will be replaced for free. As the design evolves, upgrades will be available, either free or at a low cost, depending on the details

If you damage or destroy anything, parts will be available at a reasonable cost

Since the NQALHA is large and heavy, and shipping is expensive and potentially damaging, most maintenance and repair should be done on-site. The NQALHA is a modular design. All complex parts can be replaced at the module level

The buyer needs to have a set of basic hand tools (hex drivers, wrenches, wire cutters..etc), and the ability to work with screws, cable ties and connectors

This is not a product from a faceless corporation. It's a tool for artists, handmade by an artist. All comments, good or bad, are welcome and valuable. Please send feedback or requests for assistance to support@nqalha.com

Please save the shipping box and packing material in case the NQALHA needs to be returned to MPM&E

Training Videos

I plan to shoot and post many training videos on my YouTube channel. They will be linked from the main website, nqalha.com. Topics will include, basic operation, adjustment, maintenance and how to remove and replace all parts and modules. I will also work with master glassworkers to make videos on glassworking with the NQALHA

Version History

This is Version 3

I expect it will be updated several times in the near future. Be sure to check nqalha.com for updates

V1 6/14/2018 Initial release

V2 7/3/2018 Added Positioning Mode and renamed Continuous Rotation Mode to Rotation Mode

V3 7/8/2018 Added warranty info

Windows User Interface

A USB port is provided for connecting a Windows computer. The User Interface software allows setting of many options as well as displaying various internal values. Many of the displayed values are of limited or no use to the typical user, but are included as an aid to development and troubleshooting

For Step Mode

Step mode uses three parameters to calculate the number of motor steps that are commanded each time the pedal is pressed

Rod Diameter

The diameter, in millimeters, of the rod or tube

Step Division

The fraction of one rotation that the rod moves each time the footpedal is pressed. Example, A value of 4 rotates the rod 1/4 of a turn each time the pedal is pressed

Step Increment

The number of motor steps that the motors move each time the pedal is pressed. There are 6400 steps in one full rotation of the motors

Step Speed

The speed that the motors move when the pedal is pressed. This should normally be a low speed, but can be adjusted as desired

Roller Diameter

The diameter of the o-rings on the main drive rollers. This is set by default, but can be adjusted to fine-tune the step increment

For Rotation Mode

Speed

Shows the speed of the motors. The speed is not displayed in easily understood numbers. Absolute maximum speed is 30,000. This is approximately 268 RPM

MaxSpeed

Sets the maximum speed that can be commanded by the thumbwheel. High speed rotation can be useful, but it can also be dangerous. If high speed operation is not required, it's a good idea to disable it by limiting Max Speed

MaxRestartSpeed

If the start/stop button is pressed during high speed motion, motion will stop. When the button is pressed again, it will start at the MaxRestartSpeed. For safety, this value should be low to avoid unexpected high speed motion

MinSpeed

Sets the minimum speed. There is probably never a reason to change this

InitialRotationSpeed

Sets the speed that the motors will turn the first time the start/stop button is pressed after power is applied

InitialPositioningSpeed

Sets the speed that the motors will turn the first time the start/stop button is pressed after power is applied

StopMode

The two choices are hold and release. When release is selected, and the stop button is pressed, the workpiece can be rotated by hand. When hold is selected, the motors hold position

SpeedEncoderValue

StepEncoderValue

The value measured by the thumbwheel. This is used for troubleshooting

MaxStepEncoderValue

Sets the range of the thumbwheel. The default value is 127, or one revolution of the wheel

State

Direction

HorizLockEnabled

Displays various operating values