MASSO

Documentation

v5.25 - 25 Jul,2021

How to use this documentation

Using QR codes for viewing interactive content and watching instructional videos.

Table Of Content

1. MASSO Documentation

Welcome to MASSO documentation. You can quickly search for information using the **search bar** on the top-right.

This documentation covers the **MASSO G2**, **MASSO G3** and **MASSO G3 Touch** controllers.

We have prepared the following **quick links** to help you find the right information for your project.

Installing MASSO

Current Software Versions

Machining with MASSO

Getting Support

Original Equipment Manufacturer (OEM)

v5.25 - 25 Jul,2021

[Purchasing]

2. Warnings and Cautions

WARNING: Indicates circumstances or practices that can lead to personal injury as well as damage to the controller, the machine, or other equipment.

CAUTION: Indicates circumstances or practices that can lead to damage to the controller or other equipment.

INFORMATION: Indicates important information.

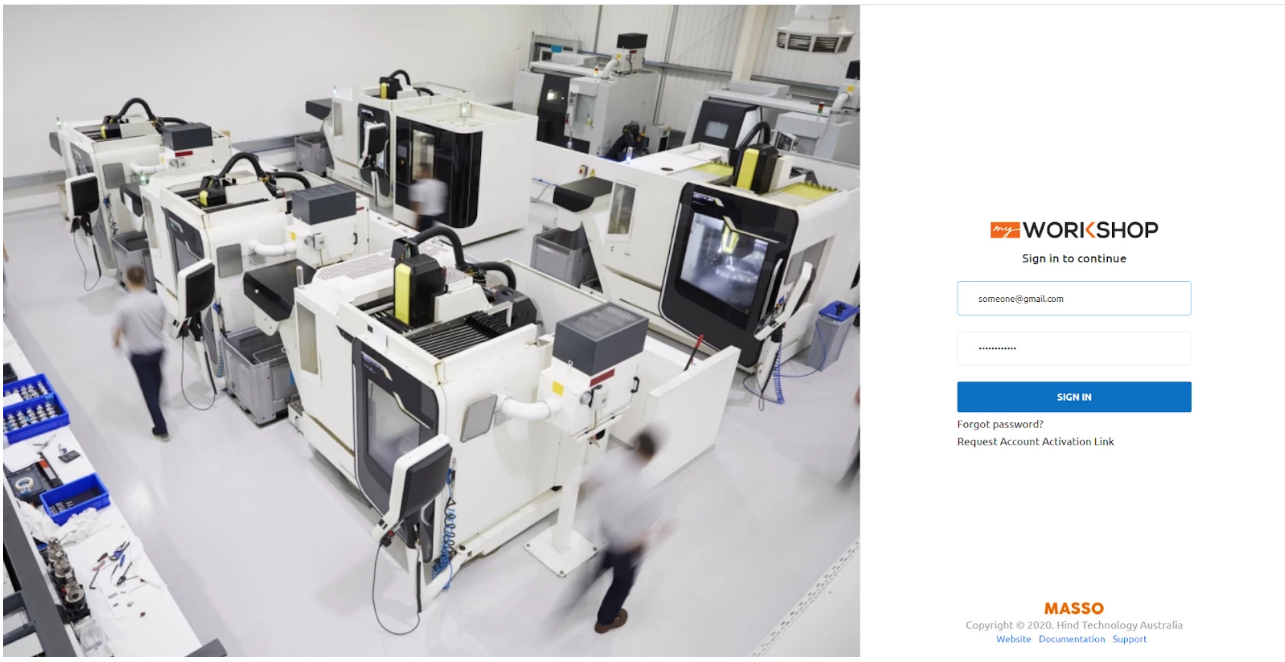
3. myWorkshop

Step1 Log into myWorkshop

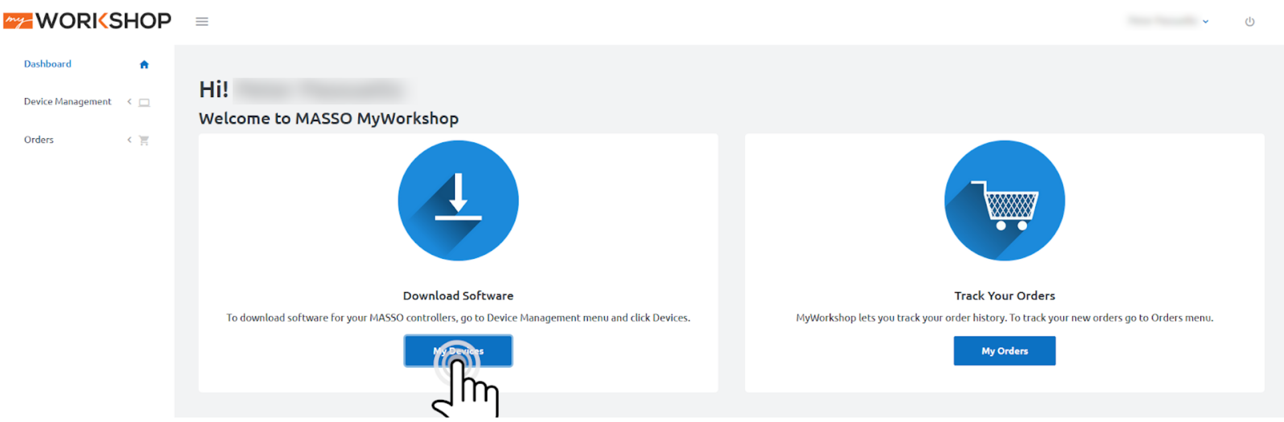
https://myworkshop.masso.com.au

Login using your account email address and password.

If your initial account registration link has expired please select **Request Account Activation Link** and a new registration email will be sent.

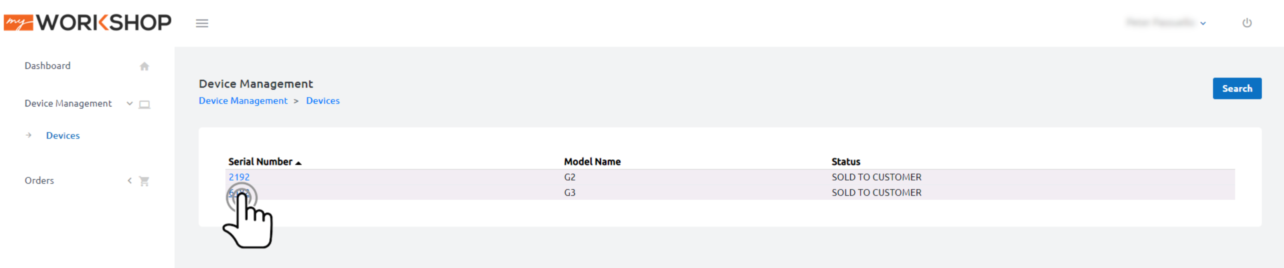


Step 2 Click My Devices

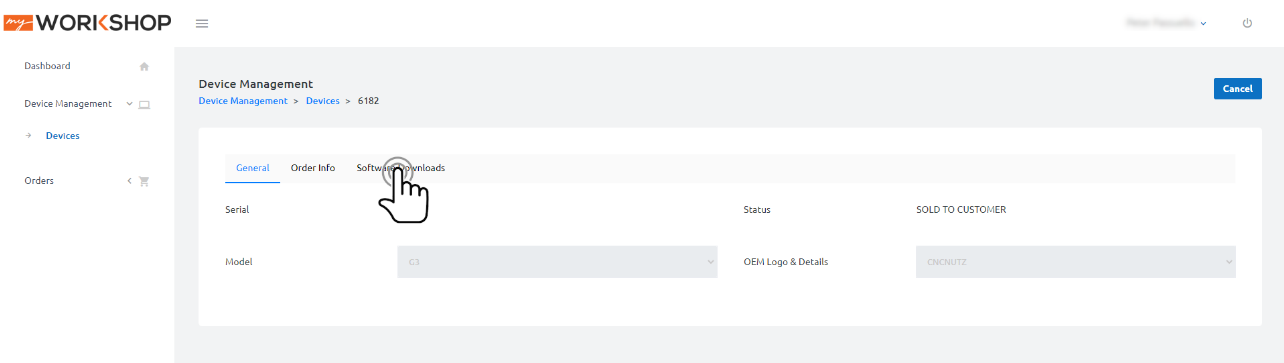


Step 3 Click your Serial Number

Click on the Serial number of your MASSO you want to download



Step 4 Click Software Downloads



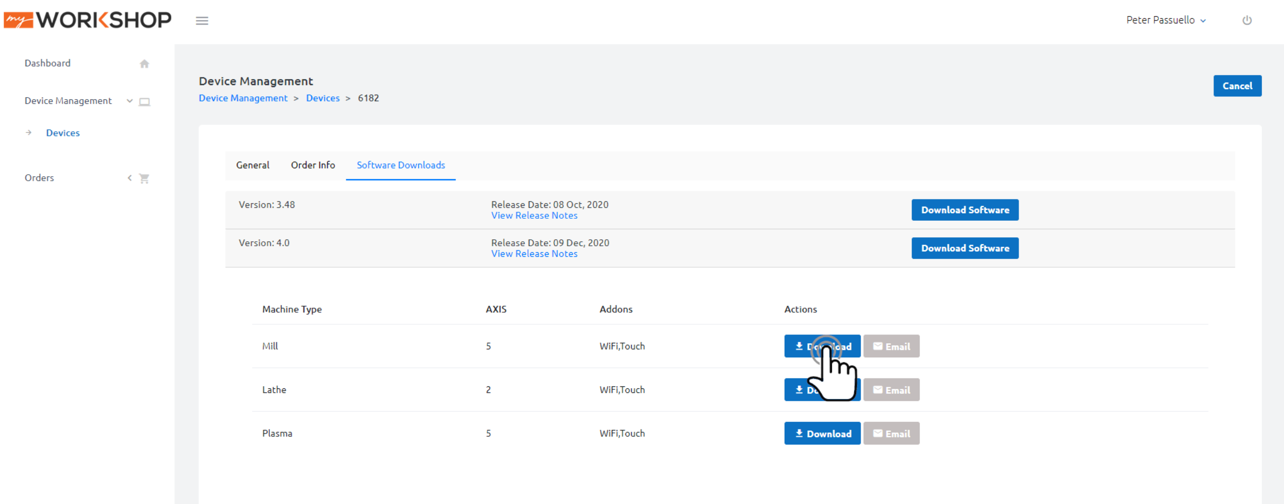
Step 5 Select software version

Click on the Download Software box of the software version you wish to download.

You can see what has changed in this version by clicking View Release Notes found under the release date.

Step 6 Download Software

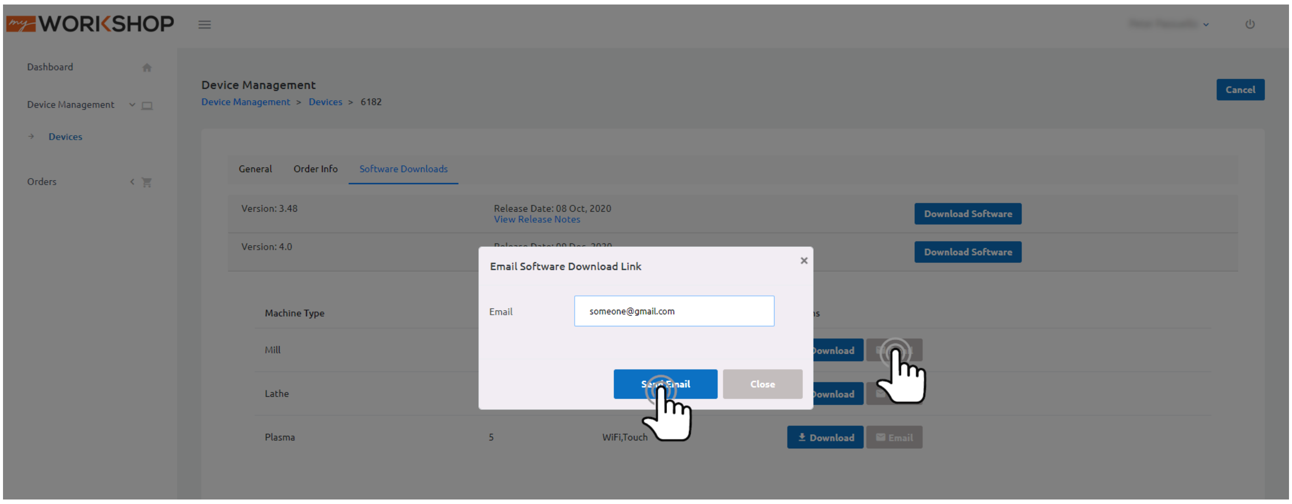
Click Download to download the latest version



Step 6 Email Software

To Email the software update Click the Email button next to the software version you wish to download and the Email Software Download Link box will open. The Email address will already be filled in with your registered Email address however you can enter a different address if you wish to have it sent elsewhere.

Click Send Email and you will receive an email with the attached Software file.


WORKSHOP
Dashboard
Device Management
Devices
Orders
Device Management
Device Management > Devices > 6182
Cancel
General
Order Info
Software Downloads
Version: 3.48
Release Date: 08 Oct, 2020
View Release Notes
Download Software
Version: 4.0
Download Software
Email Software Download Link
Email
someone@gmail.com
Close
Machine Type
Mill
Lathe
Plasma
5
WiFi,Touch
Download
Email

4. MASSO - FAQ's

4.1. About MASSO

What is MASSO?

MASSO is an embedded 5 Axis CNC controller. It is a stand-alone controller with built-in processor, motion controller, spindle control, WiFi, and I/O interfaces. MASSO comes with software to run Mill / Router, Plasma and Lathe machines.

Where can I get download MASSO controller software?

When you purchase your MASSO controller, an account for MASSO myWorkshop is created for you to manage controllers and software. If the unit was purchased through a machine manufacturer or a distributor then your myWorkshop account will be created by them. If for some reason you haven't received the myWorkshop details, email support with your MASSO serial number and email address. We will send you login details of your myWorkshop account where you can download your software. All current software and future software updates are available inMyworkshop https://docs.masso.com.au/my-workshop

Can you send a trial version of the software or can I run the MASSO software on a PC?

MASSO is a stand-alone hardware unit and the software can only run on the MASSO controller hardware, hence the software can't be run on a PC.

Do I need motor drives for my motors ?

Yes, you will need motor drives, MASSO outputs STEP\PULSE and DIRECTION signals which will then be connected to your stepper or servo motor drives. Each of these requires different drive technologies and the drive must be matched to the motor for optimum performance.

What is the difference between MASSO G3 and MASSO Touch?

- MASSO Touch has an integrated touch screen with MASSO G3 inside.
- MASSO G3 does not come with a touch screen.
- Please see our FAQ page about MASSO Touch https://docs.masso.com.au/MASSO-Touch-FAQ

I have a Mill ,Plasma and Lathe, can I use MASSO to run multiple machines?

- Yes, MASSO can be used to run Mill, Plasma or Lathe. When you purchase your MASSO you are given access to all software and can change between software when you power on your MASSO.
- Each software version has its own personal configuration file which you can load when you load the software

- The process to change between software and load the configuration file takes approximately 90 seconds from start to ready to run.
- There is no extra cost for using multiple software's on one MASSO controller.

Can I load a DXF file into MASSO

No, MASSO is a CNC controller and uses only Gcode. You need to write or use CAM software to create your Gcode

Where can I get a post processor for my CAM software?

MASSO has links to some CAM software post processors in the documentation.

If your supplier is not listed please contact them and ask if they have a post-processor available or if they can write one for the MASSO CNC Controller.

https://docs.masso.com.au/cam-post-processors

Can I transfer Gcode files from my computer to MASSO over a network?

- Yes, MASSO can connect to your computer via WiFi network and by using MASSO Link software. This will allow you to send files to MASSO, download the tool table from MASSO and monitor progress and alarms while it is machining.
- MASSO Link is available for PC, macOS and Linux https://docs.masso.com.au/getting-started-guides/machining-with-masso/wi-fi-connectivity

How easy is MASSO to set up?

- This is a hard question to answer as it depends on the person doing it and their level of understanding. To assist with the initial setup we have published quick start guides on each machine type and other useful subjects. We also have a forum where users can ask questions about their builds.
- MASSO makes things easier as there is no need for the user to source a PC, motion controller and interface boards, load the software and drivers for each and then troubleshoot for compatibility issues. MASSO provides all of these in a single package ready for use.
- https://docs.masso.com.au/quick-start-guides

Can MASSO be used for equipment other than CNC machines?

Yes. MASSO is an easily programmable controller that has inputs, outputs and precision motor control. If your application has needs for these functions then MASSO may be suitable. MASSO has the ability to autoload a program on powerup and run the program in an infinite loop making it suitable for many applications.

4.2. MASSO Touch - Frequently asked questions

Can a normal MASSO-G3 controller be installed and used inside the MASSO Touch model?

- The MASSO Touch model has special electronics to drive and control the LED screen. The normal MASSO-G3 model is designed to connect to VGA screens with a 15pin VGA connector and can't run LED/LCD screens and can't be used with MASSO Touch.

Can the MASSO-G2 controller be installed and used inside the MASSO Touch model?

- No, the MASSO Touch model has special electronics to drive and control the LED screen. The normal MASSO-G2 model is designed to connect to VGA screens with a 15pin VGA connector and can't run LED/LCD screens.
- NOTE: Even if a small add-on module to connect the VGA connector of the MASSO-G2 controller to the MASSO Touch screen is made available, MASSO-G2 does not have the memory to add MASSO Touch capacitive touch drivers or screen layouts to support full touch features.

What is the resolution of the screen?

- The screen resolution is the same as of normal G2 and G3 models, 1024x768 pixels.

What material is the enclosure made of?

- The front part of the enclosure is made of ABS plastic.
- The rear mounting plate is made of anodized aluminum.
- The touch glass is made of toughened capacitive touch glass.

What is the enclosures IP (Ingress Protection) rating?

- The unit does not have or require cooling fans which means that there is no internal positive or negative pressure to pull dust particles. The front part assembly with the rear panel has a lip to prevent dust or water from going into the system but direct dust or liquids should be avoided.
- The rear panel also has mounting holes and a cutout for wiring, the user should make sure to cover or close these during installation.

Will the normal MASSO-G3 and MASSO Touch software be different or will have different features?

- Both the models will have exact same software features and user interface.
- MASSO Touch was developed as per client and OEM requests to have an integrated design and also to solve issues with 3rd party touch screen not working.
- Both the models will have software updates released at the same time with same features added.

Can the two red and green buttons on the unit only be used for cycle start and stop?

- The buttons are wired to normal inputs and can be assigned any function from the F1-Setup screen.

What's the weight of the unit?

- The MASSO Touch weighs about 4.5kg (9.92lb).

Mechanical dimensions and mounting information?

- Please use this link **CLICK HERE**

4.3. Purchasing MASSO

Can I order directly from your Website?

Yes, we send our product worldwide. Simply select what you would like to purchase, add it to the cart and proceed to checkout. Here the shipping will be calculated for you and you can complete the purchase.

I ordered Mill instead of Plasma, can I change my order?

All MASSO units use the same hardware. When you register your MASSO you will receive Mill, Plasma and Lathe software and can load whichever one you want at any time.

I ordered 3 Axis but need 5, can I upgrade?

All MASSO units use the same hardware that is capable of running up to 5 axis. You can purchase the axis upgrade at any time and new software will be added to your myWorkshop portal for easy download.

How much will it cost to send?

The easiest way to determine this is to go to our online shop, add the items you want to the cart, and when you proceed to the checkout you can enter your country and address. The shipping will be calculated for you before you proceed to the final checkout.

I sold my MASSO, can I transfer my license to the new owner?

Please email us from your registered MASSO myWorkshop account, provide the email address of the new owner and the serial number to be transferred. New login details to myWorkshop will be sent to the new purchaser.

I purchased a 2nd hand MASSO, can I transfer the license to my name?

Please request the seller to email us from their MASSO myWorkshop account and provide your email address and the serial number of your MASSO controller. New login details to my Workshop will be sent to you.

4.4. Machine conversion and Builds

I want to convert a machine to use with MASSO, will it work?

- Unless your machine is more than 5 axis or has unusual requirements the answer is generally yes.
- We do not know the specifics of your CNC machine, how it is wired and what hardware it has. It is the responsibility of the person converting the machine to evaluate the existing hardware for compatibility.
- The conversion of a CNC machine needs to take into account many factors.
- What drives you have and what connections they have. What Spindle you have and the VFD connection. What inputs and outputs you need. You need to evaluate each existing item to see if it conforms to the MASSO standard and replace those items that do not comply. If you are unsure about a specific piece of equipment please consult the manufacturer's documentation.

Can you supply a wiring diagram for my machine conversion?

- MASSO does not offer a machine conversion or machine design service.
- We do provide example wiring diagrams in our documentation. We have example wiring diagrams for a selection of stepper and servo drive types as well as spindle VFDs.

What equipment do I need to convert my CNC machine?

To establish your requirements you need to do an inventory of what your machine currently has that you can reuse and what you would like to add.

Example of a basic mill requirements

- MASSO, Keyboard, Monitor and mouse or a MASSO Touch
- USB Flash drive
- Power supply for MASSO
- Motor drives using STEP/PULSE and DIRECTION signaling
- Power Supply for motor drives
- Spindle with VFD or router
- Homing sensors/switches, one for each axis
- Tool setter for auto tool zero.
- Encoder, required for lathe when threading.

Optional

- MASSO relay board used for external Estop to motor drives, Tower lights, etc.
- Pendant
- Encoder for spindle

What can MASSO provide for my machine?

MASSO provides CNC controllers and the following accessories available from our web store

- Relay module
- Homing sensor
- MPG Pendant
- Optical encoder for Spindle
- Estop switch

https://www.masso.com.au/product-category/sensors-accessories/

We do not provide other products and you will need to source them from other suppliers which specialize in these components.

4.5. Motors and Drives

Do I need drives for my motors?

Yes, MASSO interfaces with both stepper and servo motors using STEP/PULSE and DIRECTION signaling.

I have 2 motors on my Y axis, will it work with MASSO?

- Yes. MASSO can do both hardware and software slaving.
- Please see this video to get a better understanding of how slaving works and to determine what version of MASSO you require.
- https://docs.masso.com.au/wiring-and-setup/setup-and-calibration/slave-axis

I have a NEMA 23 or 34 motor. Will it work with MASSO?

- NEMA defines the motor mounting only.
- MASSO does not interface directly with motors. The motor connects to the drive and the drive connects to MASSO. If your servo or stepper drive uses STEP/PULSE and DIRECTION signaling then it will work.

Will a particular drive work with MASSO?

If your drive is designed to work with STEP/PULSE and DIRECTION signals then it will work with MASSO. Please consult your drive manual for signal requirements. If you have an older motor drive that uses analog or PWM signals, this will not work. You may be able to upgrade the drives to modern ones using STEP/PULSE and DIRECTION signaling and use these to drive your existing motors.

How do I wire my motor drives?

- It is not possible to provide diagrams for every drive however there are only 2 basic methods of connection. Differential and common ground modes.
- Example drive connection diagrams are provided in the MASSO documentation.
- https://docs.masso.com.au/wiring-and-setup/setup-and-calibration/axis-servo-stepper-examples

I want to use Servos with MASSO, how do I connect the motor encoders to MASSO?

When connecting servos the encoder connects directly to your servo drive which monitors the position and will send an alarm to MASSO in the event of position loss, the drive is then wired to MASSO using STEP/PULSE and DIRECTION signals. There is no need or option to connect the encoder from motors to MASSO.

What size motors do I need for my machine?

Motor size depends on a number of factors. Type of machine, required maximum speed, the weight of the axis being moved. This is outside the field of the CNC controller. Please consult an engineer who specializes in this field of machine design.

What motors and drives do you recommend?

MASSO does not recommend any specific 3rd party equipment.

4.6. Plasma

Does MASSO include a built in THC?

- There is no built in THC within MASSO however you can connect one.
- MASSO uses any THC that outputs UP / Down and Arc OK signals such as the Proma150 or Price AVHC
- Please see our documentation on how THC works.
- https://docs.masso.com.au/wiring-and-setup/plasma-torch-height-control/how-thc-works

Does MASSO supply an THC to use with MASSO?

In the future, we will be adding a MASSO THC to the MASSO range, designed specifically to work with the MASSO CNC controller. At present, there is no scheduled release date.

Can I use Third party THC's with MASSO?

MASSO uses any THC's that outputs UP / Down and Arc OK signals such as the Proma150 or Price AVHC, any system able to provide these signals can be used with MASSO.

https://docs.masso.com.au/wiring-and-setup/plasma-torch-height-control/how-thc-works

How do I turn on the Plasma with MASSO?

Please read our How THC works which details the connection process https://docs.masso.com.au/wiring-and-setup/plasma-torch-height-control/how-thc-works

What equipment do I need to convert / Build my CNC machine?

To establish your requirements you need to do an inventory of what your machine currently has that you can reuse and what you would like to add.

Example of basic Plasma requirements

- MASSO, Keyboard, Monitor and mouse or a MASSO Touch
- USB Flash drive
- Power supply for MASSO
- Motor drives using step and direction signaling
- Power Supply for motor drives
- Homing sensors, one for each axis
- MASSO relay board used for Turning Plasma on and off, external Estop to motor drives, Tower lights, etc.
- Plasma source

Optional

- THC
- Pendant

Please see these pages for additional information.

https://docs.masso.com.au/quick-start-guides/setup-masso-plasma

https://docs.masso.com.au/wiring-and-setup/plasma-torch-height-control/how-thc-works

4.7. Encoders

Can I use an encoder on my Spindle?

- MASSO has provision for a spindle encoder in both Mill and Lathe software.
- Lathe uses the spindle encoder for threading to ensure correct feed synchronization with the Z axis.
- Mill uses the encoder to report the spindle RPM.
- https://docs.masso.com.au/wiring-and-setup/setup-and-calibration/spindle-rpm-encoder

Can I use absolute or linear encoders on axis?

MASSO does not support the use of absolute or linear encoders to determine the position or home the machine. Homing sensors or switches are required on each axis to home the machine.

4.8. Spindles

Will a particular spindle work with MASSO?

- MASSO provides a 0~10v, CW and CCW signals to control spindle speed (RPM).
- Two open-collector optical switches for forward (clockwise) and reverse (counter-clockwise) signals.
- If your VFD conforms to this format then MASSO will work with your spindle.
- https://docs.masso.com.au/wiring-and-setup/setup-and-calibration/spindle-vfd-examples

How do I connect my Spindle?

It is not possible to provide wiring diagrams for every VFD or provide advice on how to configure specific VFD's. Please consult your VFD manual and VFD supplier for configuration settings.

Our documentation provides examples of some common VFDs and we have produced a step-by-step video explaining how to connect a VFD to MASSO.

https://docs.masso.com.au/wiring-and-setup/setup-and-calibration/spindle-vfd-examples

4.9. Tool Changers

Will MASSO work with my machine's tool changer?

MASSO has built in a range of tool changer logic for both Mills and Lathes. Please have a look at the current list of tool changers available and compare their logic to the logic requirements of yours to see if there is one suitable for your machine https://docs.masso.com.au/wiring-and-setup/tool-changers

My tool changer logic will not work with any of the current tool changer options.

If your tool changer does not conform to one of the existing tool changer logics built in to MASSO then you can contact support to see if one can be written for your tool changer type.

You will need to supply

- A complete explanation of how the tool changer works.
- A description of the logic required in a step by step format. This must include all inputs, outputs and timings.
- A video of the tool changer in action would be helpful to understand the tool changer operation.
- Any other information about the tool changer.

4.10. Support

How do I contact MASSO support?

MASSO support can be contacted either via email or via the MASSO support portal

- For easy administration of your support tickets try out the MASSO Support Portal
- How to use your MASSO support ticket Portal https://youtu.be/2NE4DFL4_Ck
- Support Portal Login page https://hindtechnology.freshdesk.com/support/login
- MASSO support can also be contacted via email at support@masso.com.au

What can MASSO support help with?

What we can support	What we can't support
Request MASSO software	Selecting/wiring motors and drives – For more info see MASSO Forums/Documentation
Bug Reports	How to use CAD/CAM software – For more info see Google/YouTube
Feature Requests	How to design/machine parts – For more info see MASSO Forums
OEM/Machine Manufacturers	Educating about electronics and wiring – For more info see Google/YouTube/MASSO Forums
Sales/Ordering	Retrofitting MASSO to a particular machine – For more info see MASSO Forums
Request to Add/Edit Documentation	Setting up and Programming Axis & Spindle Drives (VFD) – For more info see MASSO Forums/Documentation
Request to Add/Edit Video Tutorials	Creating/adding features to CAM post-processors – For more info check with your CAM Software Provider

Do you offer phone support?

As we have clients in all parts of the world, we are unable to offer phone support. Further by using the MASSO support portal or email allows for a record of questions and the answers to be available to members of the MASSO support team to follow up on and refer back to at a future date. It also eliminates issues of international time zones and assists with language barriers through the use of translation.

- For easy administration of your support tickets try out the support MASSO Portal
- Support Portal Login page https://hindtechnology.freshdesk.com/support/login
- How to use your MASSO support ticket Portal https://youtu.be/2NE4DFL4_Ck
- MASSO support can also be contacted via email at support@masso.com.au

What is the MASSO Support Portal?

- The support portal allows you to create and manage support tickets for each question, update, reply, check on progress, close a ticket and review old tickets that have been resolved.
- Support Portal Login page https://hindtechnology.freshdesk.com/support/login
- How to use your MASSO support ticket Portal https://youtu.be/2NE4DFL4_Ck

Using the MASSO Support Portal

The video below takes you through setting up the MASSO support portal step by step and demonstrates how to use it.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

5. Installing MASSO

5.1. MASSO Touch

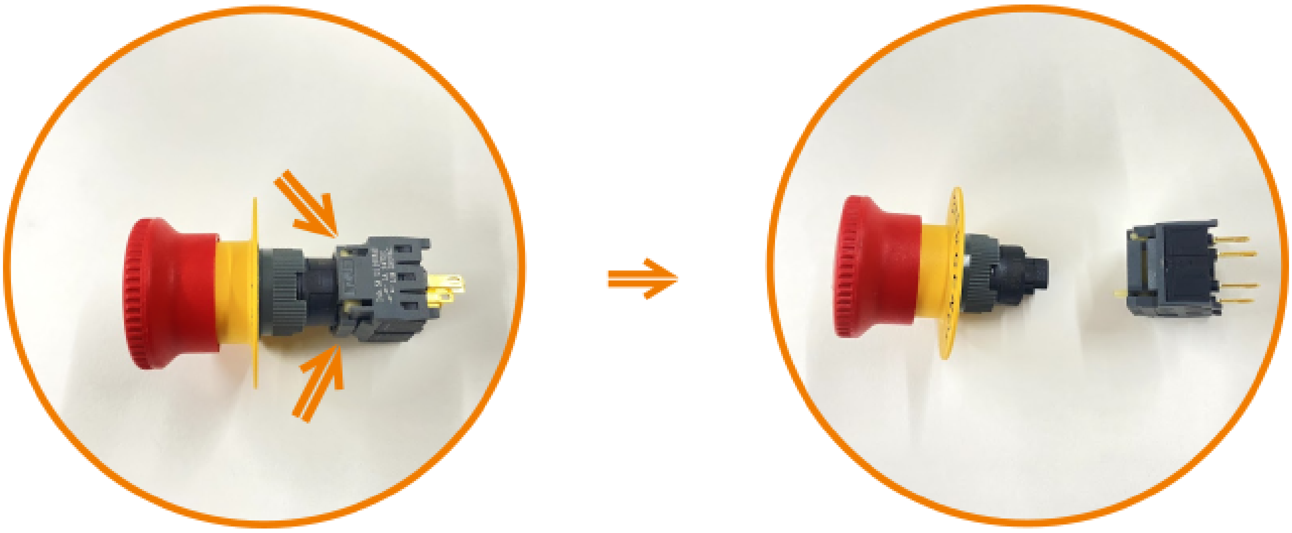
CAUTION: Semiconductor parts inside the unit can be damaged by electrostatic discharge (ESD). When handling, care must be taken so that the devices are not damaged. Damage due to inappropriate handling is not covered by the warranty.

Open the enclosure by removing the four marked M5 HEX bolts. Please fully remove the four bolts and the swing open the top part towards the left side.

WARNING: When closing the enclosure and installing the M5 HEX bolts, please do not overtighten.

Installing the E-Stop button

The E-Stop button needs to be installed first, please follow the steps to install the E-Stop button.



Press the two clips and pull the backside of the E-Stop button

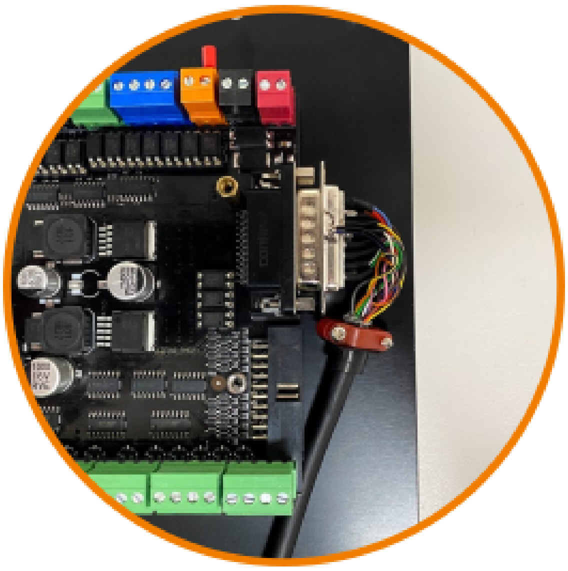
Bend the switch button as shown above.

NOTE: Keep the direction of the switch as marked by the tab.

Install the E-Stop button, plugin the rear switch, and plug the wire crimps into the middle two pins.

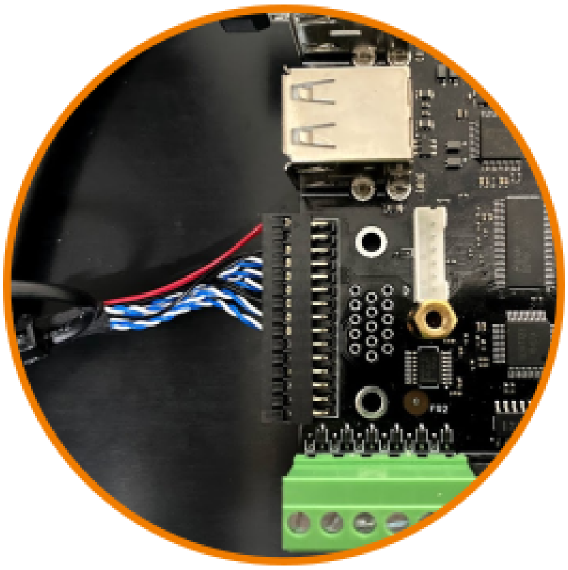
Installing MPG connector

For installing the MPG connector, remove the D-Connector plastic shell and install it as shown below.



LCD Cable connector

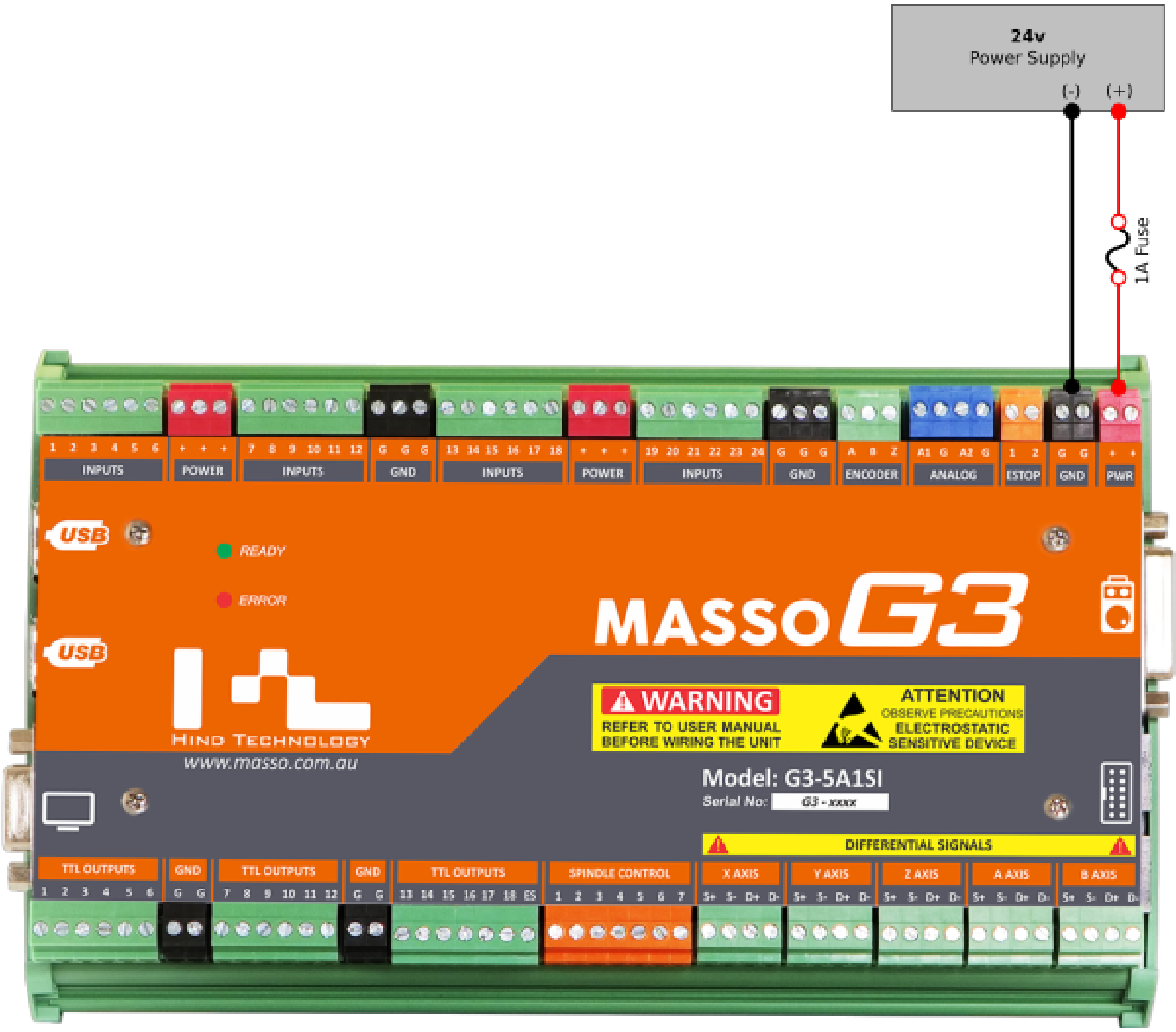
If for any reason the LCD cable has to be removed and installed back, it must be installed in the direction as shown below else the LCD or the MASSO controller might get damaged.



Powering the MASSO Touch

The MASSO Touch power supply connector is located at the top-right corner of the controller as seen in the picture below. MASSO Touch requires a power supply of **24 VDC** with a minimum of **1.5 Amps** output. Voltage not to exceed 25 **VDC** or be less than 23 **VDC**.

MASSO Touch will power on instantly once power is connected.



WARNING: The installation of a 1 amp fuse between your Power Supply and MASSO is required to protect against an accidental short circuit of the auxiliary power connectors on MASSO, such an event can damage the controller beyond repair.

WARNING: The MASSO Touch requires a power supply of nominal 24 **VDC**. Voltage not to exceed 25 **VDC** or be less than 23 **VDC**.

INFORMATION: There are multiple **Power (Red-colored)** and **Ground (Black-colored)** provided on the controller and can be used to easily wire drives, sensors and switches.

Some examples:

- The **Power** terminals can be used to provide voltage to sensors or switches for machine homing.
- The **Ground** terminals can be used to wire common ground signals between stepper or servo motor drives.

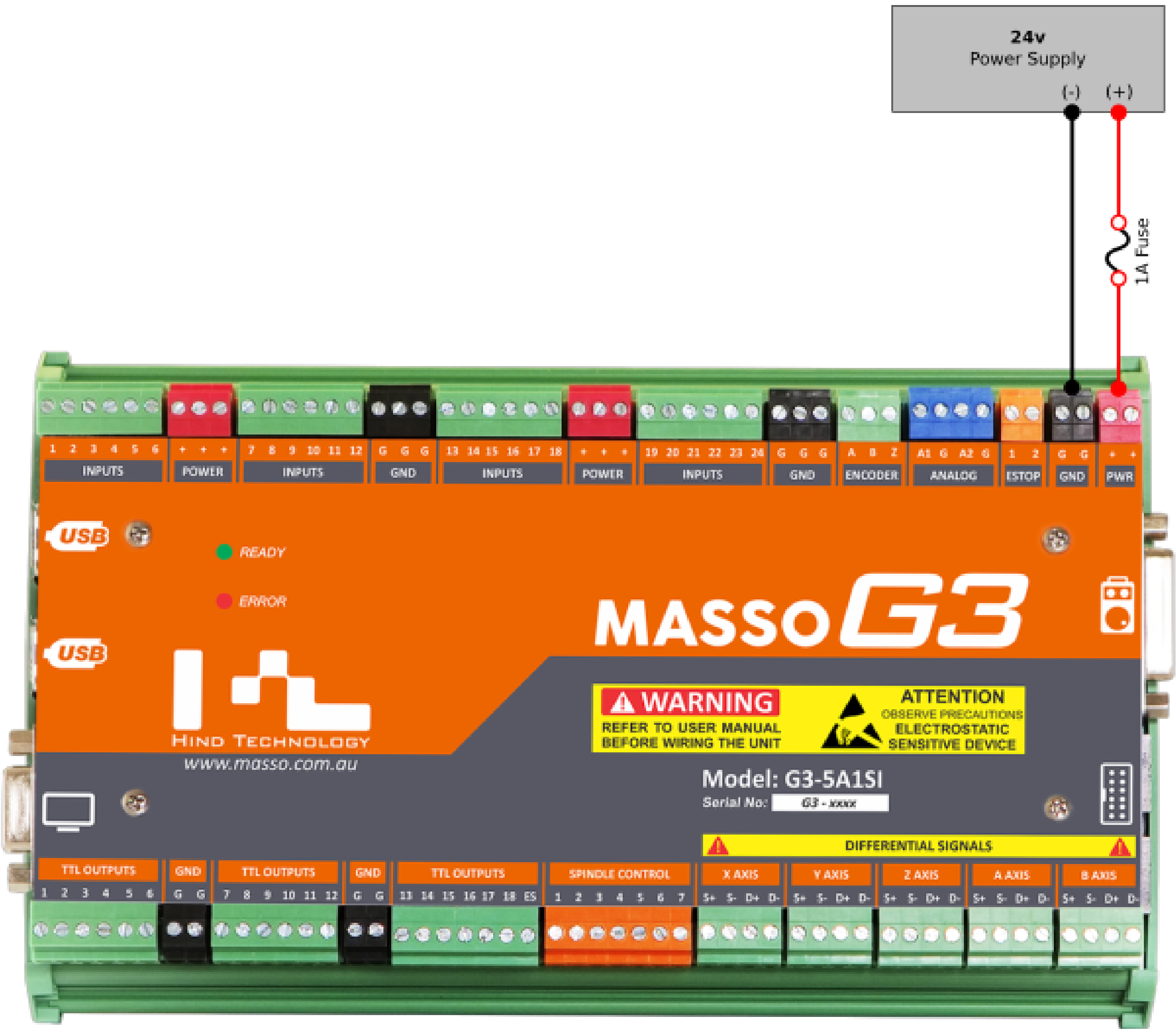
> **CAUTION: Power** and **Ground** terminals provided on the controller are only to be used for very low current signals. Connecting high current loads can damage the controller beyond repair.

5.2. Powering MASSO-G3

CAUTION: Semiconductor parts inside the unit can be damaged by electrostatic discharge (ESD). When handling, care must be taken so that the devices are not damaged. Damage due to inappropriate handling is not covered by the warranty.

The MASSO power supply connector is located at the top-right corner of the controller as seen in the picture below. MASSO requires a power supply between **12 and 24 VDC** with a minimum of **1.5 Amps** output. Voltage not to exceed 25 **VDC** or be less than 12 **VDC**.

MASSO will power on instantly once power is connected.



WARNING: The installation of a 1 amp fuse between your Power Supply and MASSO is required to protect against an accidental short circuit of the auxiliary power connectors on MASSO, such an event can damage the controller beyond repair.

WARNING: The MASSO G3 power supply not to exceed 25 **VDC** or be less than 12 **VDC**.

INFORMATION: There are multiple **Power (Red-colored)** and **Ground (Black-colored)** provided on the controller and can be used to easily wire drives, sensors and switches.

Some examples:

- The **Power** terminals can be used to provide voltage to sensors or switches for machine homing.
- The **Ground** terminals can be used to wire common ground signals between stepper or servo motor drives.

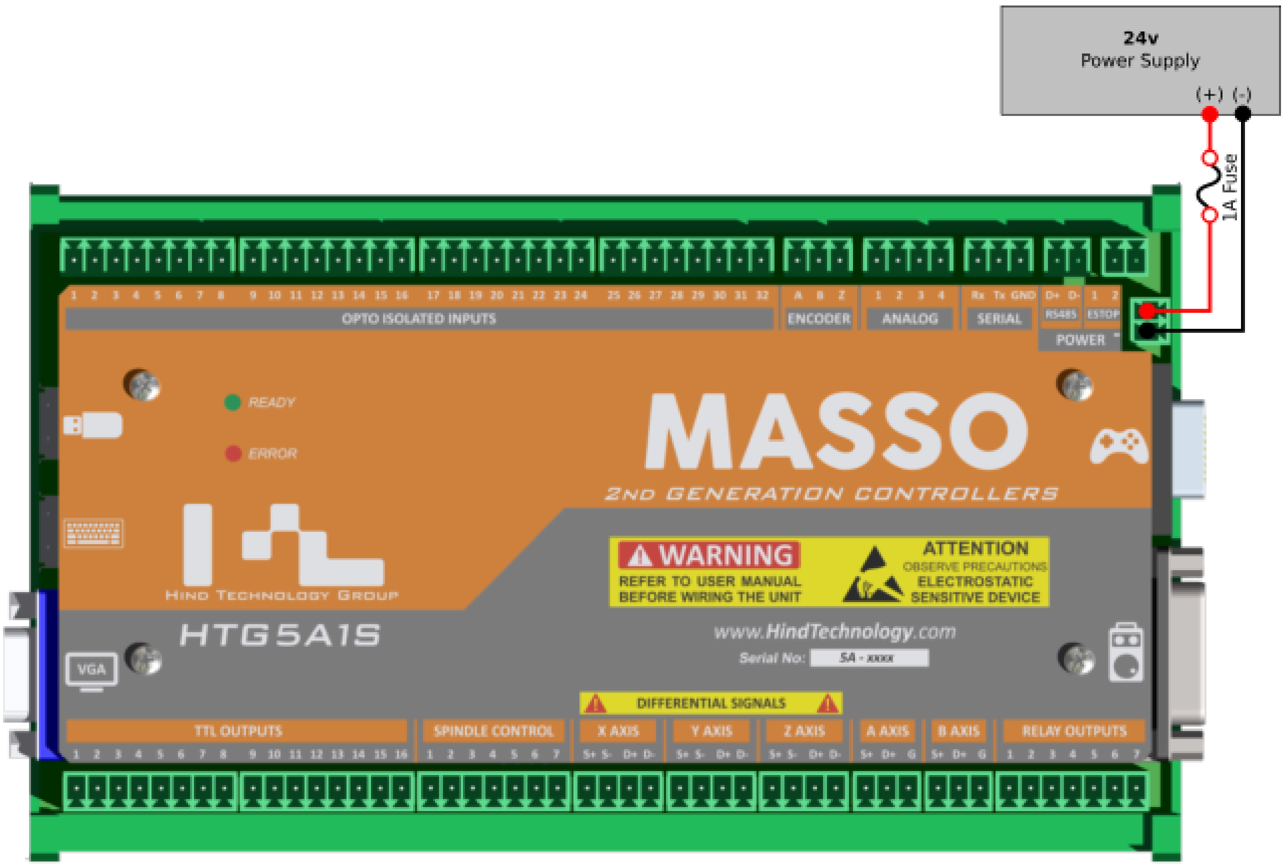
CAUTION: Power and **Ground** terminals provided on the controller are only to be used for very low current signals. Connecting high current loads can damage the controller beyond repair.

5.3. Powering MASSO-G2

CAUTION: Semiconductor parts inside the unit can be damaged by electrostatic discharge (ESD). When handling, care must be taken so that the devices are not damaged. Damage due to inappropriate handling is not covered by the warranty.

The MASSO power supply connector is located at the top-right corner of the controller as seen in the picture below. MASSO requires a power supply between **12 and 24 VDC** with a minimum of **1.5 Amps** output. Voltage not to exceed 25 **VDC** or be less than 12 **VDC**.

MASSO will power on instantly once power is connected.



WARNING: The MASSO G2 power supply not to exceed 25 **VDC** or be less than 12 **VDC**.

v5.25 - 25 Jul,2021

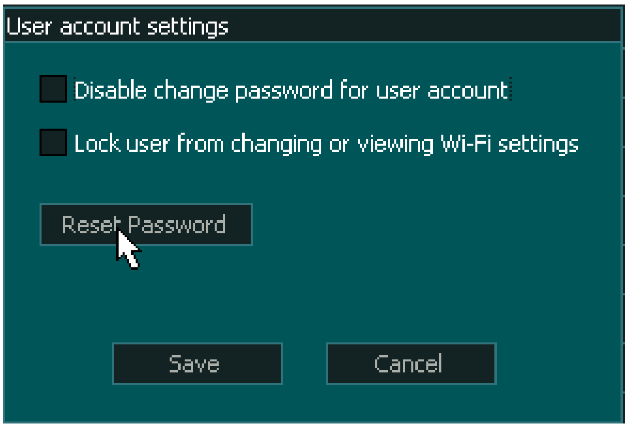
5.4. Password Reset

MASSO Touch & G3 User Password Reset

If you have lost the User level password but still know Admin password you can use the User password reset feature.

- Press F1 to go to the F1 screen
- Enter the Admin Password.
- Select User Account
- Press Reset Password
- Press Save
- The User password is not set to the default of **HTG.**

The Admin password is not changed and you can set a new User password.



MASSO Touch & G3 Admin Password Reset

If you have lost the Admin password you will need to contact MASSO Support and request the Password Reset file for your machine.

Please send an email to **support@masso.com.au** and please supply your MASSO serial number. The file will be emailed to you. Please retain this file in case you need it in the future.

For this process you will need the Password Reset file and a copy of your MASSO software which you can download from your myWorkshop portal.

- Ensure your Flash drive is formatted to Fat32
- Create a folder called MASSO on the flash drive and copy the Password Reset file emailed to you into this folder.
- Place a copy of your MASSO software into the MASSO folder on the flash drive.
- On powering the MASSO, immediately press the F1 key or for MASSO Touch, tap the screen repeatedly until the MASSO software load screen appears. If the software load screen does not

appear re-power MASSO and start again.
- Select the Password Reset file from the list in the software load screen using the up/down arrow keys and press the enter key on your keyboard.
- After the software has finished loading press the ESC key, your MASSO will restart and will display a message requesting that you load the main software.

- Repowering the MASSO, immediately press the F1 key or for MASSO Touch, tap the screen repeatedly until the MASSO software load screen appears. If the software load screen does not appear re-power MASSO and start again.
- Select the MASSO software from the list in the software load screen using the up/down arrow keys and press the enter key on your keyboard.
- After the software has finished loading press the ESC key, your Masso will restart and the both the User and Admin passwords will be restored to the default of **HTG**.
- The settings file is unchanged.

MASSO G2 Password Reset

If you have lost the Admin or User password you will need to contact MASSO Support and request the Password Reset file for your machine.

Please send an email to **support@masso.com.au** and please supply your MASSO serial number. The file will be emailed to you. Please retain this file in case you need it in the future.

For this process you will need the Password Reset file and a copy of your MASSO software which you can download from your my Workshop portal.

NOTE: For the below example the controller serial number will be **5A-2192**

WARNING: Check that while copying file from email the file name is not renamed and is exactly "**00002192.HTG"**

- Check that the file name matches the serial number of the controller.
- Connect a USB flash drive to your PC/MAC and **make sure it's been formatted in FAT or FAT32** format.
- Copy Password Reset file you receive eg. **"00002192.HTG"** to the root directory of the USB flash drive.
- **NOTE:** Make sure that there is nothing connected on the PlayStation connector on the MASSO
- Insert the USB flash drive into the controller's USB flash drive connector and DO NOT connect a USB hub.
- Power up the controller and a progress bar will be displayed on the screen showing the upgrade status.
- Once the progress bar shows 100%, the upgrade process is finished, please power cycle the unit.
- A message will be displayed requesting you to load the main software.

- Copy all the files you downloaded from your my Workshop portal
  eg. **"00002192.HTG"** and **Data1.HTG** file to the root directory of the USB flash drive.
- Insert the USB flash drive into the controller's USB flash drive connector
- Power up the controller and a progress bar will be displayed on the screen showing the upgrade status.
- Once the progress bar shows 100%, the upgrade process is finished, please power cycle the unit.
- After Masso starts, both the User and Admin passwords will be restored to the default of **HTG**.
- The settings file is unchanged.

> **CAUTION:** Because the Password Reset file and your Main software files have the same name it is easy to mix them up and accidently load the wrong software. This will not cause any damage to MASSO but may cause confusion.

5.5. Connecting a Screen

MASSO uses a standard **15 pin female VGA connector (1024 x 768 screen resolution)**

INFORMATION: If the monitor only supports HDMI input then a simple VGA to HDMI converter can be used.

INFORMATION: The display is a 4:3 aspect ratio and will look distorted when displayed as 16:9 on a widescreen monitor. Monitors have settings to set display ratio, please refer to your monitor's user manual.

INFORMATION: For information about connecting touch screens, please use the below link.

Touch Screen Interface

5.6. Connecting Keyboard & Mouse

Standard USB Keyboard & Mouse can be connected to MASSO, both wired and wireless devices are supported.

INFORMATION: MASSO G3 has 4 USB ports and MASSO G2 has 2 USB ports. If more USB ports are required then a USB HUB can also be connected.

INFORMATION: MASSO supports English (QWERTY) and German (QWERTZ) keyboards. Select your keyboard type under General Settings.

CAUTION: Avoid using unbranded Keyboard and Mouse as they are known to cause issues.

5.7. Loading Software to MASSO-G3

Regular updates are released to add more features to the units. Custom software's are also released for special client requirements. The software upgrade process can be easily performed on site by following the instructions below:

INFORMATION: The latest software updates are available from your my Workshop portal.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Information: Avoid using unbranded USB Flash drives as these are known to give issues with software install and upgrades

Information: It is advisable to make a backup of your settings before upgrading your software.

Information: Summary of install and upgrade process

- Ensure your Flash drive is formatted to Fat32
- Create a folder called MASSO on the flash drive and copy the software file emailed to you into this folder.
- On powering the MASSO, immediately press the F1 key or for MASSO Touch, tap the screen repeatedly until the MASSO software load screen appears. If the software load screen does not

appear re-power MASSO and start again.

- Select the desired software from the list in the software load screen using the up/down arrow keys and press the enter key on your keyboard.
- After the software has finished loading press the ESC key and your MASSO will restart with your new software.

5.8. Loading Software to MASSO-G2

Regular updates are released to add more features to the units. Custom software's are also released for special client requirements. The software up-gradation process can be easily performed on site by following the instructions below:

INFORMATION: The latest software updates are available from your my Workshop portal.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Information: Avoid using unbranded USB Flash drives as these are known to give issues with software install and upgrades

Information: It is advisable to make a backup of your settings before upgrading your software.

NOTE: For the below example the controller serial number will be **5A-660**

WARNING: Check that while copying file from email the file name is not renamed and is exactly

"**00000660.HTG"**

- Check that the file name matches the serial number of the controller.
- Connect a USB flash drive to your PC/MAC and **make sure it's been formatted in FAT or FAT32** format.
- Copy all the files received in the software update email including **"00000660.HTG"** and **Data1.HTG** file to the root directory of the USB flash drive.
- When copying the files to the USB flash drive, please make sure that your email software does not download the files as ZIP file.
- Power off the controller.
- **NOTE:** Make sure that there is nothing connected on the PlayStation connector on the MASSO
- Insert the USB flash drive into the controller's USB flash drive connector and DO NOT connect a USB hub.
- Power up the controller and a progress bar will be displayed on the screen showing the upgrade status.
- Once the progress bar shows 100%, the upgrade process is finished, please power cycle the unit.

5.9. Admin and User Passwords

By default the system password is set to **"HTG"** (in capital letters) for both **Admin** and **User logins**.

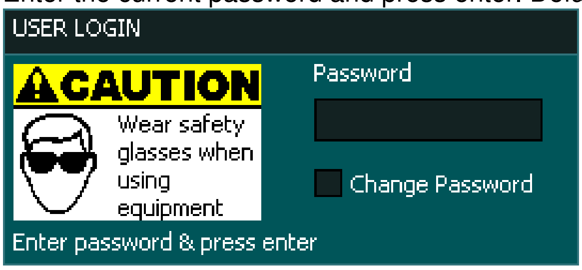
INFORMATION: When the controller is powered up, Caps Key is enabled by default, as of v3.49 for G2 and v4.00 for G3 Caps key is not enabled.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

INFORMATION: If want to lock Masso to prevent unauthorized use, Press **CTRL + L** and you will be prompted to re-enter the User and Admin Passwords.

Changing the User or Admin Password

- To change the User or Admin password Click on the Change Password in the Login box.
- Enter the current password and press enter. Default Password is "**HTG**"
- 

- Enter the new password up to 5 characters long in the New Password box. (Passwords are case sensitive)
- Enter the new password again into the Confirm Password box
- Press Ok

Removing User login

To remove the user login leave the New Password and Confirm Password boxes blank and press Ok.

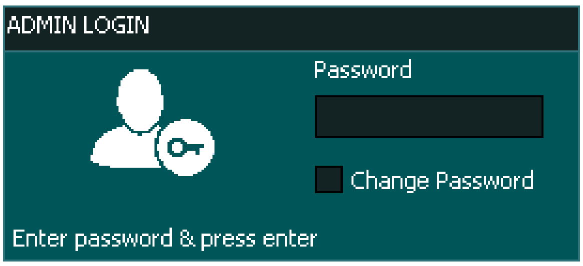
When you next start Masso the user password login box will not be presented.

Removing Admin Login Password

It is not possible to remove the Admin Login.

The Admin Password can be set a blank just like the user password but it will not remove the login.

When you set the Admin login to blank, select the Password box press the Enter Key to login.



Resetting Passwords

Should you lose or forget your passwords you will need to contact Masso support with your Masso serial number to get a Password reset file for your Masso which will reset both User and Admin password to default.

Before performing a password reset ensure that you have both the Password reset file and a copy of your Masso software. Mill, Plasma or Lathe.

G3 Reset Process

- Copy the supplied reset file into the Masso directory of your flash drive along with the current software version you are running on your Masso.
- Restart Masso pressing the F1 key multiple times until the software load screen appears
- Select the Password reset file and install. This will reset both your User and Admin Passwords to default "**HTG**"
- Restart Masso pressing the F1 key multiple times until the software load screen appears
- Select the Masso software you are running on your Masso and install.
- Press ESC once the install process is complete.
- You can now login using the default password. "**HTG**"

G2 Reset Process

- Copy the supplied reset file into the Root directory of your flash drive.
- Restart Masso and the software will automatically load.
- Wait for the software to complete loading.This will reset both your User and Admin Passwords to default "**HTG**"
- Copy the Masso software files into the Root directory of your flash drive.
- Restart Masso and the software will automatically load.
- Wait for the software to complete loading and restart Masso.
- You can now login using the default password. "**HTG**"

Resetting the Password does not change the configuration settings of Masso.

5.10. Wiring and Calibration

Now the axis and spindle drives can be wired to MASSO, followed by calibration. Please use the below links:

Axis Servo/Stepper Examples

Spindle VFD Examples

5.11. Current Software Versions

Masso G3

Mill, Plasma & Lathe v4.01 (Release Date: 29 Jan, 2021)

Masso G2

Mill, Plasma & Lathe v3.49 (Release Date: 29 Jan, 2021)

Masso Link

Version 2.0 (Release Date: 29 Jan, 2021)

Click here to download MASSO Link software

INFORMATION: The latest version of your software is available on your myWorkshop portal

INFORMATION: For more information on using your myWorkshop portal please see here: Using myWorkshop

6. Machining with MASSO

6.1. Loading Software to MASSO-G3

Regular updates are released to add more features to the units. Custom software's are also released for special client requirements. The software up-gradation process can be easily performed on site by following the instructions below:

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Information: Avoid using unbranded USB Flash drives as these are known to give issues with software install and upgrades

Information: It is advisable to make a backup of your settings before upgrading your software.

Summary of install and upgrade process

- Ensure your Flash drive is formatted to Fat32
- Create a folder called MASSO on the flash drive and copy the software file emailed to you into this folder.
- On powering the MASSO, immediately press the F1 key or for MASSO Touch, tap the screen repeatedly until the Masso software load screen appears. If the software load screen does not appear re-power MASSO and start again.
- Select the desired software from the list in the software load screen using the up/down arrow keys and press the enter key on your keyboard.
- After the software has finished loading press the ESC key and your Masso will restart with your new software.

6.2. Loading Software to MASSO-G2

Regular updates are released to add more features to the units. Custom software's are also released for special client requirements. The software up-gradation process can be easily performed on site by following the instructions below:

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Information: Avoid using unbranded USB Flash drives as these are known to give issues with software install and upgrades

Information: It is advisable to make a backup of your settings before upgrading your software.

NOTE: For the below example the controller serial number will be **5A-660**

WARNING: Check that while copying file from email the file name is not renamed and is exactly the file name sent to you. example **"00000660.HTG"**

Summary of the install process

- Check that the file name matches the serial number of the controller.
- Connect a USB FLASH drive to your PC/MAC and **make sure it's been formatted in FAT or FAT32** format.
- Copy all the files received in the software update email including **"00000660.HTG"** and **Data1.HTG**

file to the root directory of the USB FLASH drive.
- When copying the files to the USB flash drive, please make sure that your email software does not download the files as ZIP file.
- Power off the controller.
- **NOTE:** Make sure that there is nothing connected on the PlayStation connector on the MASSO
- Insert the USB FLASH drive into the controller's USB flash drive connector and DO NOT connect a USB hub.
- Power up the controller and a progress bar will be displayed on the screen showing the upgrade status.
- Once the progress bar shows 100%, the upgrade process is finished, please power cycle the unit.

6.3. Admin and User Passwords

By default the system password is set to **"HTG"** (in capital letters) for both **Admin** and **User logins**.

INFORMATION: When the controller is powerd up, Caps Key is enabled by default, as of v3.49 for G2 and v4.00 for G3 Caps key is not enabled.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, [Click here to view the video]

6.4. Graphical Interface

6.4.1. Graphical Interface Version 3

This page describes the User interface on MASSO G2 & G3 running Version 3 software

The user interface is divided into 6 screens from **F1** to **F6**, the below video explains each screen in detail.

Scan the QR code to watch the MASSO video tutorial on YouTube

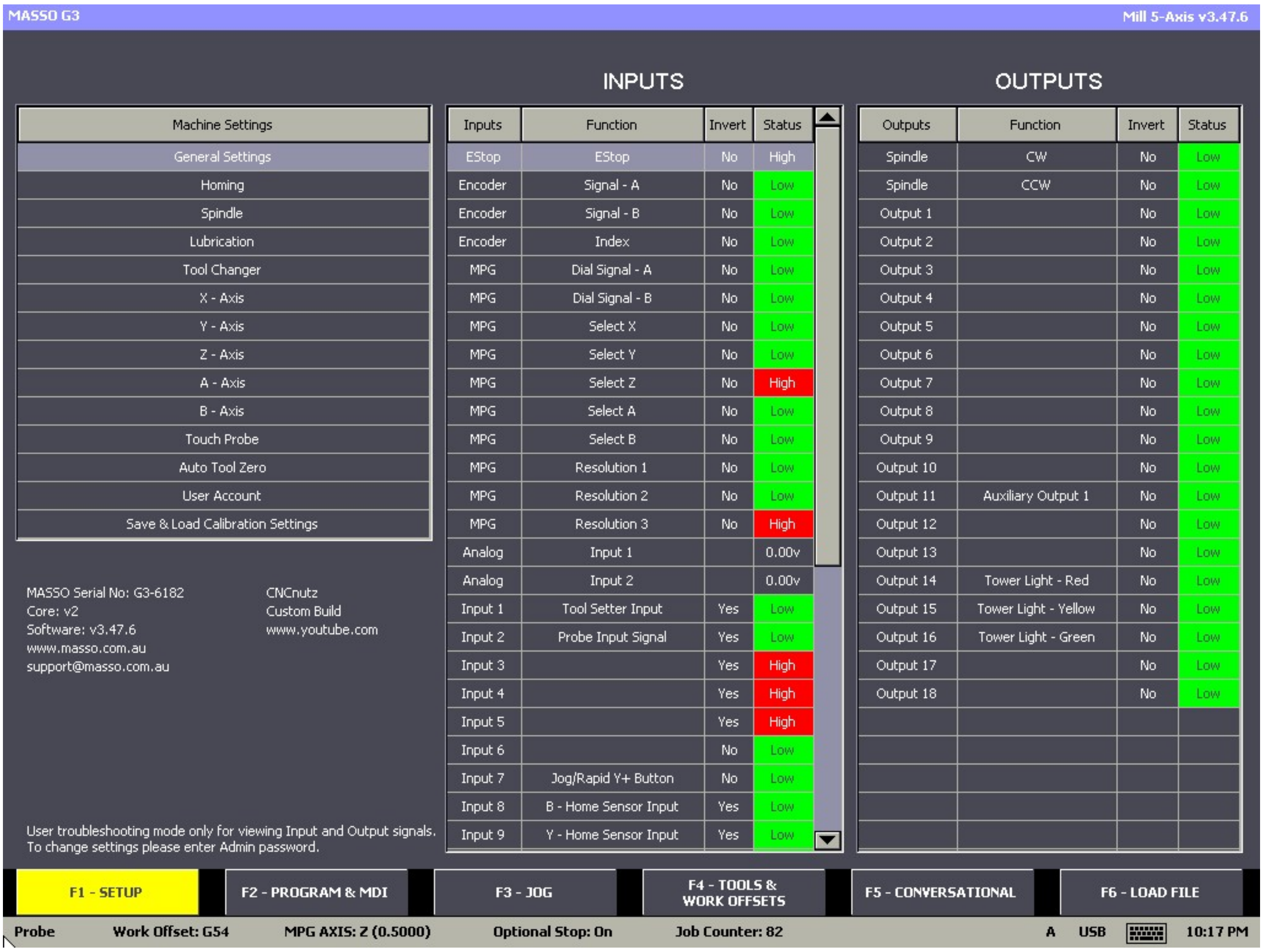
Or, Click here to view the video

INFORMATION: You can navigate between the screens by pressing keys F1 - F6 or by clicking the buttons at the bottom of the screen.

F1 Screen

This screen allows you to configure your Masso settings.

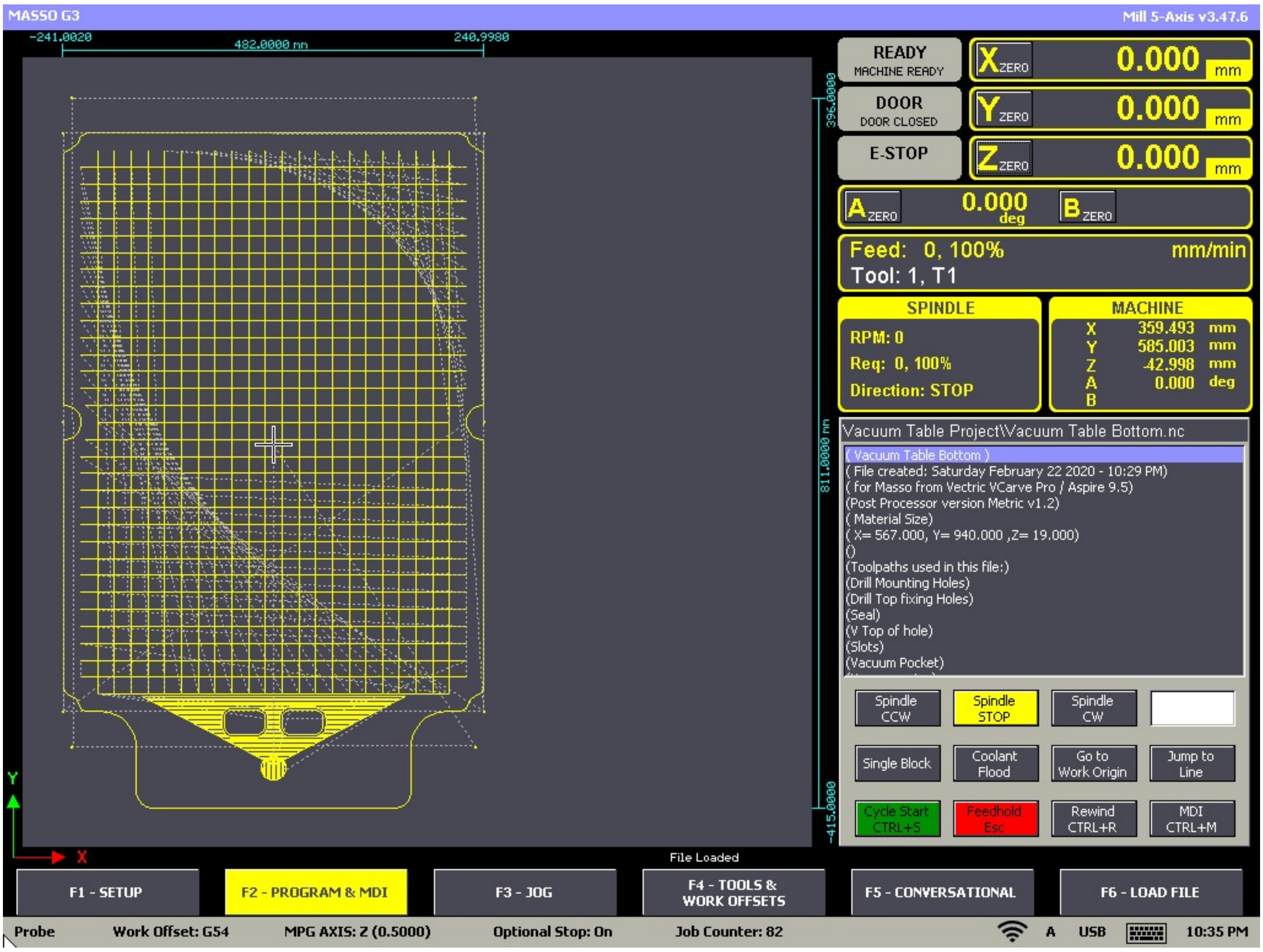
- When you enter this screen you will be prompted for the Admin Password. Default Password is "HTG"
- If you do not enter the password you will enter read only mode where you will not be able to make changes. Use **CTRL+L** if you want to reenter the password.



F2 Screen

This is the Run screen where you run your GCode files and monitor progress.

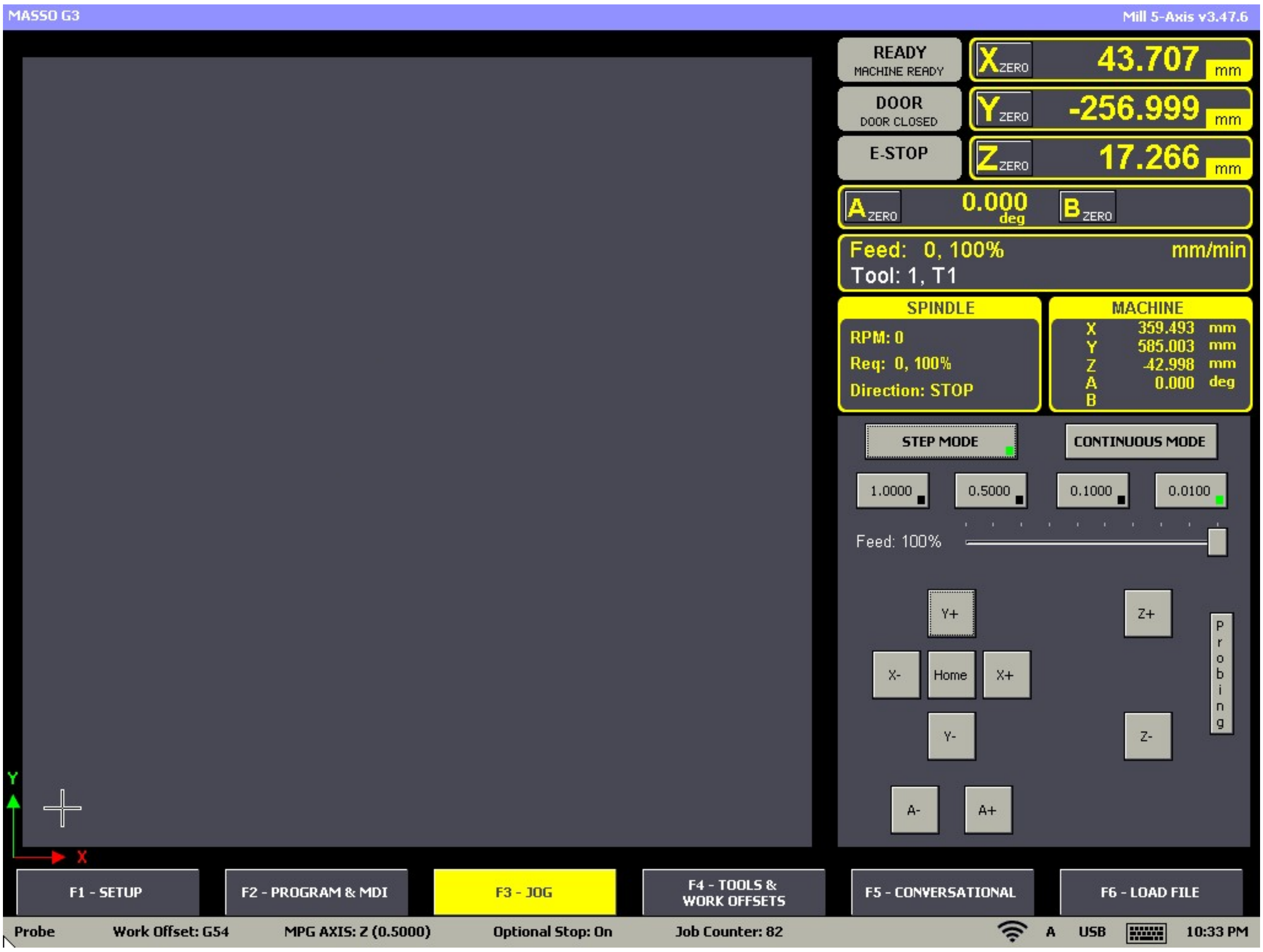
- When you enter this screen you will be prompted for the User Password. Default Password is "HTG". The user password can be changed or removed.
- **Use CTRL+L** to lock the Screen and prevent unauthorized use.
- The White box next to the Spindle CW is where you can enter your spindle speed. Type the desired speed into the box and press enter.
- Click on the WiFi symbol to enter the WiFi configuration page.
- Click the Axis Zero buttons to zero out an Axis DRO



F3 Screen

This is the Jog Screen. From this screen you can Home and Jog your machine.

- You can access MASSO probing functions by pressing the probing button on screen.
- Press the Home Button for 3 seconds to home the machine
- Jog and using the Axis + & - Buttons
- Select continuous or step jog mode as well as step distance
- Use the Slider to set continuous jog speed.
- Click the Axis Zero buttons to zero out an Axis DRO



F4 Screen

Tool Table, work offset screen and Park location.

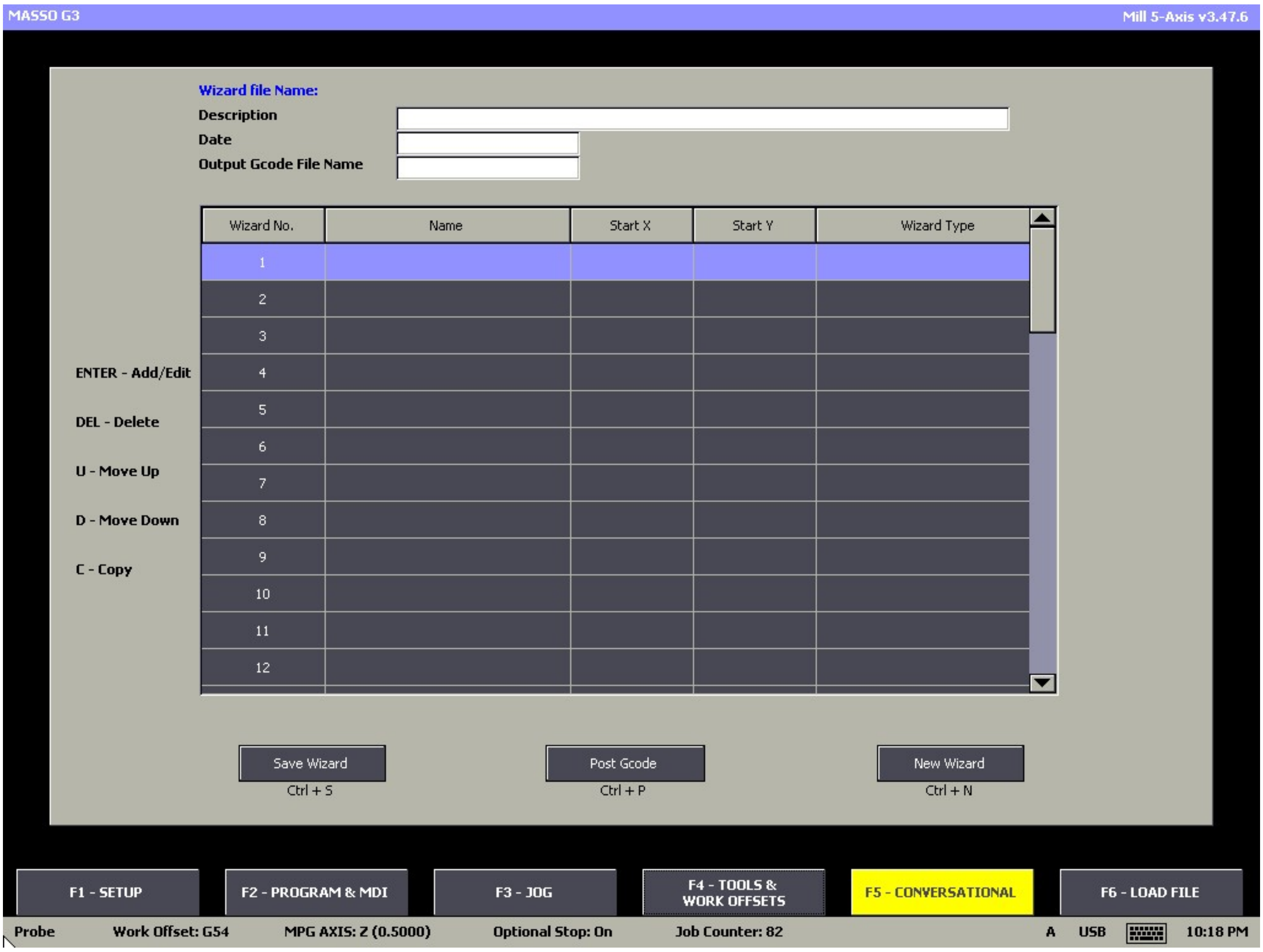
- This is where tool data is stored for each tool including it's name, Z offset and Tool Diameter.
- Work offsets G54 to G59 are stored in the Work offset table. These values are automatically stored when you zero your axis and you can also manually change them if needed.
- Double Click on a tool to change it's parameters as required
- The Parking location coordinates are stored here.

F5 Screen

Masso have built in wizards that will allow you to create basic Gcode files.

The wizards are intended for the most basic of jobs and CAM software is recommended.

[Additional information on the available wizards](#)



F6 Screen

This screen is where you will select files from your USB Flash drive and load them into MASSO.

- Double click the file you wish to load or select the file and press the load key
- Once the file loaded it will draw the toolpaths onto the screen for you to view.
- If you do not wish to wait for the screen print to load or wish to cancel the selected file from loading press the Escape key
- Right Click on a file name to see the file delete function


MASSO G3
Mill 5-Axis v3.47.6
READY
MACHINE READY
DOOR
DOOR CLOSED
E-STOP
X ZERO 43.707 mm
Y ZERO -256.999 mm
Z ZERO 17.266 mm
A ZERO 0.000 deg
B ZERO
Feed: 0, 100% mm/min
Tool: 1, T1
SPINDLE
RPM: 0
Req: 0, 100%
Direction: STOP
MACHINE
X 359.493 mm
Y 585.003 mm
Z -42.998 mm
A 0.000 deg
B
MASSO
Vacuum Table
Vacuum Table Bottom.nc
Vacuum Table Bottom Profile cut.nc
Skim Back of Vacuum Table top.nc
Front of Vacuum Table top.nc
Vacuum Table Top Profile cut.nc
Vacuum Table Top.nc
Pods.nc
Skim Table Top.nc
Autoload1.nc
Autoload2.nc
Autoload3.nc
Autoload4.nc
Autoload5.nc
Autoload6.nc
AUTO TOOL ZERO.nc
Offset Testing IMPERIAL.nc
Load File
Escape
F1 - SETUP
F2 - PROGRAM & MDI
F3 - JOG
F4 - TOOLS & WORK OFFSETS
F5 - CONVERSATIONAL
F6 - LOAD FILE
Probe
Work Offset: G54
MPG AXIS: Z (0.5000)
Optional Stop: On
Job Counter: 82
A
USB
10:21 PM

6.4.2. Graphical Interface Version 4

This page describes the User interface of MASSO G3 Version 4 Software

The user interface is divided into 6 screens from **F1** to **F6**

INFORMATION: The interface can be set as either Horizontal or Vertical by selecting the desired option under F1 General Settings. The Vertical interface is primarily designed for MASSO touch though can be used with any G3 with a suitable touchscreen monitor.

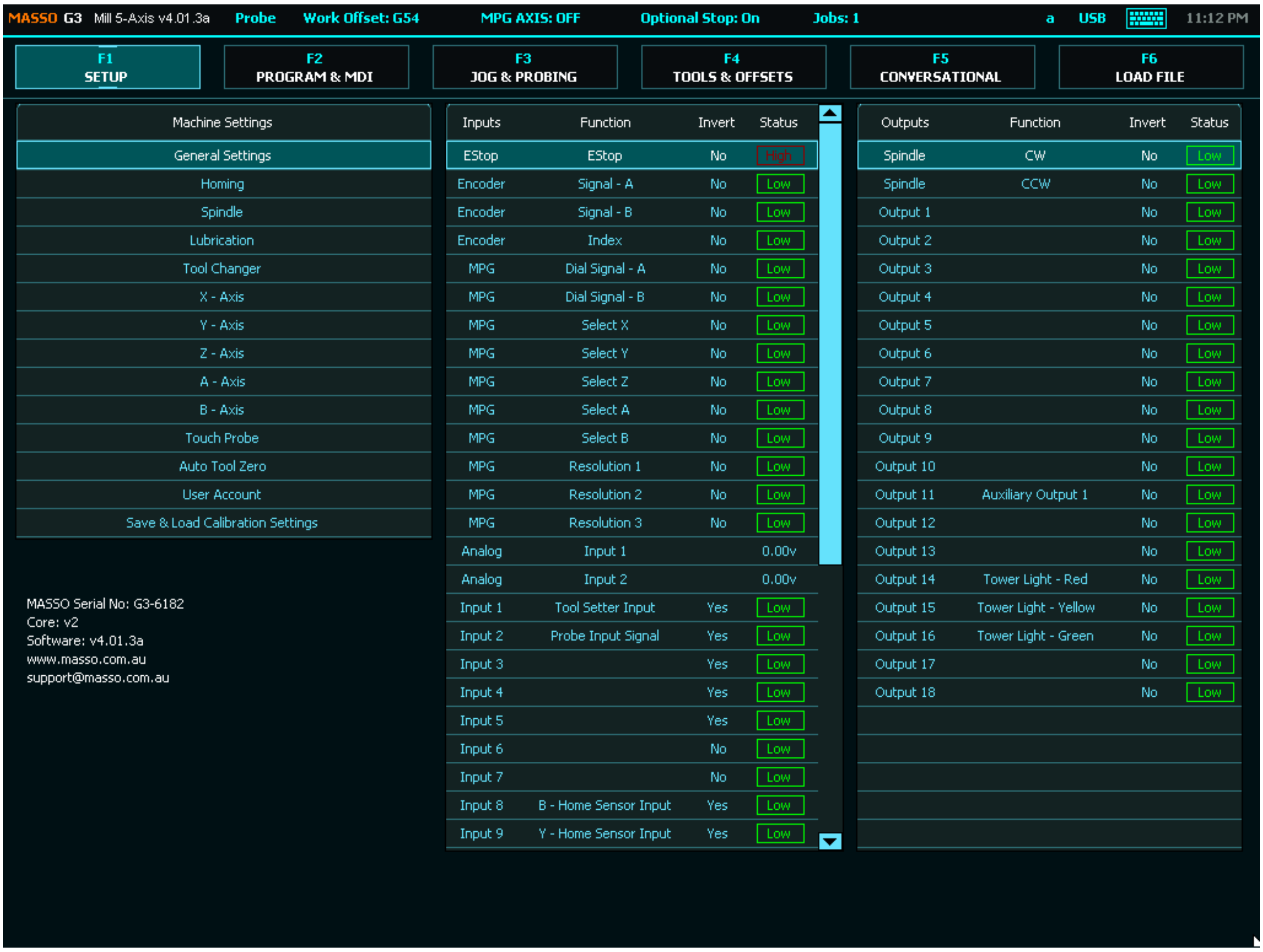
INFORMATION: You can navigate between the screens by pressing keys F1 - F6 or by clicking the buttons at the bottom of the screen.

Vertical Format

F1 Screen

This screen allows you to configure your Masso settings.

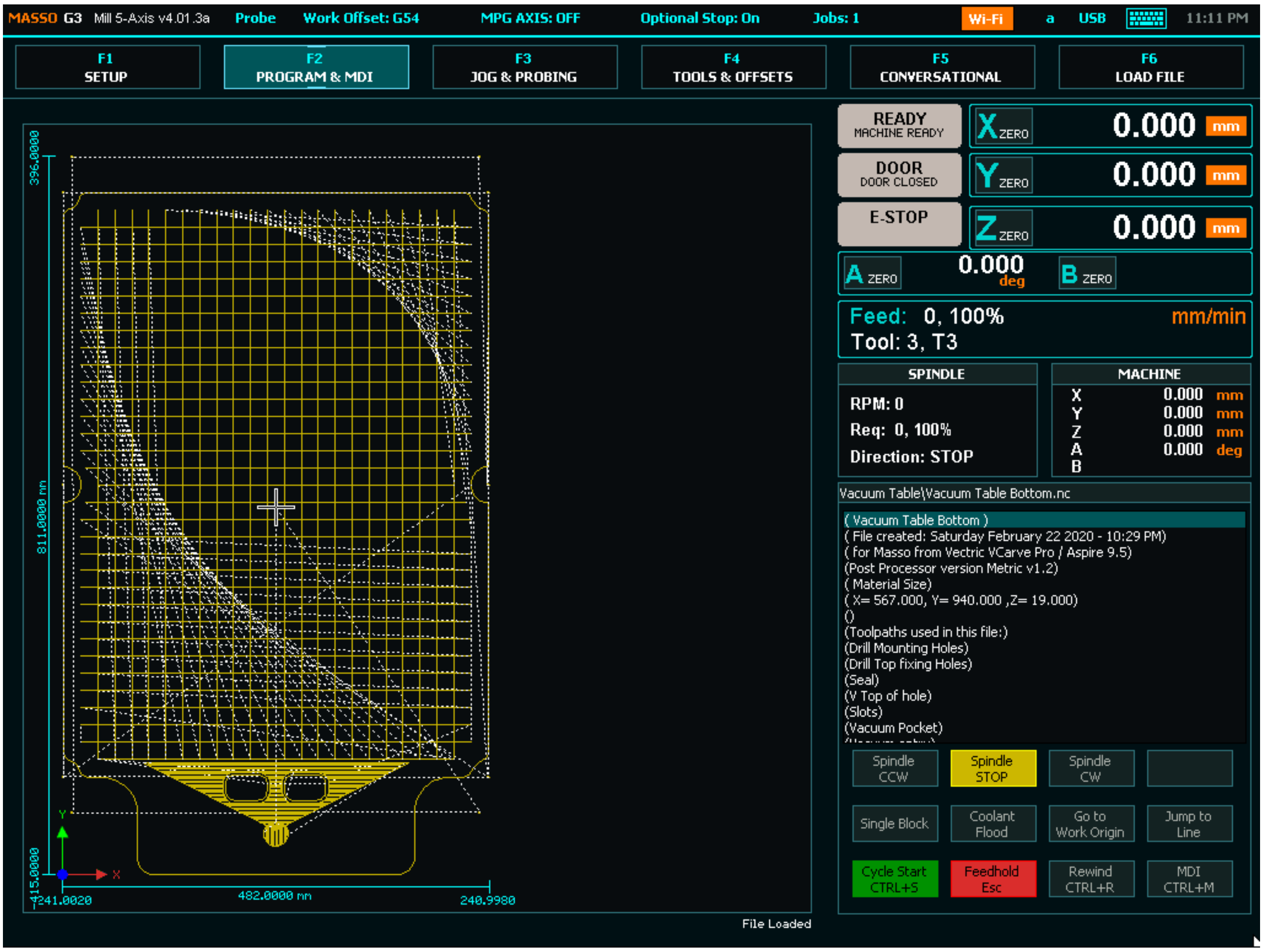
- When you enter this screen you will be prompted for the Admin Password. Default Password is "HTG"
- If you do not enter the password you will enter read only mode where you will not be able to make changes. Use **CTRL+L** if you want to reenter the password.



F2 Screen

This is the Run screen where you run your GCode files and monitor progress.

- When you enter this screen you will be prompted for the User Password. Default Password is "HTG". The user password can be changed or removed.
- Use **CTRL+L** to lock the Screen and prevent unauthorized use.
- The empty box next to the Spindle CW is where you can enter your spindle speed. Type the desired speed into the box and press enter.
- Click on Wi-Fi at the top of the screen to enter the Wi-Fi configuration page. If Wi-Fi is Orange it is connected.
- Click the Axis Zero buttons to zero out an Axis DRO
- Click on the DRO value to manually enter a new value
- Click Optional Stop at the top of the screen to toggle between on and off.



F3 Screen

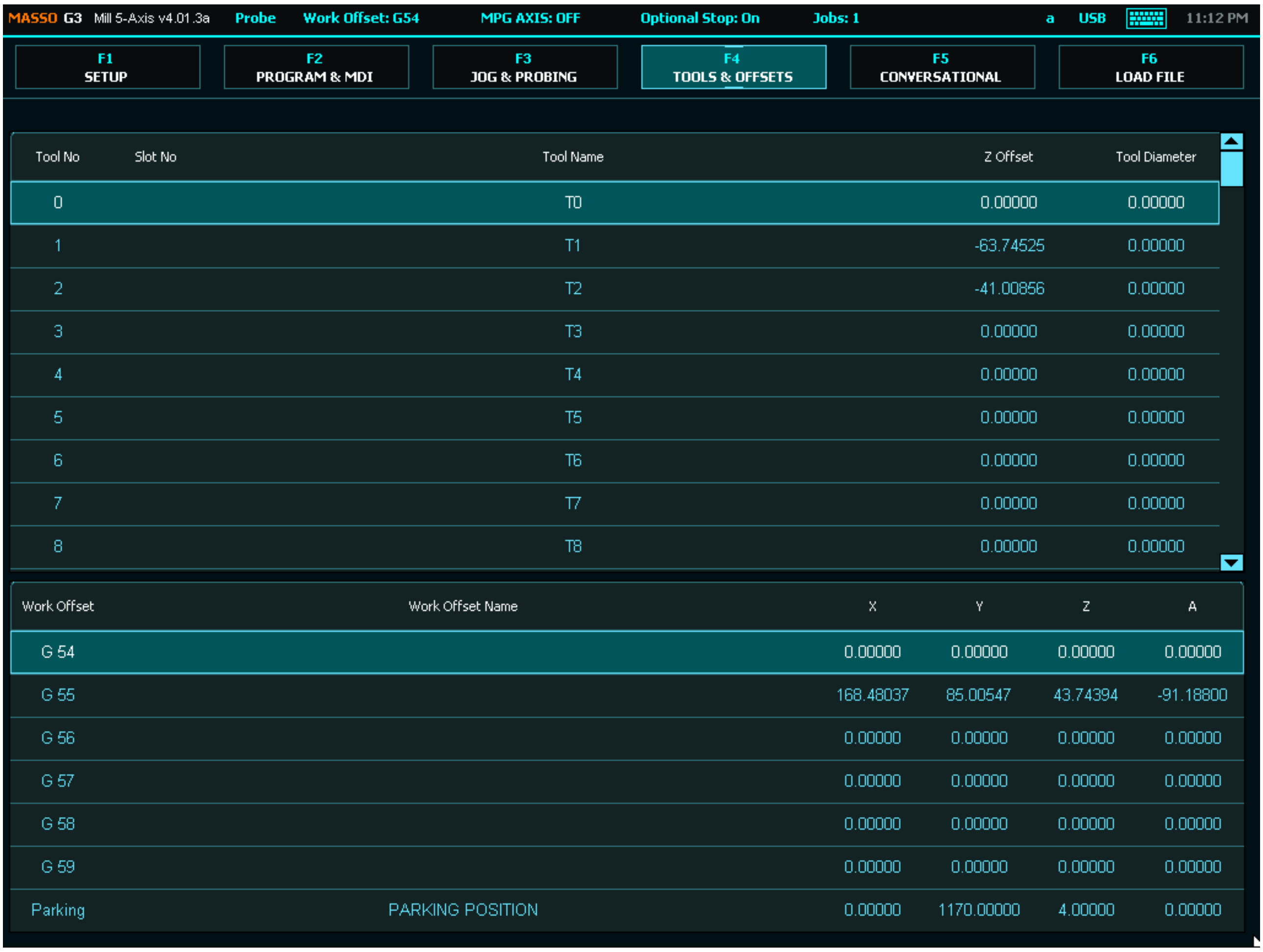
This is the Jog Screen. From this screen you can Home and Jog your machine.

- You can access MASSO probing functions by pressing the probing button on screen.
- Press the Home Button for 3 seconds to home the machine
- Jog and using the Axis + & - Buttons
- Select continuous or step jog mode as well as step distance
- Use the Slider to set continuous jog speed.
- Click the Axis Zero buttons to zero out an Axis DRO

F4 Screen

Tool Table, work offset screen and Park location.

- This is where tool data is stored for each tool including it's name, Z offset and Tool Diameter.
- Work offsets G54 to G59 are stored in the Work offset table. These values are automatically stored when you zero your axis and you can also manually change them if needed.
- Double Click on a tool to change it's parameters as required
- The Parking location coordinates are stored here.

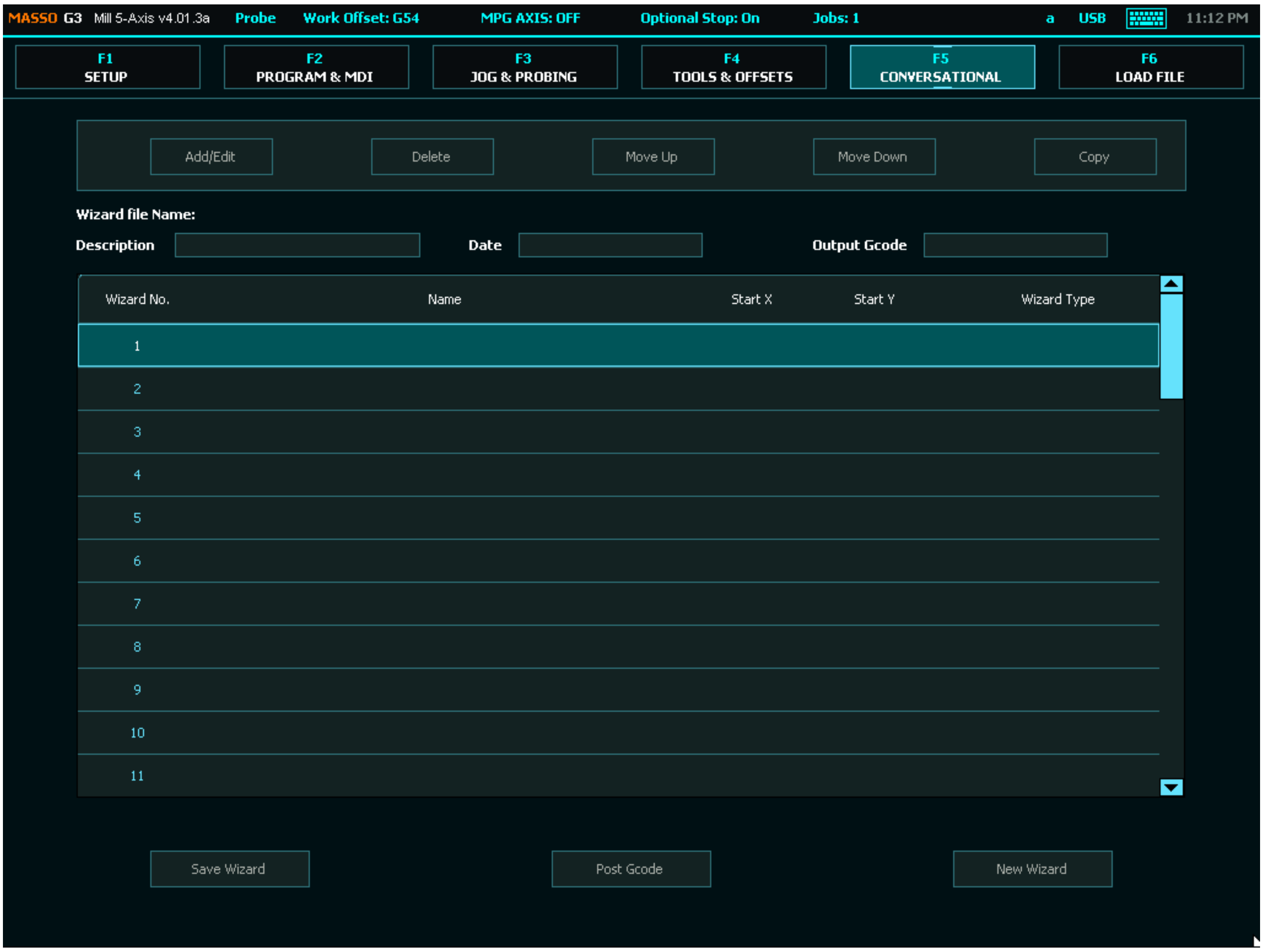


F5 Screen

Masso have built in wizards that will allow you to create basic Gcode files.

The wizards are intended for the most basic of jobs and CAM software is recommended.

Additional information on the available wizards



F6 Screen

This screen is where you will select files from your USB Flash drive and load them into MASSO.

- Double click the file you wish to load or select the file or press the **Load** key
- Once the file loaded it will draw the toolpaths onto the screen for you to view.
- If you do not wish to wait for the screen print to load or wish to cancel the selected file from loading press the Escape key
- To Delete a file select and press **Delete**
- To create a new File Press **New**
- To edit a file select and Press **Edit**

Vertical Touch Screen Format

INFORMATION: The Vertical interface is primarily designed for MASSO touch though can be used with any G3 with a suitable touchscreen monitor. It includes an on screen keyboard which is permanently dispalyed.

F1 Screen

This screen allows you to configure your Masso settings.

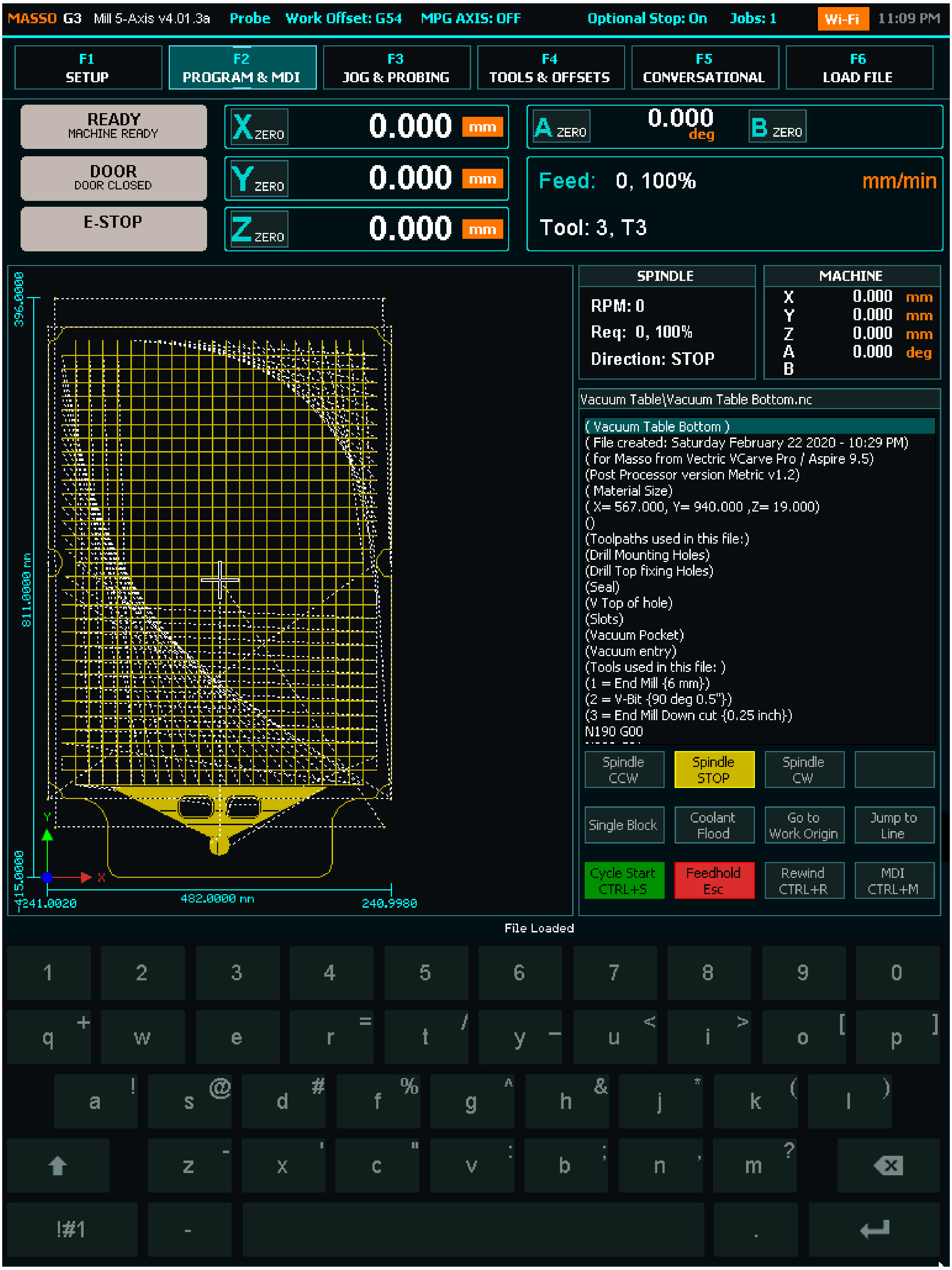
- When you enter this screen you will be prompted for the Admin Password. Default Password is "HTG"
- If you do not enter the password you will enter read only mode where you will not be able to make changes. Use **CTRL+L** if you want to reenter the password.


F1 SETUP
F2 PROGRAM & MDI
F3 JOG & PROBING
F4 TOOLS & OFFSETS
F5 CONVERSATIONAL
F6 LOAD FILE
Machine Settings
General Settings
Homing
Spindle
Lubrication
Tool Changer
X - Axis
Y - Axis
Z - Axis
A - Axis
B - Axis
Touch Probe
Auto Tool Zero
User Account
Save & Load Settings
MASSO Serial No: G3-6182
Core: v2
Software: v4.01.3a
www.masso.com.au
support@masso.com.au
Inputs Function Invert Status
EStop EStop No High
Encoder Signal - A No Low
Encoder Signal - B No Low
Encoder Index No Low
MPG Dial Signal - A No Low
MPG Dial Signal - B No Low
MPG Select X No Low
MPG Select Y No Low
MPG Select Z No Low
MPG Select A No Low
MPG Select B No Low
MPG Resolution 1 No Low
MPG Resolution 2 No Low
MPG Resolution 3 No Low
Analog Input 1 0.00v
Analog Input 2 0.00v
Input 1 Tool Setter Input Yes Low
Input 2 Probe Input Signal Yes Low
Input 3 Yes Low
Input 4 Yes Low
Input 5 Yes Low
Input 6 No Low
Input 7 No Low
Input 8 B - Home Sensor Input Yes Low
Input 9 Y - Home Sensor Input Yes Low
Outputs Function Invert Status
Spindle CW No Low
Spindle CCW No Low
Output 1 No Low
Output 2 No Low
Output 3 No Low
Output 4 No Low
Output 5 No Low
Output 6 No Low
Output 7 No Low
Output 8 No Low
Output 9 No Low
Output 10 No Low
Output 11 Auxiliary Output 1 No Low
Output 12 No Low
Output 13 No Low
Output 14 Tower Light - Red No Low
Output 15 Tower Light - Yellow No Low
Output 16 Tower Light - Green No Low
Output 17 No Low
Output 18 No Low
1 2 3 4 5 6 7 8 9 0
q + w e r = t / y – u < i > o [p]
a ! s @ d # f % g ^ h & j * k (l)
z - x ' c " v : b ; n , m ?
!#1 - .

F2 Screen

This is the Run screen where you run your GCode files and monitor progress.

- When you enter this screen you will be prompted for the User Password. Default Password is "HTG". The user password can be changed or removed.
- **Use CTRL+L** to lock the Screen and prevent unauthorized use.
- The empty box next to the Spindle CW is where you can enter your spindle speed. Type the desired speed into the box and press enter.
- Click on Wi-Fi at the top of the screen to enter the Wi-Fi configuration page. If Wi-Fi is Orange it is connected.
- Click the Axis Zero buttons to zero out an Axis DRO
- Click on the DRO value to manually enter a new value
- Click Optional Stop at the top of the screen to toggle between on and off.


MASSO G3 Mill 5-Axis v4.01.3a Probe Work Offset: G54 MPG AXIS: OFF Optional Stop: On Jobs: 1 Wi-Fi 11:09 PM
F1 SETUP
F2 PROGRAM & MDI
F3 JOG & PROBING
F4 TOOLS & OFFSETS
F5 CONVERSATIONAL
F6 LOAD FILE
READY MACHINE READY
DOOR DOOR CLOSED
E-STOP
X ZERO 0.000 mm
Y ZERO 0.000 mm
Z ZERO 0.000 mm
A ZERO 0.000 deg B ZERO
Feed: 0, 100% mm/min
Tool: 3, T3
SPINDLE
RPM: 0
Req: 0, 100%
Direction: STOP
MACHINE
X 0.000 mm
Y 0.000 mm
Z 0.000 mm
A 0.000 deg
B
Vacuum Table\Vacuum Table Bottom.nc
(Vacuum Table Bottom)
(File created: Saturday February 22 2020 - 10:29 PM)
(for Masso from Vectric VCarve Pro / Aspire 9.5)
(Post Processor version Metric v1.2)
(Material Size)
(X= 567.000, Y= 940.000 ,Z= 19.000)
()
(Toolpaths used in this file:)
(Drill Mounting Holes)
(Drill Top fixing Holes)
(Seal)
(V Top of hole)
(Slots)
(Vacuum Pocket)
(Vacuum entry)
(Tools used in this file:)
(1 = End Mill {6 mm})
(2 = V-Bit {90 deg 0.5"})
(3 = End Mill Down cut {0.25 inch})
N190 G00
Spindle CCW
Spindle STOP
Spindle CW
Single Block
Coolant Flood
Go to Work Origin
Jump to Line
Cycle Start CTRL+S
Feedhold Esc
Rewind CTRL+R
MDI CTRL+M
396.0000
811.0000 mm
415.0000
241.0020
482.0000 mm
240.9980
File Loaded

F3 Screen

This is the Jog Screen. From this screen you can Home and Jog your machine.

- You can access MASSO probing functions by pressing the probing button on screen.
- Press the Home Button for 3 seconds to home the machine
- Jog and using the Axis + & - Buttons
- Select continuous or step jog mode as well as step distance
- Use the Slider to set continuous jog speed.
- Click the Axis Zero buttons to zero out an Axis DRO


MASSO G3 Mill 5-Axis v4.01.3a Probe Work Offset: G54 MPG AXIS: OFF Optional Stop: On Jobs: 1 Wi-Fi 11:08 PM
F1 SETUP
F2 PROGRAM & MDI
F3 JOG & PROBING
F4 TOOLS & OFFSETS
F5 CONVERSATIONAL
F6 LOAD FILE
READY MACHINE READY
DOOR DOOR CLOSED
E-STOP
X ZERO 0.000 mm
Y ZERO 0.000 mm
Z ZERO 0.000 mm
A ZERO 0.000 deg
B ZERO
Feed: 0, 100% mm/min
Tool: 3, T3
NOTE: From software v4.0, CAPS lock will be in off state on system power up.
MASSO
SPINDLE
RPM: 0
Req: 0, 100%
Direction: STOP
MACHINE
X 0.000 mm
Y 0.000 mm
Z 0.000 mm
A 0.000 deg
B
STEP MODE
CONTINUOUS MODE
1.0000
0.5000
0.1000
0.0100
Feed: 100%
Y+
Z+
X-
Home
X+
Y-
Z-
A-
A+

F4 Screen

Tool Table, work offset screen and Park location.

- This is where tool data is stored for each tool including it's name, Z offset and Tool Diameter.
- Work offsets G54 to G59 are stored in the Work offset table. These values are automatically stored when you zero your axis and you can also manually change them if needed.
- Double Click on a tool to change it's parameters as required
- The Parking location coordinates are stored here.

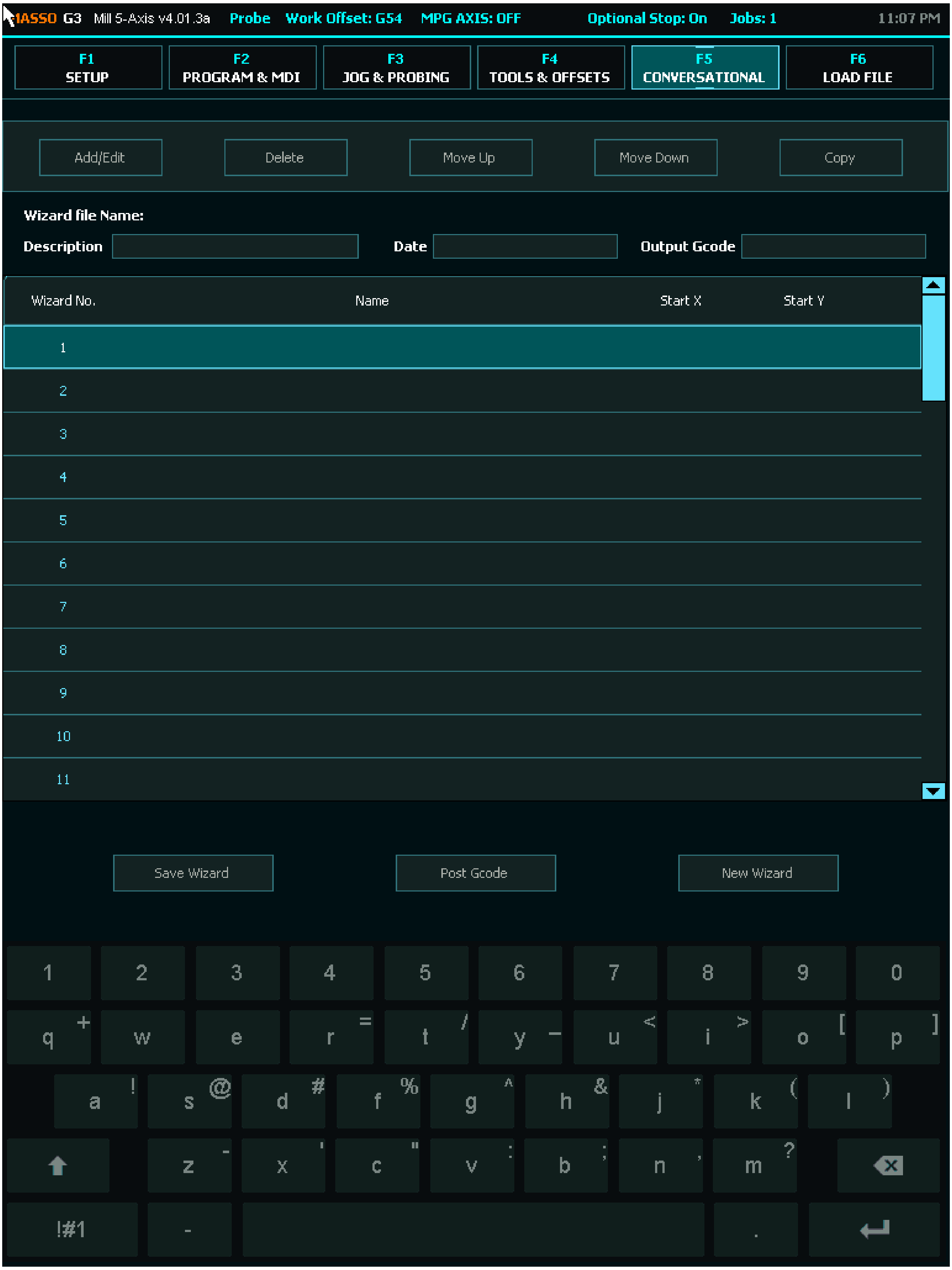

MASSO G3 Mill 5-Axis v4.01.3a Probe Work Offset: G54 MPG AXIS: OFF Optional Stop: On Jobs: 1 11:08 PM
F1 SETUP
F2 PROGRAM & MDI
F3 JOG & PROBING
F4 TOOLS & OFFSETS
F5 CONVERSATIONAL
F6 LOAD FILE
Tool No Slot No Tool Name Z Offset Tool Diameter
0 T0 0.00000 0.00000
1 T1 -63.74525 0.00000
2 T2 -41.00856 0.00000
3 T3 0.00000 0.00000
4 T4 0.00000 0.00000
5 T5 0.00000 0.00000
6 T6 0.00000 0.00000
7 T7 0.00000 0.00000
8 T8 0.00000 0.00000
Work Offset Work Offset Name X Y Z A
G 54 0.00000 0.00000 0.00000 0.00000
G 55 168.48037 85.00547 43.74394 -91.18800
G 56 0.00000 0.00000 0.00000 0.00000
G 57 0.00000 0.00000 0.00000 0.00000
G 58 0.00000 0.00000 0.00000 0.00000
G 59 0.00000 0.00000 0.00000 0.00000
Parking PARKING POSITION 0.00000 1170.00000 4.00000 0.00000
1 2 3 4 5 6 7 8 9 0
q + w e r = t / y - u < i > o [p]
a ! s @ d # f % g ^ h & j * k (l)
z - x ' c " v : b ; n , m ?
!#1 - .

F5 Screen

Masso have built in wizards that will allow you to create basic Gcode files.

The wizards are intended for the most basic of jobs and CAM software is recommended.

Additional information on the available wizards


MASSO G3 Mill 5-Axis v4.01.3a Probe Work Offset: G54 MPG AXIS: OFF Optional Stop: On Jobs: 1 11:07 PM
F1 SETUP
F2 PROGRAM & MDI
F3 JOG & PROBING
F4 TOOLS & OFFSETS
F5 CONVERSATIONAL
F6 LOAD FILE
Add/Edit
Delete
Move Up
Move Down
Copy
Wizard file Name:
Description
Date
Output Gcode
Wizard No.
Name
Start X
Start Y
1
2
3
4
5
6
7
8
9
10
11
Save Wizard
Post Gcode
New Wizard

F6 Screen

This screen is where you will select files from your USB Flash drive and load them into MASSO.

- Double click the file you wish to load or select the file or press the **Load** key
- Once the file loaded it will draw the toolpaths onto the screen for you to view.
- If you do not wish to wait for the screen print to load or wish to cancel the selected file from loading press the Escape key
- To Delete a file select and press **Delete**
- To create a new File Press **New**
- To edit a file select and Press **Edit**


MASSO G3 Mill 5-Axis v4.01.3a
Probe
Work Offset: G54
MPG AXIS: OFF
Optional Stop: On
Jobs: 1
Wi-Fi
11:07 PM
F1 SETUP
F2 PROGRAM & MDI
F3 JOG & PROBING
F4 TOOLS & OFFSETS
F5 CONVERSATIONAL
F6 LOAD FILE
READY
MACHINE READY
DOOR
DOOR CLOSED
E-STOP
X ZERO 0.000 mm
Y ZERO 0.000 mm
Z ZERO 0.000 mm
A ZERO 0.000 deg
B ZERO
Feed: 0, 100% mm/min
Tool: 3, T3
NOTE: From software v4.0, CAPS lock will be in off state on system power up.
SPINDLE
RPM: 0
Req: 0, 100%
Direction: STOP
MACHINE
X 0.000 mm
Y 0.000 mm
Z 0.000 mm
A 0.000 deg
B
MASSO
Load
Edit
New
Delete
1 2 3 4 5 6 7 8 9 0
q + w e r = t / y – u < i > o [p]
a ! s @ d # f % g ^ h & j * k (l)
z - x ' c " v : b ; n , m ?
!#1
-
.

6.4.3. Controller Alarms

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Estop alarm

An EStop alarm is given on startup of Masso. Press and release the EStop button to test the EStop is working and this will cancel the alarm.

EStop also occurs if the EStop button is pressed on the machine.

Homing alarm

This alarm indicates that the machine has not been homed. To clear the alarm home the machine.

If you get a homing error alarm it means something has gone wrong while homing. Rehome the machine to clear

Door Alarm

This alarm indicates that the cabinet door is open. Close the door to clear the alarm.

You can set the machine to automatically stop and start when the door is opened or closed.

If you have a G2 you must assign an output as a door alarm even if you do not have a door. Setting this to logic low will remove the alarm

Soft Limit

The extremes of travel of each axis is defined in each axis settings page.

If you execute a move that will exceed the limit of travel a soft limit will alarm will dispay.

To cancel issue a valid move on the axis and the alarm will clear.

Hard Limit

These alarms are triggered by the homing sensors. If a mechanical fault occurs that causes the axis to trigger a hard limit the Hard Limit alarm will be displayed.

To clear the alarm find and clear the issue that caused the Hard limit alarm and Home the machine to clear the alarm.

Probing alarm

A Probing alarm occurs during a probing cycle where Masso does not receive a signal from the probing sensor within the specified distance.

You will also get a probing alarm if the probe is already in the active state when a probing cycle is started.

To clear issue a new probing command with a valid distance ensuring the probe is not already in an active state.

Tool Error Alarm

This occurs if you try and load a tool not supported by Masso. EG the tool number is greater that 99 0n the G3 or Greater that 31 on the G2

Drive Alarm

When a Stepper or Servo drive goes into an alarm condition the Drive can signal Masso which will put the system into Feedhold and stop the spindle.

The Drive alarm indication will be displayed on the screen. you drive must be capable of providing the required signal and they be connected to Masso.

To clear the alarm first clear the fault with the drive and home the machine to clear Alarm indication on Masso.

Lubricant Low alarm

If you have a lubricant vessel that has an alarm output you can connect it to Masso and a Lubrication alarm will display on Masso.

Top up your lubricant vessel and the alarm will automatically clear.

6.5. Touch Screen Interface

- As per special user requests to add touch screen support with MASSO, from software **version 3.35** MASSO Touch Screen Interface USB was added.
- **NOTE: Not all touch screens with USB HID interface are supported so please see the list of supported screens below.**
- Being a special request feature, the standard version of the MASSO software will only allow 10 screen tap's so that you can evaluate the features and check your screen support with MASSO. A full version will be available for purchase.

Please use our forum topic for touch screen support: https://www.masso.com.au/forums/topic/touch-screen-interface/

For purchasing a touchscreen software update please contact MASSO Support.

List of touch screens tested with MASSO:

WARNING: Its been reported by users that some models listed below do not work as the manufacturers seem to be using different internal hardware versions but same product model. As these changes are not document by screen manufacturers, we can not guarantee that the screens will work. If you require touch screen feature then its best to use MASSO Touch controller.

- **Eyoyo** 15? LCD Touch Screen Monitor, **Touch Type:** Four-wire resistive touch. ***Recent changes to the internal interface of this monitor by the manufacturer means some of these monitors will not work. There is no way of telling the variants apart as they look identical and have the same part number.***
- **Eyoyo** 15? LCD Touch Screen Monitor with HDMI P/N 1901W **Touch Type:** Four-wire resistive touch. ***Recent changes to the internal interface of this monitor by the manufacturer means some of these monitors will not work. There is no way of telling the variants apart as they look identical and have the same part number.***
- **Cocar** monitor 15? 150S
- **iChawk** screen, Model: K120TC-DUV2
- **iChalk** monitor 19" Model: ZK190TC-592R
- **Beetronics** 15TS5 Monitor
- **Eyoyo** ZXD15 SKU:A1210AG

Screens reported by users not to be working:

- **EIO TouchSystems**, Model: ET1739L-8CWA-3-NPB-G
- **ELO Touch Solutions** Model ET2740L, P/N E220828
- **ELO**, Model: ET1537L-7CWA-1-G
- **ASUS**, Model: VT168N
- **ASUS,** Model: VT229H

- **Kodak** Model: KD15V700 15"
- **DELL** Model: E157FPTe
- **Medion** Model: MD20165
- **HP Compaq** Model: L5009tm Part No. ELO E476049
- **EYOYO** Model: EM15T
- **Planar** Model: PXL2430MW
- **Planar Helium** Model: PCT2235
- **Viewsonic** Model: TD2421
- **iiyama Prolite** T2253MTS-B1
- **ZHIXIANDA**

6.6. Keyboard and Key Shortcuts

NOTE: Most of the functions can now be accessed easily with mouse but will still require some keyboard shortcuts as below:

Operation	Key Combination	Valid in Screen
Lock System	CTRL + L	All Screens
Home Machine	CTRL + ALT + Home key	F2 & F3
Move to Parking Position	CTRL + ALT + P	F2 & F3
Cycle Start	CTRL + S	F2
Cycle Stop	Escape	F2
Restart Program	CTRL + R	F2
Jump to G-Code line	CTRL + J	F2
Jog Step Size	1,2,3 or 4	F3 *(MASSO G3 Only)*
X – Rapid	SHIFT+ Left or Right arrow key	F3
Y – Rapid	SHIFT + Up or Down arrow key	F3
Z – Rapid	SHIFT + “U” or “D” keys	F3
X – Jog	Left or Right arrow key	F3
Y – Jog	Up or Down arrow key	F3
Z – Jog	“U” or “D” keys	F3
Feed Override	select “F11”	F2 & F3
Spindle Override	select “F12”	F2
Override Increase	“+” *(You can also use MPG)*	F2 & F3
Override Decrease	“-” *(You can also use MPG)*	F2 & F3
Optional Stop On/Off	CTRL + O	All Screens
Open MDI Window	CTRL + M	F2 & F3
Create New Gcode File	CTRL + N	F2
Edit Gcode File	CTRL + E	F2
Set X-Axis to zero	CTRL + X	F3
Set Y-Axis to zero	CTRL + Y	F3
Set Z-Axis to zero	CTRL + Z	F3
Screen Print	Print Screen Key	All Screens
Screen Print	CTRL +P	All Screens

6.6.1. Setting Time

MASSO has a built in real time clock and to set system time, a special command in the MDI window can be given in this format **Time:HH:MM**. Please see the below video for full instructions.

> **INFORMATION:** If the MASSO controller is connected to a PC via WiFi and using the MASSO Link software on the PC then the time is automatically synced with the PC time. You can find more information about MASSO WiFi connectivity and **MASSO Link** software CLICK HERE

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

To manually reset the Time:

- Goto the **F2 - Program & MDI** screen.
- Press **CTRL + M** or click the MDI button to open the **MDI** Window.
- Type **Time:HH:MM** and press **Enter.**

> When entering the time you must use 24 hour clock to specify PM. If it is afternoon add 12 hours to the current time, for example 3:20pm is 15:20 in 24hr clock.

6.6.2. Homing the machine

Homing the machine is one of the most important parts of a CNC. Without homing the machine, no CNC machine can be used to its full potential and can result in crashing of the machine as the controller does not know the position of the axis on power up.

INFORMATION: Its a good idea to set to enable ***"Request Home on startup"*** and ***"Request Home after E-Stop press"*** option in "***Homing settings"*** window. This will blink a homing request alarm on the screen to tell the user to home the machine before use and wont let the user run and gcode without homing the machine.

Steps to home the machine

- To home the machine, first make sure that no alarms such as E-Stop are flashing on the screen.
- Next check that its safe to run the homing cycle on the machine and the tool, work piece or clamps will not be hit. If you need to move the axis to a safe position before homing, jogging from the F3 screen or MPG is allowed.
- Once you are ready to home the machine, press **CTRL+ALT+HOME** key on the keyboard or hold the **HOME** button in the F3 screen for 3 seconds.
- You can also assign one of the input on Masso as a Home Button Input and connect a button to it to home the machine.

6.6.3. Rapid/Jog

Press **F3** to goto **“F3 – Jog/Rapid”** screen. For Jogging use **Arrow keys** and for Rapid movement press and hold the **SHIFT key** and use **Arrow keys.**

INFORMATION: MPG can also be used in the F1 screen to jog the axis.

6.6.4. Feed rate Override

Feed rate Override

Feed rate override function allows the feed rate to be changed during machining. The range is from 20% to 100% of the specified feedrate and the current feedrate percentage is shown on the screen.

Information: This feature is available on the F2 & F3 Screens.

Information: Feed rate override ranges from 20% to 100% of the specified Feed rate. Feed rate override cannot exceed 100%

How to use

- Press the F11 Key on the keyboard
- Use the **+** & **-** keys on your keyboard to change the feed rate.
- You can also use the Pendant to change the feed rate by rotating the MPG dial in either the **+** or **-** direction to increase or decrease the feed rate.

Feed rate Override set at 100%

6.6.5. Speed Override

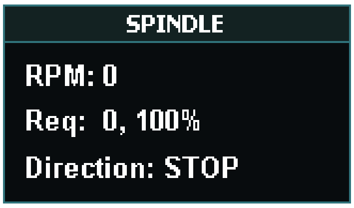
Spindle Speed Override

Information: This feature is available on the F2 & F3 Screens.

Information: Speed override ranges from 10% to 150% of the specified spindle speed.

How to use

- Press the F12 Key on the keyboard
- Use the **+** & **-** keys on your keyboard to change the speed.
- You can also use the Pendant to change the speed by rotating the MPG dial in either the **+** or **-** direction to increase or decrease the speed.



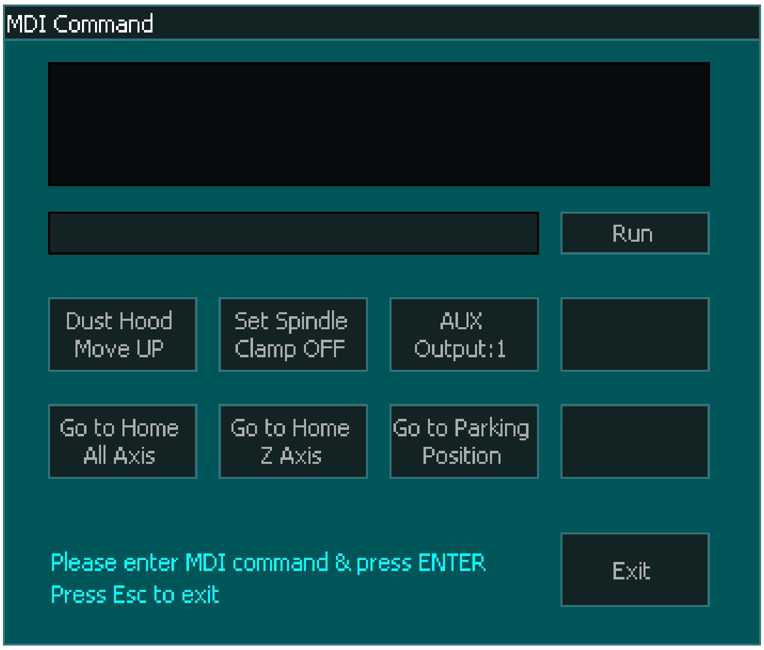
Speed Override set at 100%

6.6.6. MDI command

MDI window can be opened from **F2 - Program & MDI** screen using **CTRL+M** or by clicking on the MDI button towards the bottom left of the screen.

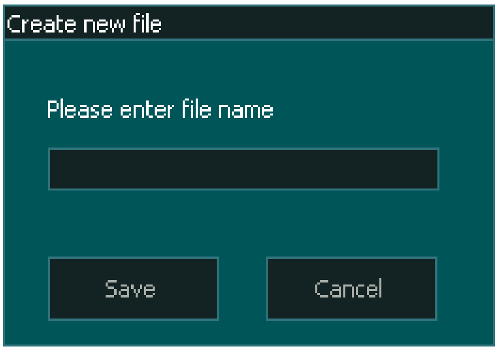
MDI window can be used to quickly run any gcode commands and the on-screen buttons can be used to control outputs or move the axis to the home position.

INFORMATION: In MASSO G3 the up and down arrow key can be used the select and execute commands from history. The last 20 commands are saved in memory.



6.6.7. Creating New G-Code Files

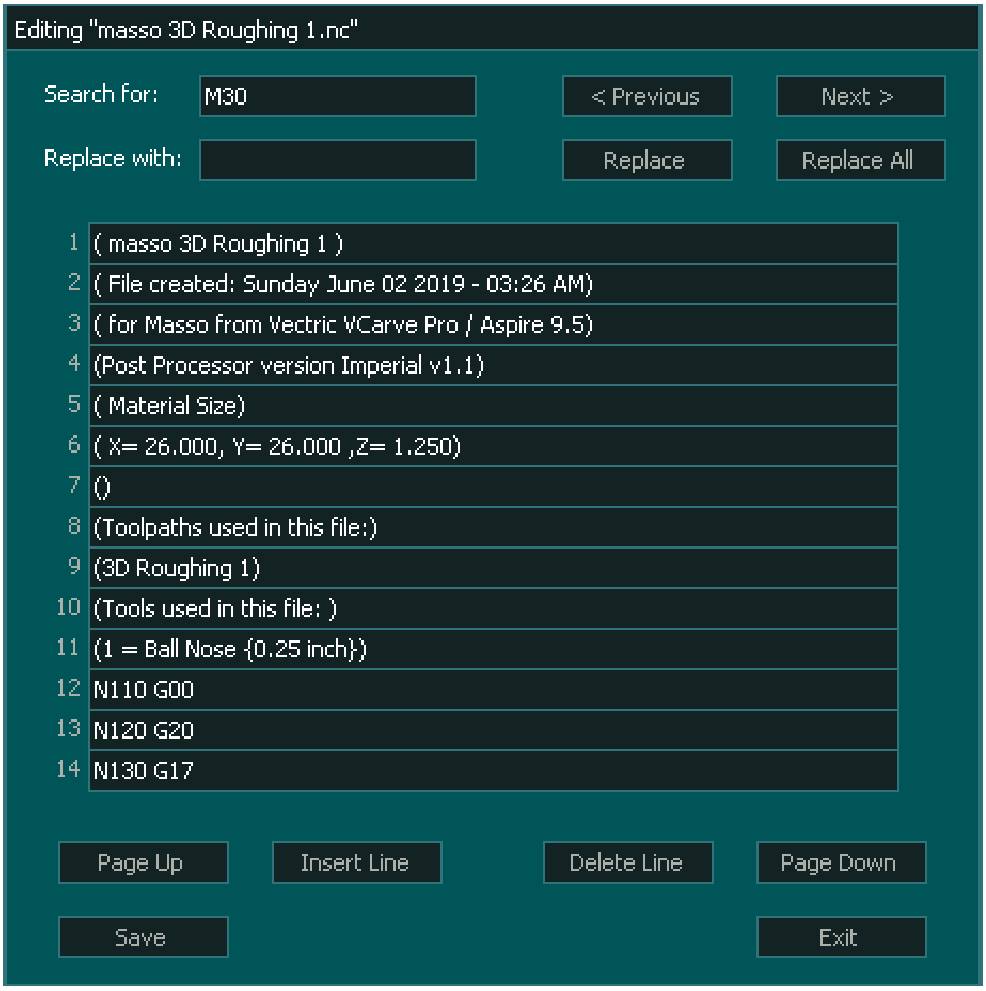
- Press **F2** to go to the **F2 - Program & MDI** screen
- Next press **CTRL + N** to open a new file name window



6.6.8. Editing G-Code

INFORMATION: This editor is only available on MASSO G3 controllers running software v4.02 and above.

- Press **F2** to go to the **F2 - Program & MDI** screen
- Next press **CTRL + E** to open the edit file window



6.6.9. Resetting Job Counter

MASSO has a built in job counter that increments everytime a gcode file runs. This counter can be used to see number of parts made in large production work.

To reset the job counter back to 0:

- Goto the **F2 - Program & MDI** screen.
- Press **CTRL + M** or click the MDI button to open the **MDI** Window.
- Type **RESET_JOB_COUNTER** and press **Enter.**

INFORMATION: The job counter can also be seen and reset remotely on a PC using the MASSO Link software.

INFORMATION: The job counter value in retained even after system power down. If the backup battery on the MASSO is removed, the job counter is reset to 0.

INFORMATION: For MASSO G2 model the job counter can count up to **4094** and for MASSO G3 model the job counter can count up to **4,294,967,295**.

6.7. Loading & Running G-Code

MASSO runs gcode files directly from the USB Flash drive. Please see the below video for instructions on how to load and run gcode files.

Files with extensions **.nc, .cnc, .tap, .wiz, .txt, .eia** are displayed in the **F6 - Load File** screen.

After loading your Gcode file you must press the Rewind button before pressing Cycle Start to run your program.

INFORMATION: Gcode files can also be transferred wirelessly using WiFi connection and transferring files from PC using the MASSO Link software.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

INFORMATION: Gcode files as big as 4GB can be run on controller.

INFORMATION: If you are loading a very large Gcode and do not want to wait for the toolpath preview to be displayed you can press the Escape button on screen or the ESC key on the keyboard to cancel the preview.

6.8. Resuming Program or Jump to Line

INFORMATION: This feature is only available for mill and plasma software versions.

When machining complex jobs such as die molds or complex engraving jobs which can take a long time to machine, power failure or broken tool means that you need to start the entire gcode file from start. Restarting the gcode file from start is very time and resource consuming. To be able to effectively restart your machining process from where you left, MASSO has a **Resuming Program or Jump to Line** feature (from software v3.30).

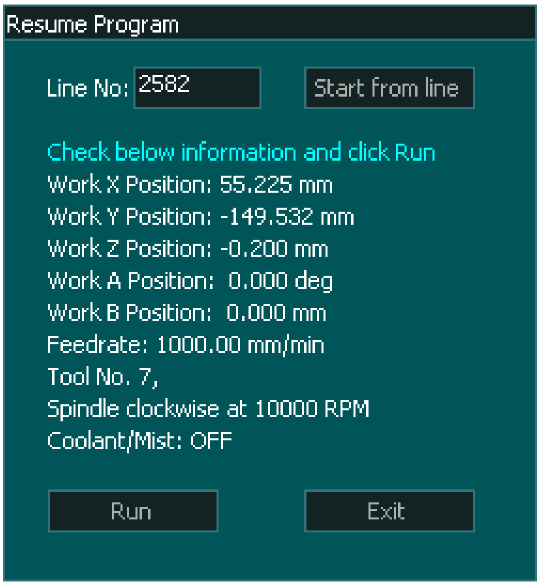
- With this feature the current gcode line number is saved into a high speed internal memory and even if the machine is powered off while machining, MASSO will automatically store that last line number in memory.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, [Click here to view the video]

On power-up, a message is displayed on the gcode list with the last line number that was running

- After this please load the gcode file from the **F6-Load File** screen and go to **F2-Program & MDI** screen
- Now press **CTRL+J** to open the **Resuming Program** window.
- The last line number will automatically be filled and depending on your program, please go back a few lines from the last running line so that the machining is resumed a few lines before it stopped.



- Next click the **Start from line** button and MASSO will process the gcode file up to the line number entered by you. When done MASSO will calculate all the machining parameters from the gcode file as below:
- Calculate the X, Y, and Z-axis positions to resume machining.
- Cutting feedrate as per gcode.
- Tool Number.
- Spindle RPM and direction.
- Coolant/Mist status.
- Carefully check the information and click the **Run** button.
- Next, MASSO will resume the machining cycle as below:
- Move the Z axis up to the homing position.
- Change tool if a different tool is required.
- Sets the status of any output if used with M62 or M63 codes.
- Start spindle at the requested RPM and direction.
- Start Coolant/Mist as per gcode.
- Goto X & Y resume position.
- Move the Z axis down to the cutting position and start machining at the feedrate as per gcode file.

Jump to Line in Plasma software

INFORMATION: When using the **Jump to line** in Plasma software MASSO will search backward in the Gcode file to locate the last M5 command and use this as its starting line. If the line you have selected is an M5 command it will use that line. If there is no previous M5 command it will return to the start of the Gcode file. The use of Plasma Jump to line works the same as Mill software in its operation.

6.9. Wi-Fi Connectivity

MASSO comes with Wi-Fi hardware and software to easily connect your MASSO controller to a Wi-Fi network.

With the MASSO Link software, users can easily view the real-time status of your MASSO controller remotely, transfer gcode files to MASSO from your PC, get tool data from MASSO's memory and generate tools list document that can be used with CAM software.

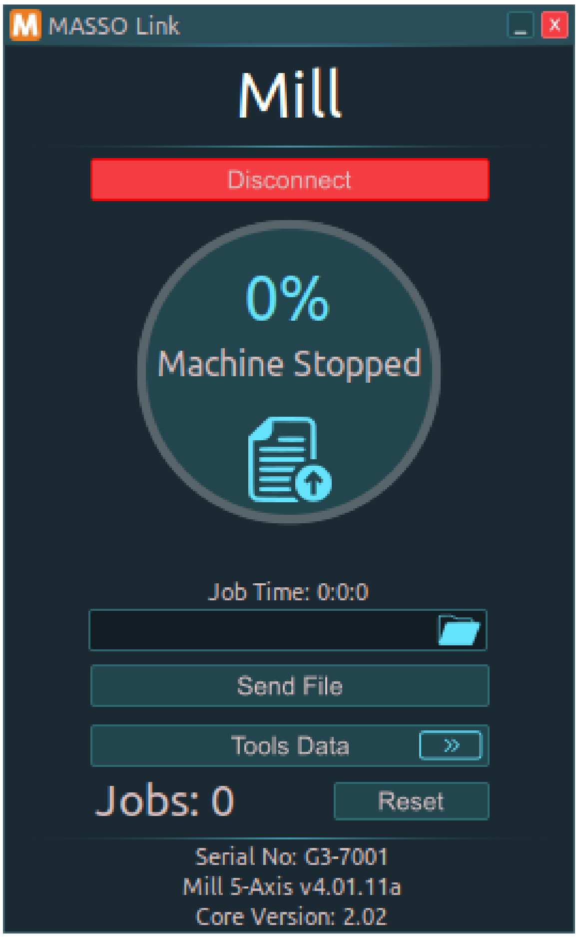
INFORMATION: MASSO Link software download link.

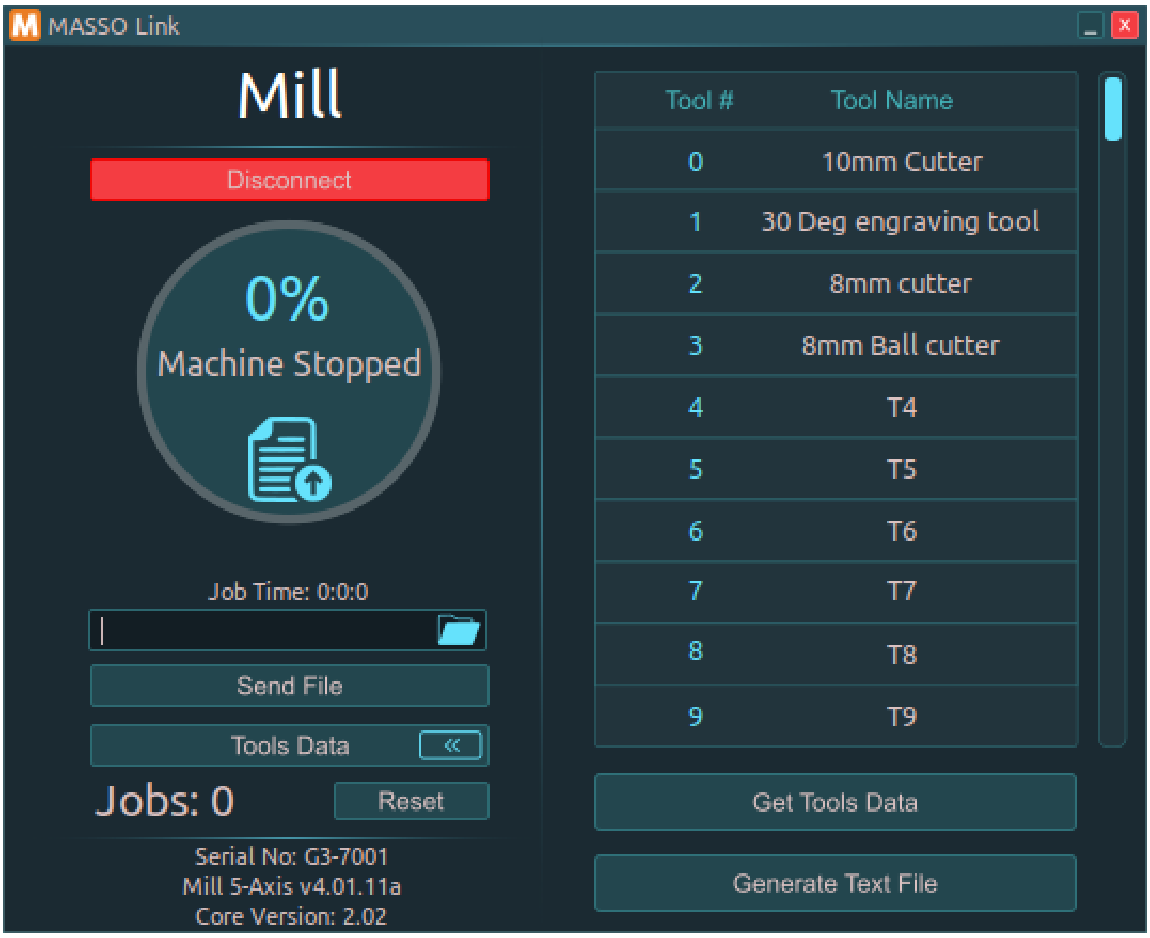
MASSO Link software is available for Windows, macOS, and Linux.

Running "MASSO Link" software on PC

INFORMATION: Masso link software uses UDP ports 11000 to 11050 for sending data and 65535 for receiving data.


MASSO Link
MASSO
Connected to My MASSO network
192
168
1
76
Connect
Machine name
Mill
Give a name of your machine for your reference.
Example: My Mill - Main Workshop
MASSO Documentation
MASSO Link
MASSO Link v2.0
Build: 28-01-2021


MASSO Link
Mill
Disconnect
0%
Machine Stopped
Job Time: 0:0:0
Send File
Tools Data
Jobs: 0
Reset
Serial No: G3-7001
Mill 5-Axis v4.01.11a
Core Version: 2.02



Additional installation information Install and using MASSO Link

Creating your own Wi-Fi network

If a Wi-Fi network is not available, MASSO can be used to create a Wi-Fi network and a PC can be connected directly to MASSO via this Wi-Fi network. This feature is called **My MASSO Network**.

Tick the **Make "My MASSO Network"**, enter a network name (SSID) that you would like to call this network, and enter the security key. Click the **Enable** button.

At this stage, the Wi-Fi network will show up on your PC in the Wi-Fi networks list and you can connect to this network and use the **MASSO Link** software.

INFORMATION: The security key must be between 8 to 32 characters long.

Transferring gcode files to MASSO

INFORMATION: Please note that a USB Flash drive needs to be connected to MASSO to store these files.

- Once connected, gcode files with **.txt, .nc, .cnc, .tap, .eia** extensions can be dragged and dropped on to the **MASSO Link** software window.
- A folder name can be given and all the files sent to MASSO will be saved on the USB pen drive in this folder, else keeping this blank will save the files on the root folder of the USB pen drive.
- Click **Send File** to send the file to MASSO.

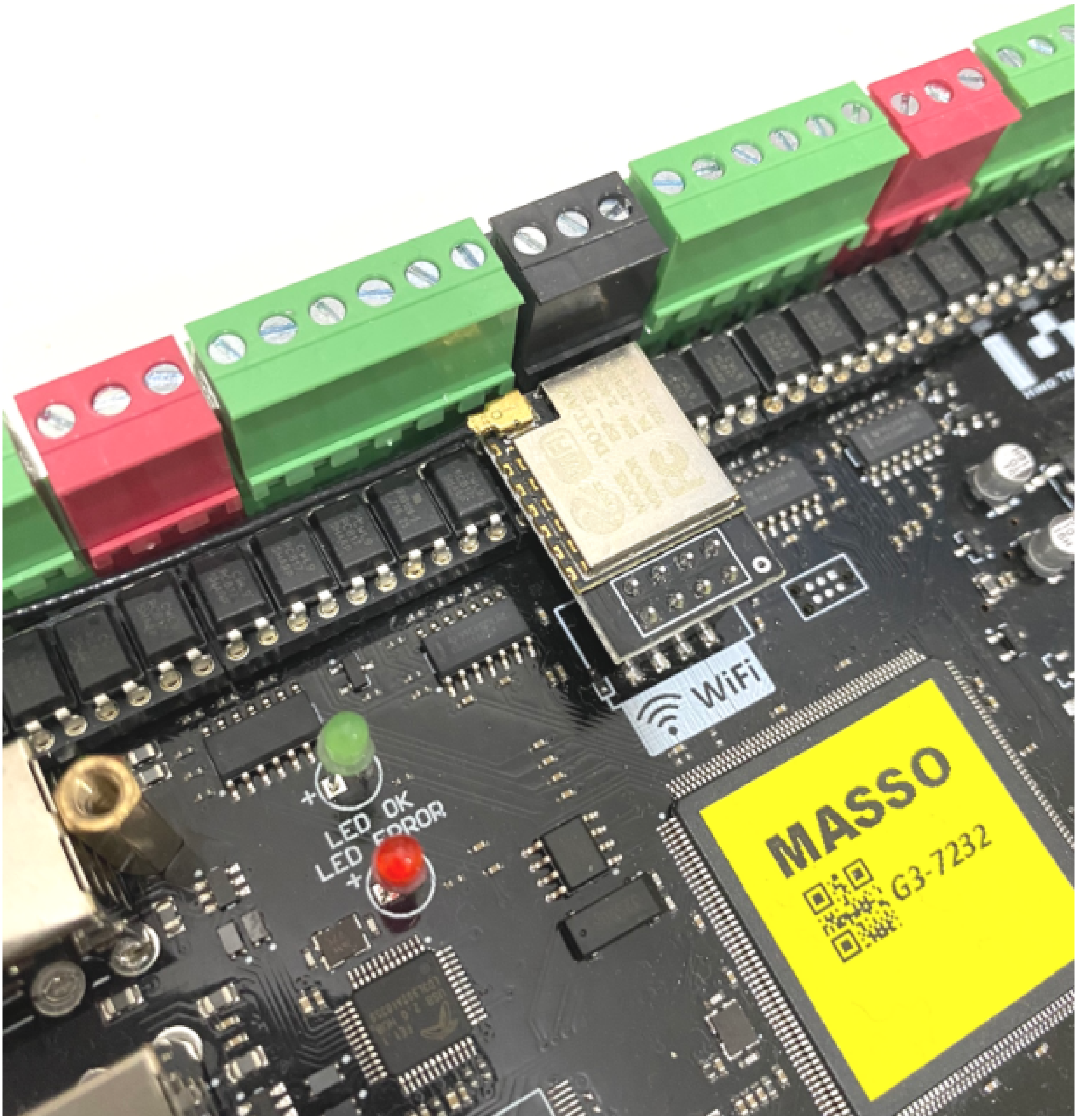
INFORMATION: File transfer speed is up to 2Mb per minute and is dependent on several factors including Wi-Fi Signal and flash drive write speed. A poor Wi-Fi signal may slow down the file transfer process by requiring data to be resent. A quality, branded USB2 or USB3 flash drive is recommended as modern flash drives will have higher internal write speeds. While the transfer rate may be slower than your flash drive write speed the data is not written to the drive until a block of data is received at which time it will write the data and request the next block. Slow write speeds within the flash drive will become a determining factor in overall transfer speed. A slow flash drive can half the transfer speed of a file doubling the amount of time it needs to send.

Installing the Wi-Fi module

The WiFi module is required to be plugged into MASSO's Wi-Fi connector before being able to use the WiFi functionality. The antenna cable and antenna must also be installed.

- Switch off the MASSO and remove the main label cover and slide out the label panel towards the left side.
- After installing the WiFi module the label panel can be installed back and MASSO powered up.

> **CAUTION:** Make sure to install the WiFi module in the correct direction as shown in the below photo.



Connecting to WiFi network

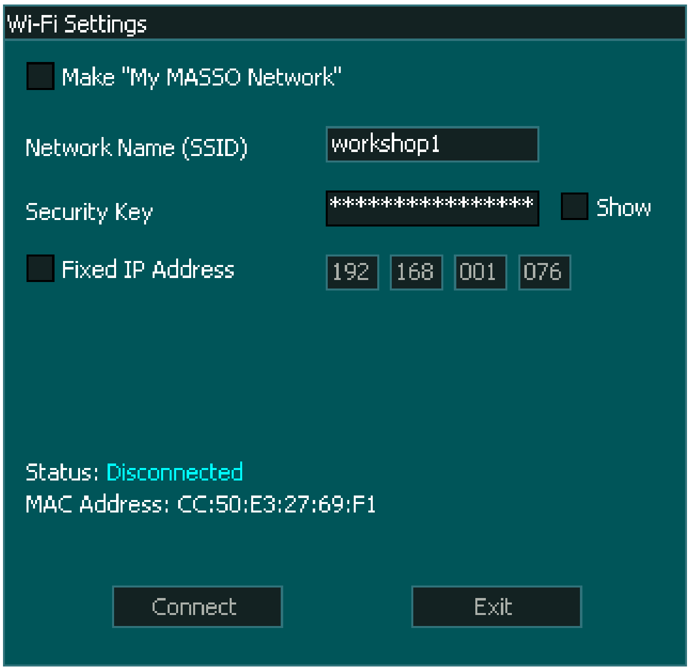
INFORMATION: MASSO Wi-Fi module supports 2.4GHz frequency (IEEE 802.11 b/g/n).

In the **F2 - Program & MDI** screen, click the Wi-Fi icon.

Enter the name (SSID) and security key of the Wi-Fi network that you would like to connect to. If you would like to use dynamic IP as provided by your Wi-Fi network then leave the **Fixed IP Address** un-ticked and click the **Connect** button. Once connected the IP address provided by your Wi-Fi network is displayed.

INFORMATION: It's a good idea to use the **Fixed IP Address** option as every time you connect to your Wi-Fi network, the IP address might be changed by the router. As the IP address is required by MASSO Link software, the new IP address needs to be updated on the PC to be able to connect to the MASSO. Using the **Fixed IP Address** solves this issue.

INFORMATION: The maximum length of SSID is 30 characters and 60 characters for the security key.



6.9.1. MASSO Link Software

Click on the below operating system links of your choice to download MASSO Link software.

MASSO Link v2.1

Release date: 1 July 2021

INFORMATION: MASSO Link v2.1 requires **MASSO G3 v4.03** or higher or **MASSO G2 v3.50** or higher. Most of the features can still be used with older versions of MASSO controller software but it's best to use with these versions.

Release Notes

1. Fixed windows scaling issue.
2. Improved graphics resolution.
3. Added support to send MASSO software update **.HTG** files to the controller.
4. Fixed bug where job run time was not displayed correctly in some situations.
5. Minor improvements and bug fixes.

MASSO Link v2.0

Release date: 28 January 2021

INFORMATION: MASSO Link v2.0 requires **MASSO G3 v4.01** or higher or **MASSO G2 v3.49** or higher.

Windows Version

macOS Version

Linux Version

Release Notes

1. The first cross-platform version released.
2. Supports running multiple copies of MASSO Link on a computer to monitor multiple machines at the same time.
3. Added option to remember the last position of the window so that next time MASSO Link opens at the same location.

MASSO Link v1.6

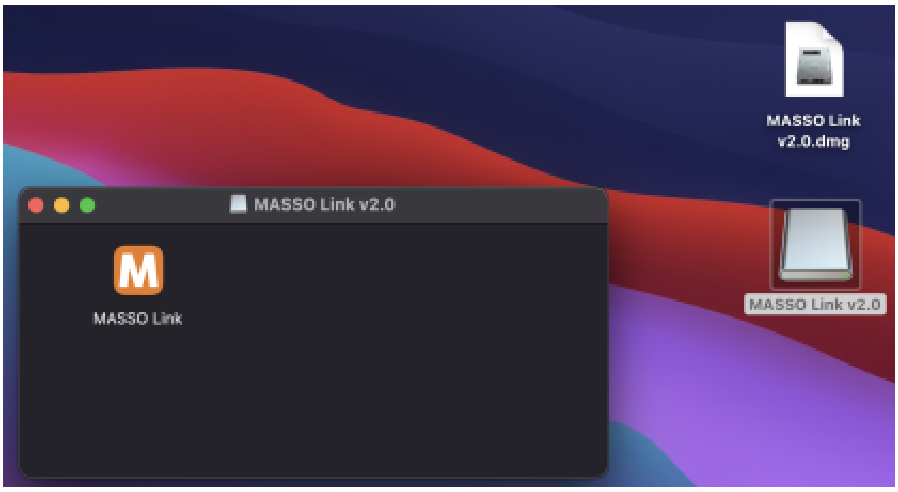
This version is only available for Windows.

Windows Version

6.9.2. MASSO Link - macOS Instructions

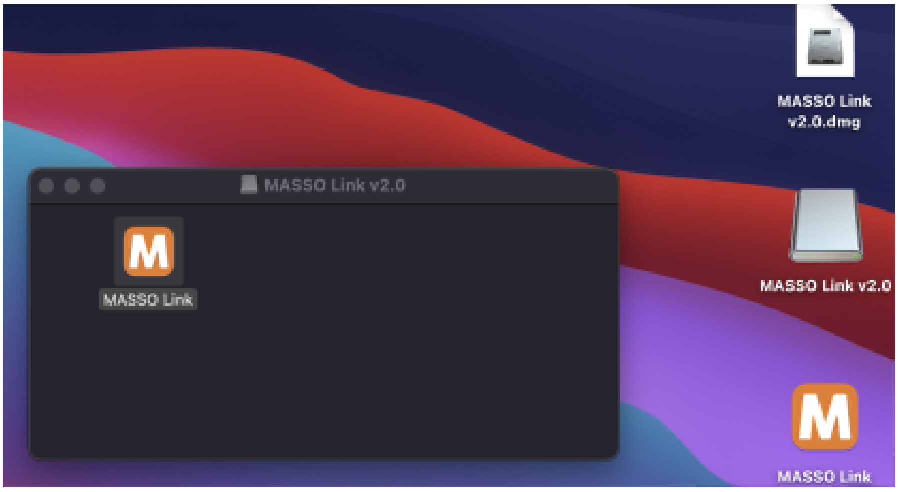
Running MASSO Link on your Apple computer

Step 1



After downloading the MASSO Link **.dmg** file, double click to mount the image.

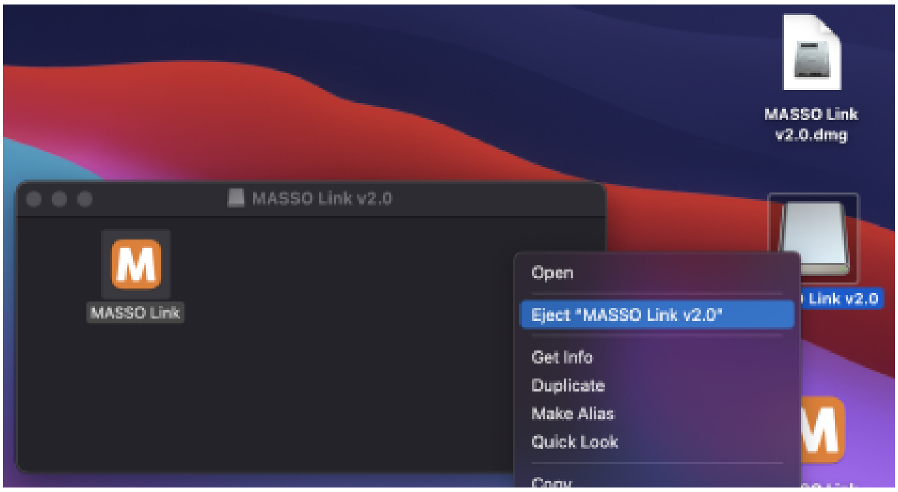
Step 2



Once the image has been mounted, drag and extract the MASSO Link software file on the desktop or in a folder.

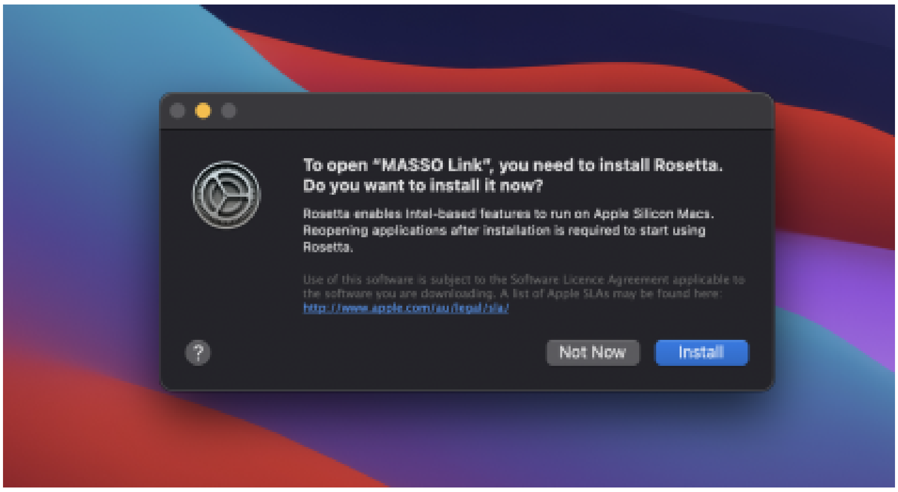
WARNING: Do not run the MASSO Link file without extracting it from the image.

Step 3



Next right the image file and click **Eject**. At this stage, the dmg file can also be moved to the bin.

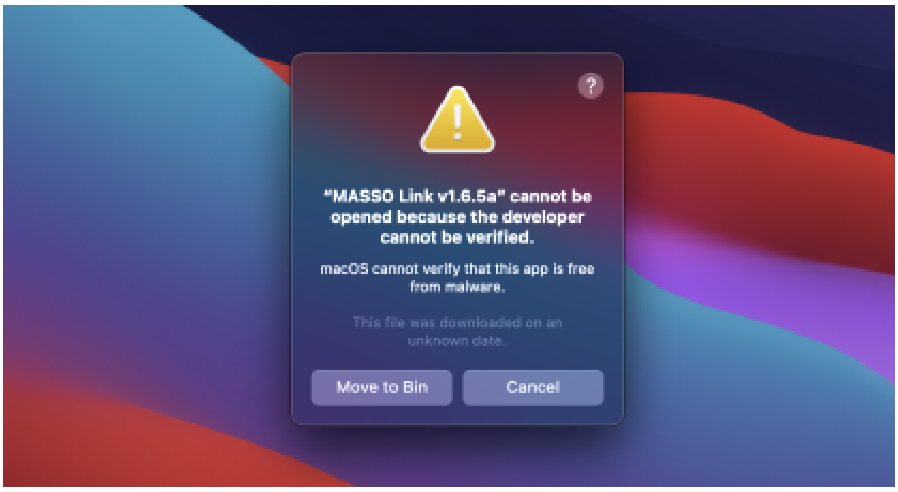
Step 4



Double click the MASSO Link icon.

INFORMATION: If you are using mac with the M1 chip and if Rosetta is not installed on your system then the above message will be displayed. Click **Install** to install Rosetta and once done, double click the MASSO Link icon.

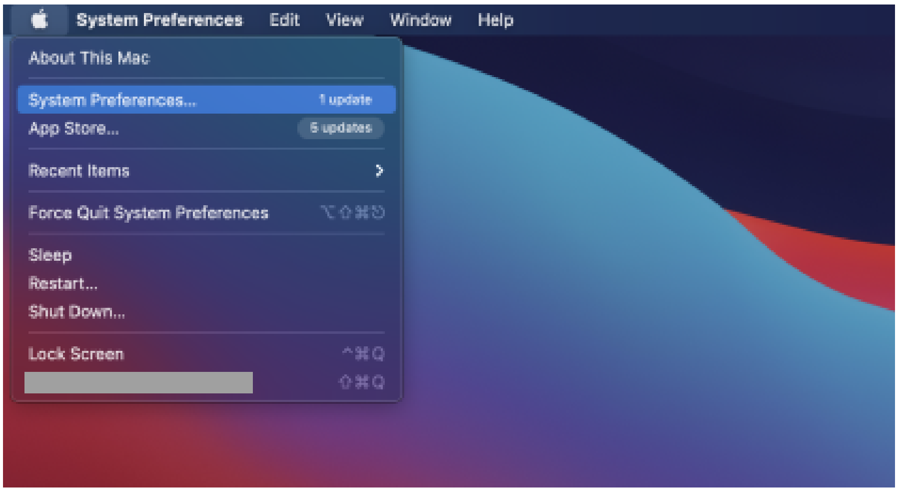
Step 5



On the first run, macOS will warn that the developer cannot be verified, click **Cancel**.

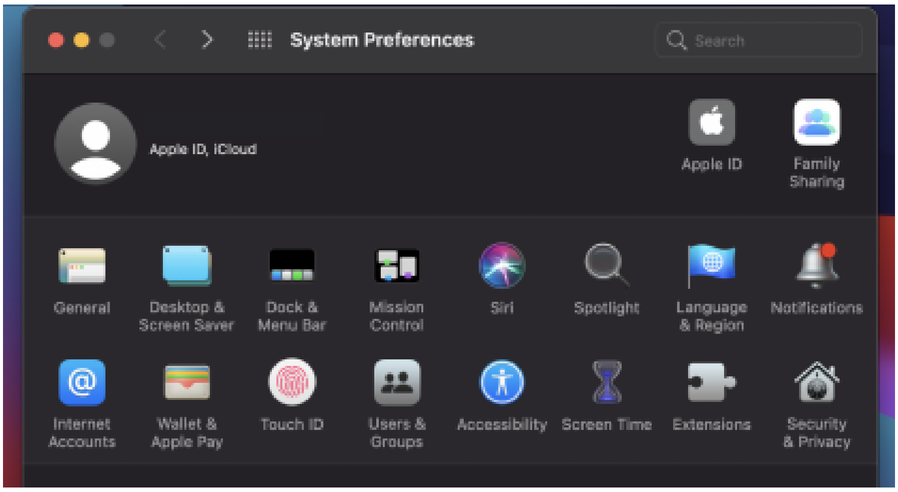
INFORMATION: You will need to follow the below steps once to allow MASSO Link to run on your mac.

Step 6



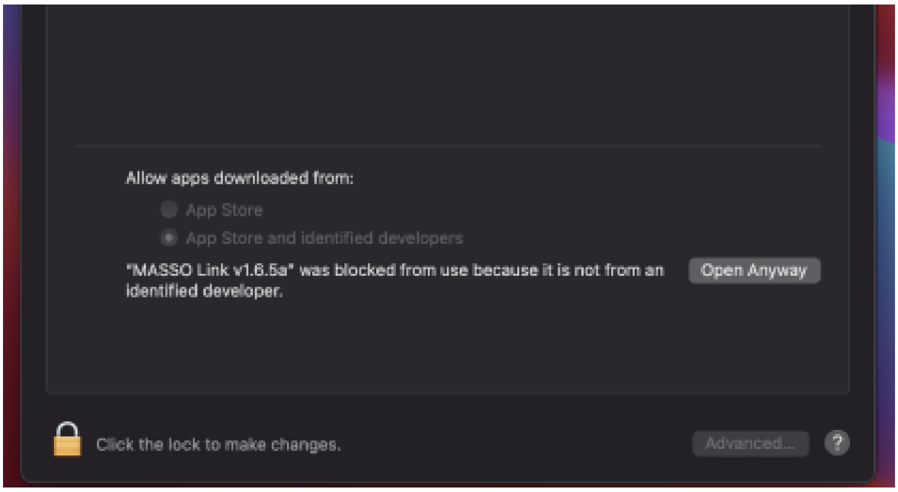
Go to the menu and click System Preferences.

Step 7



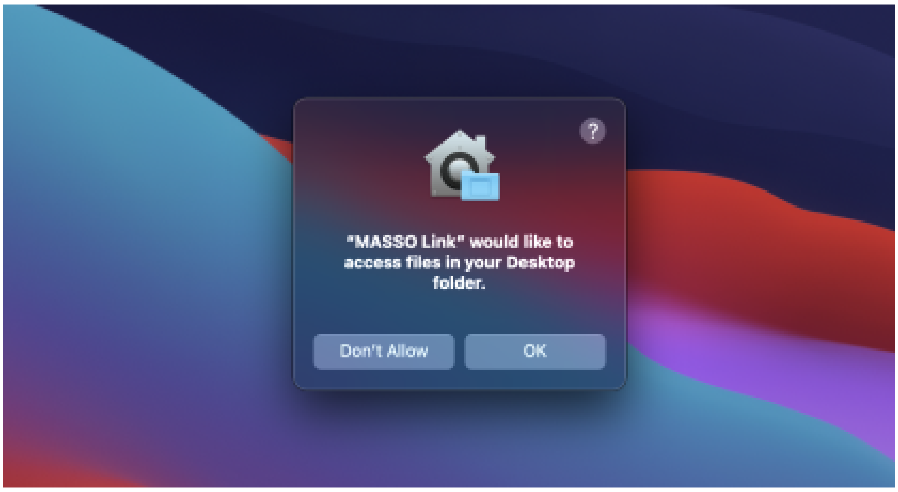
Double click and open **Security & Privacy**.

Step 8



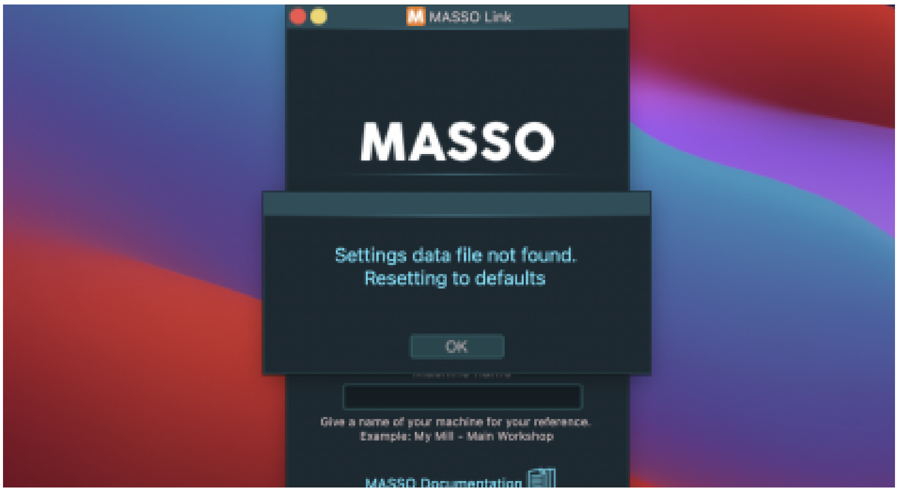
You will see the above message, click the **Open Anyway** button and close the window.

Step 9



Double click the MASSO Link icon, on first use you will see the above message, click the **OK** button.

Step 10



On first use, a settings file **MASSO_Settings.dat** will be created in the same folder and a message will be displayed. This settings file is used to store all the information such as machine name, IP address of MASSO and window position.

6.9.3. MASSO Link - Windows Instructions

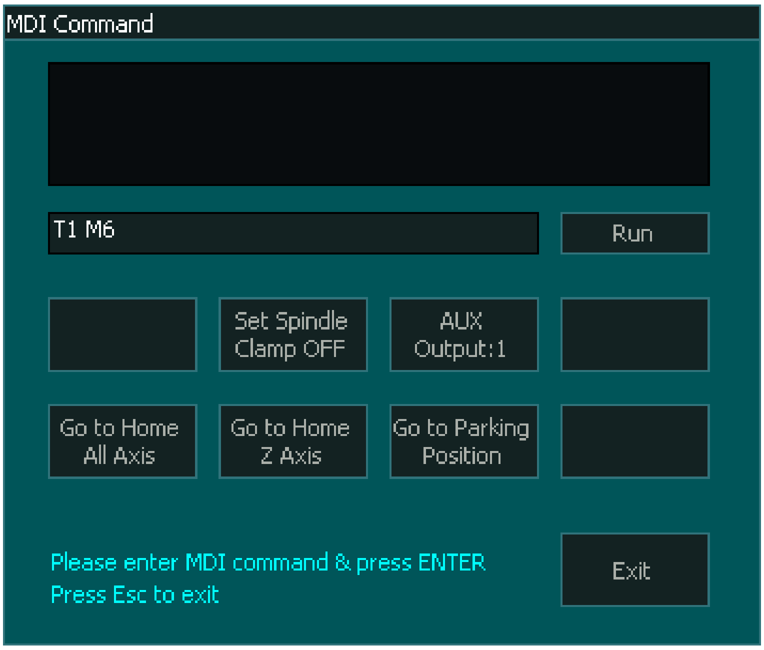
6.9.4. MASSO Link - Linux Instructions

6.10. Calibrating Tools

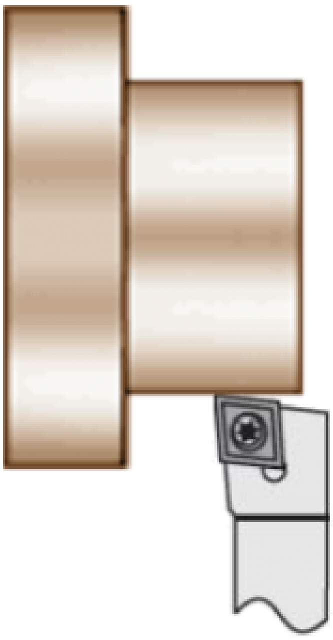
6.10.1. Lathe Tool Calibration Steps

INFORMATION: On a lathe machine X-axis work offsets are not used or available because changing the X offset would result in a change of workpiece diameter. For setting the X offset to calibrate each tool, please follow the below procedures.

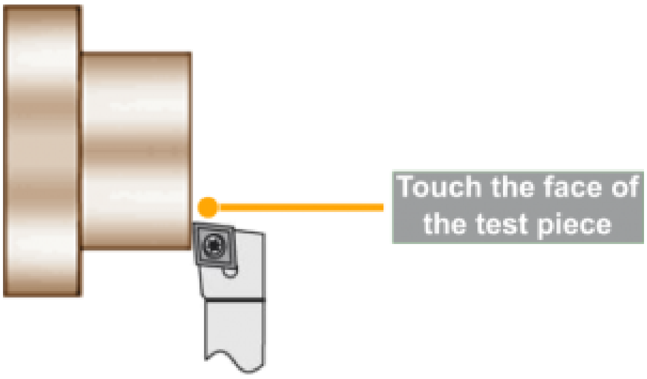
Step 1: Open the MDI window using the MDI button in F2 Screen or CTRL+M and load the tool you would like to calibrate, in this example we will be calibrating Tool No.1.



Step 2: Machine a small test piece or use an existing piece.

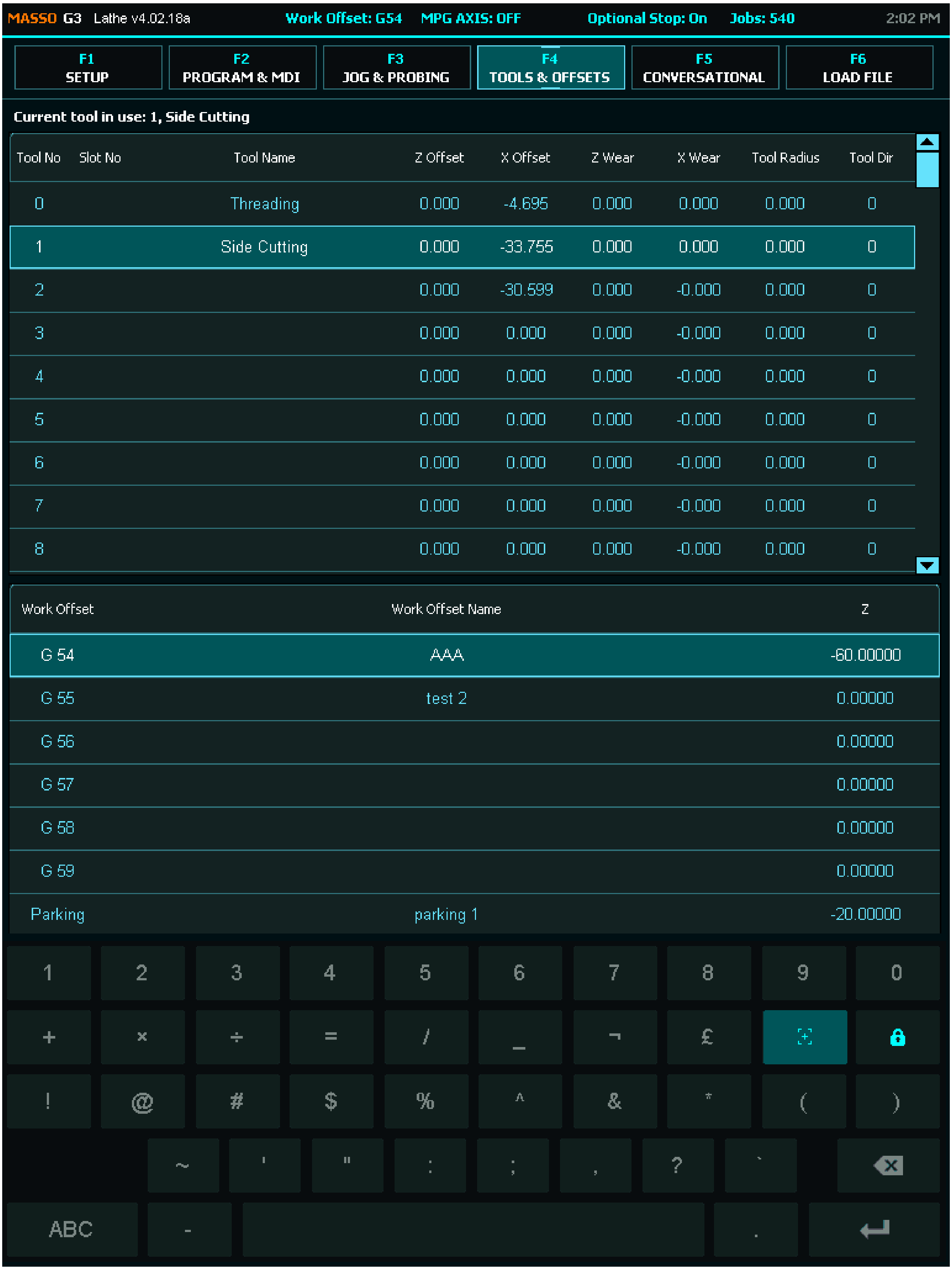


Step 3: Go to **F3 – Jog/Rapid** screen and touch the tool to the front face of the test piece.

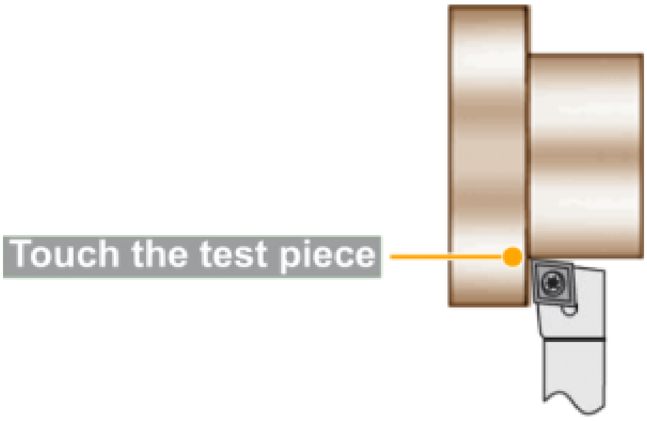


Step 4: Go to **F4-Tools & Work Offset** screen and open the tool number you want to calibrate.

Step 5: Give a name to the tool for your reference and click the **Zero** button.

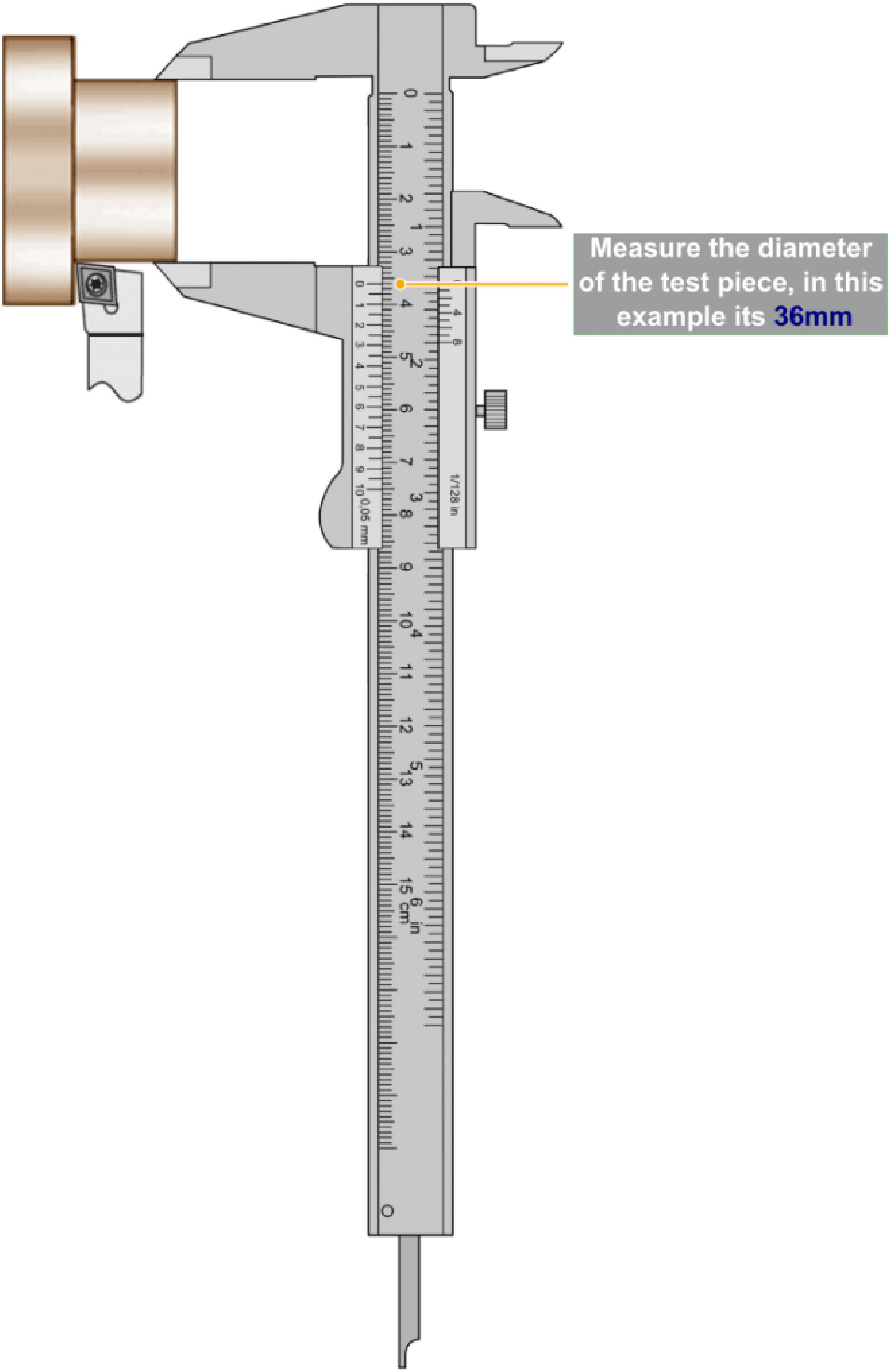


Step 6: Now go to **F3 – Jog/Rapid** screen and touch the tool to the side of the test piece.



Step 7: Measure the diameter of the test piece and note the value.

WARNING: Do not Jog or move the tool away unit the next step has been completed.


Measure the diameter of the test piece, in this example its 36mm
0.05 mm
1/128 in
cm
in

Step 8: Go back to **F4-Tools & Work Offset** screen and enter the measured diameter value in **Test Piece (Dia)** box and click the **Touch** button.

CAUTION: Make sure to select the position of the tool depending if it is installed on the front or the backside.

Step 9: Next select if the tool is on the front side or the backside and make sure that the **Z Wear** and **X Wear** values are **0.00**.

Step 10: Click the **Save** button to save and complete tool calibration.

6.10.2. Mill Tool Calibration Steps

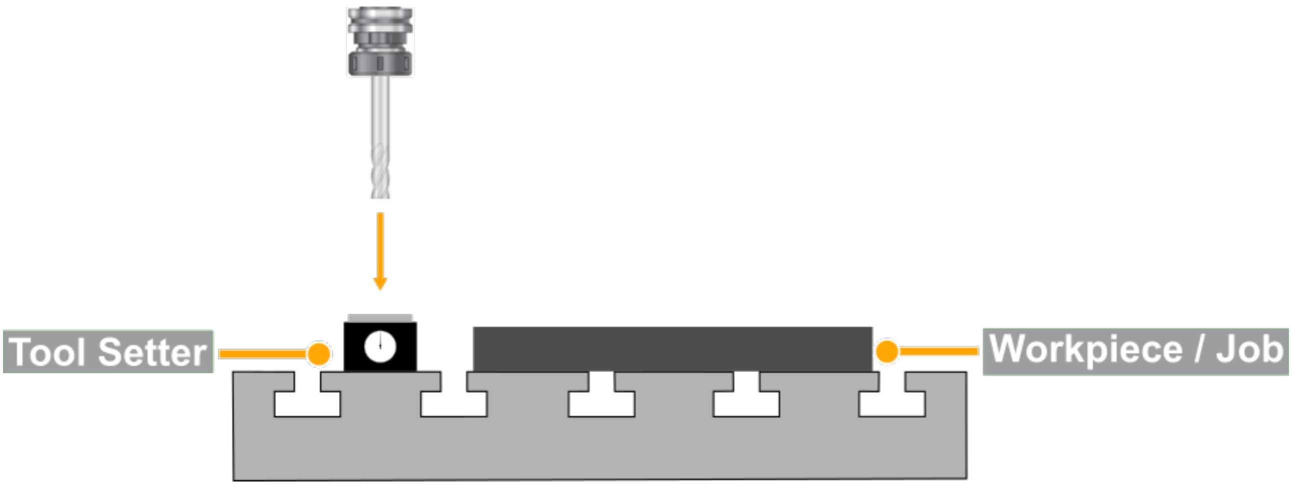
For routers and milling machines, tool length can be calibrated for manually or automatically by using a tool setter or a simple touch plate.

INFORMATION: More information about Touch Probe and Plates setup can he found on this link CLICK HERE

Scan the QR code to watch the MASSO video tutorial on YouTube

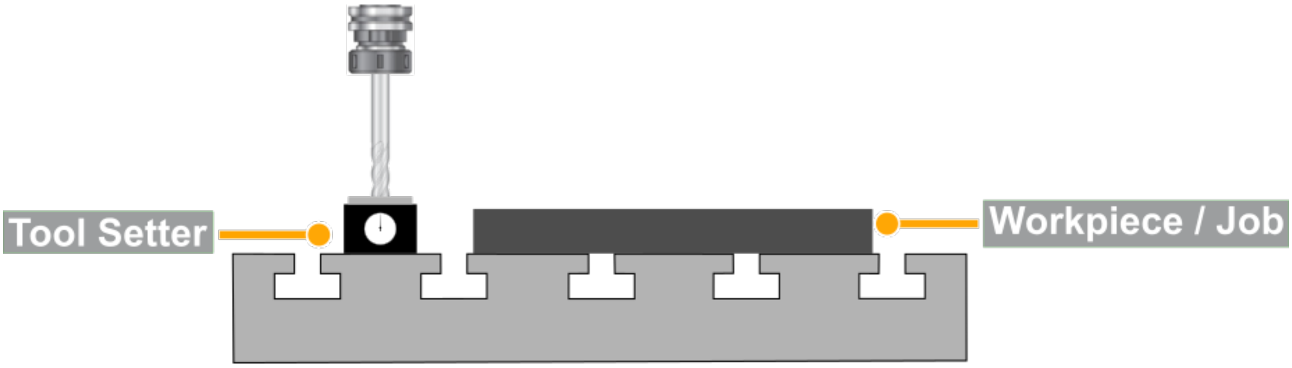
Or, Click here to view the video

Step 1: Place the tool setter at a predefined position on the machine.



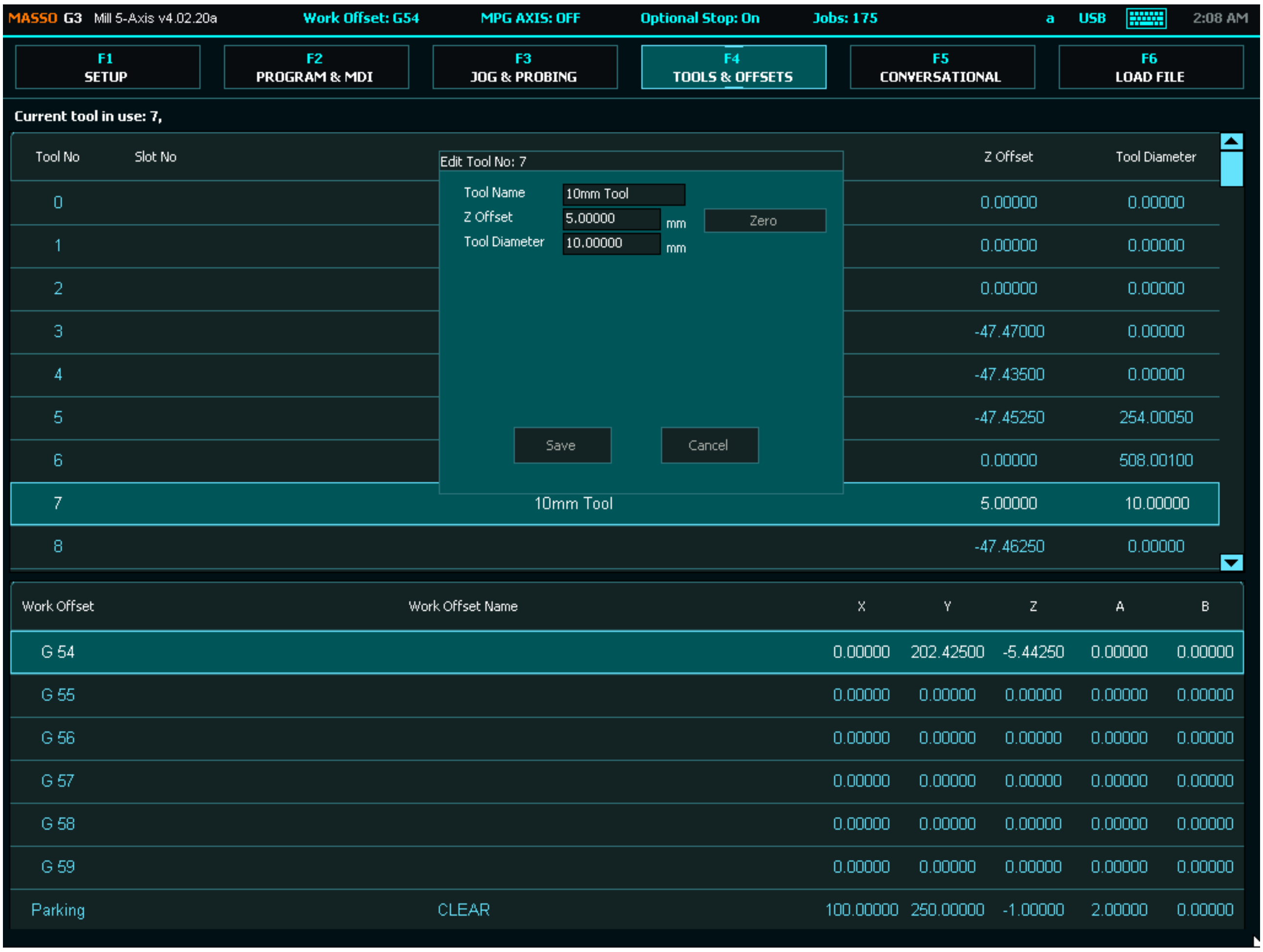
Step 2: On MASSO go to **F3-JOG** screen, next move the tool in position on top of the tool setter and touch the tool till the tool setter shows exactly 0.00.

CAUTION: Once in position **DO NOT MOVE** the tool before completing the next step.

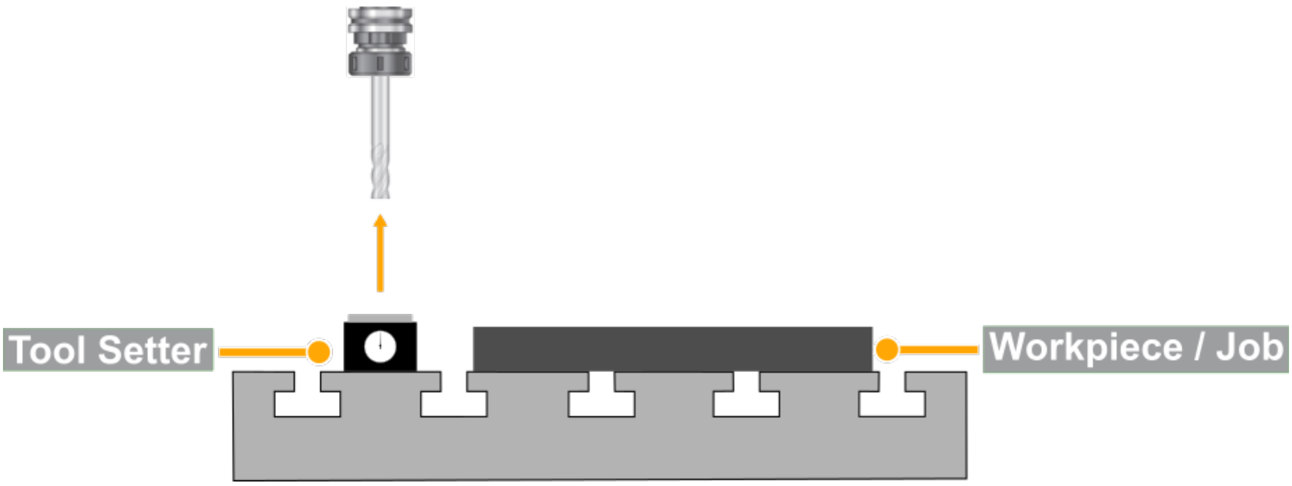


Step 3: On MASSO go to the **F4-Tools** screen and select the tool number you would like to assign to this tool. Now press the enter key to open the Edit Tool window.

Step 4: In the **Edit Tool** window give a tool name as per your requirement. Next move the click the **Zero** button to automatically calibrate the tool, MASSO will calculate the tool height and automatically fill the Z Offset value. Now the tool diameter can be entered if required and press **Save** button to save and complete the calibration process.



Step 5: Once the tool has been calibrated, please go to **F3-JOG** screen and move tool away from the tool setter.



6.11. Work Offsets

Work offsets allows the user to position the work piece and cutting tool to allow cutting at the required position. There are different types of offsets such as work and temporary offsets, its very important to understand these concepts as these will help you generate gcode from a CAD/CAM software and then how to position the work piece on the machine.

Here is a great video from CNCnutz explaining the entire process

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

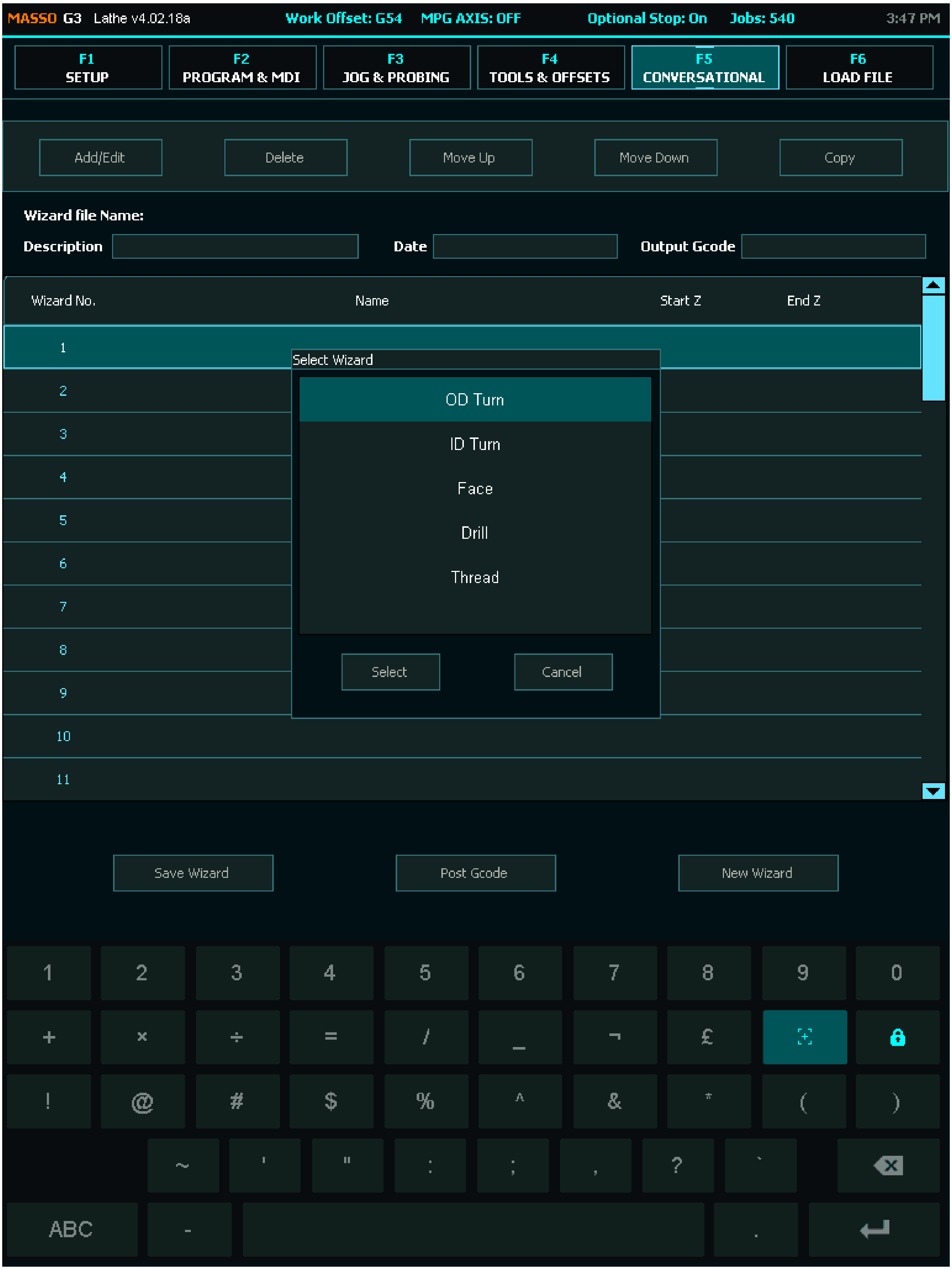
6.12. Conversational Programming

6.12.1. Lathe Conversational Wizards

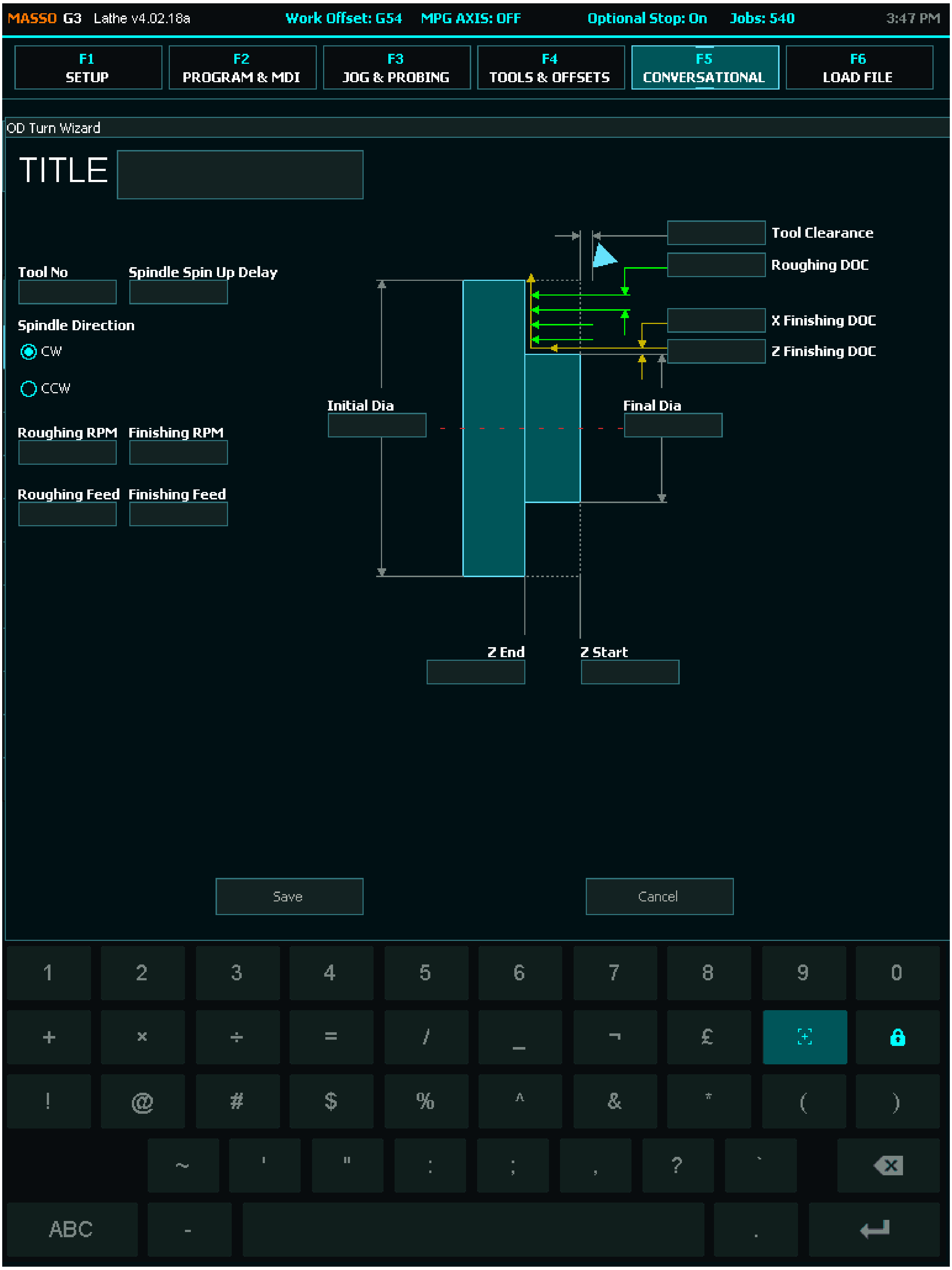
MASSO has built-in conversational wizards to easily generate gcode programs for basic machining operations by entering basic information.

List of wizards available for Lathe Machines:

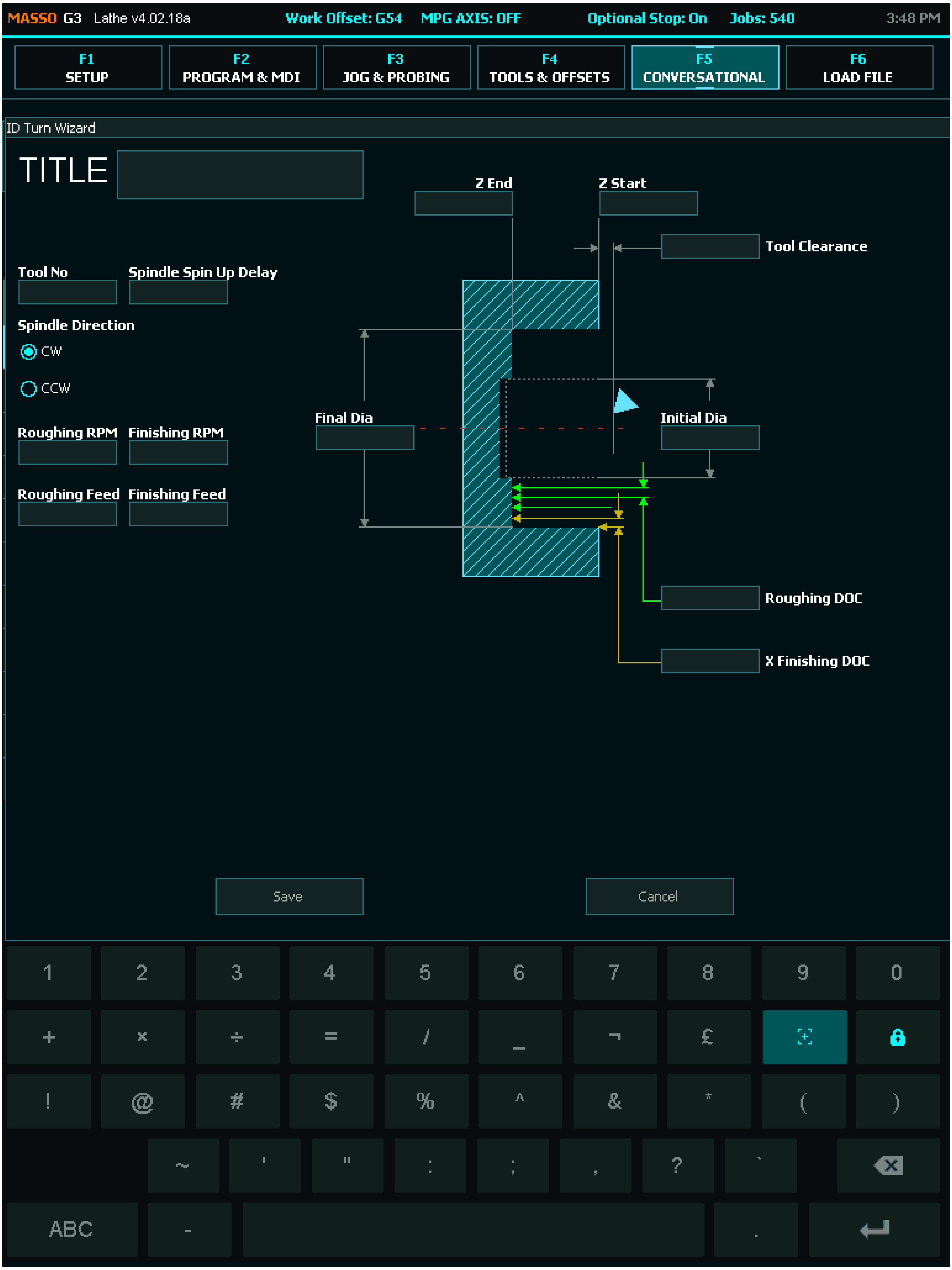
- Outer diameter turn wizard
- Inside turn wizard
- Facing wizard
- Drilling wizard
- Threading wizard



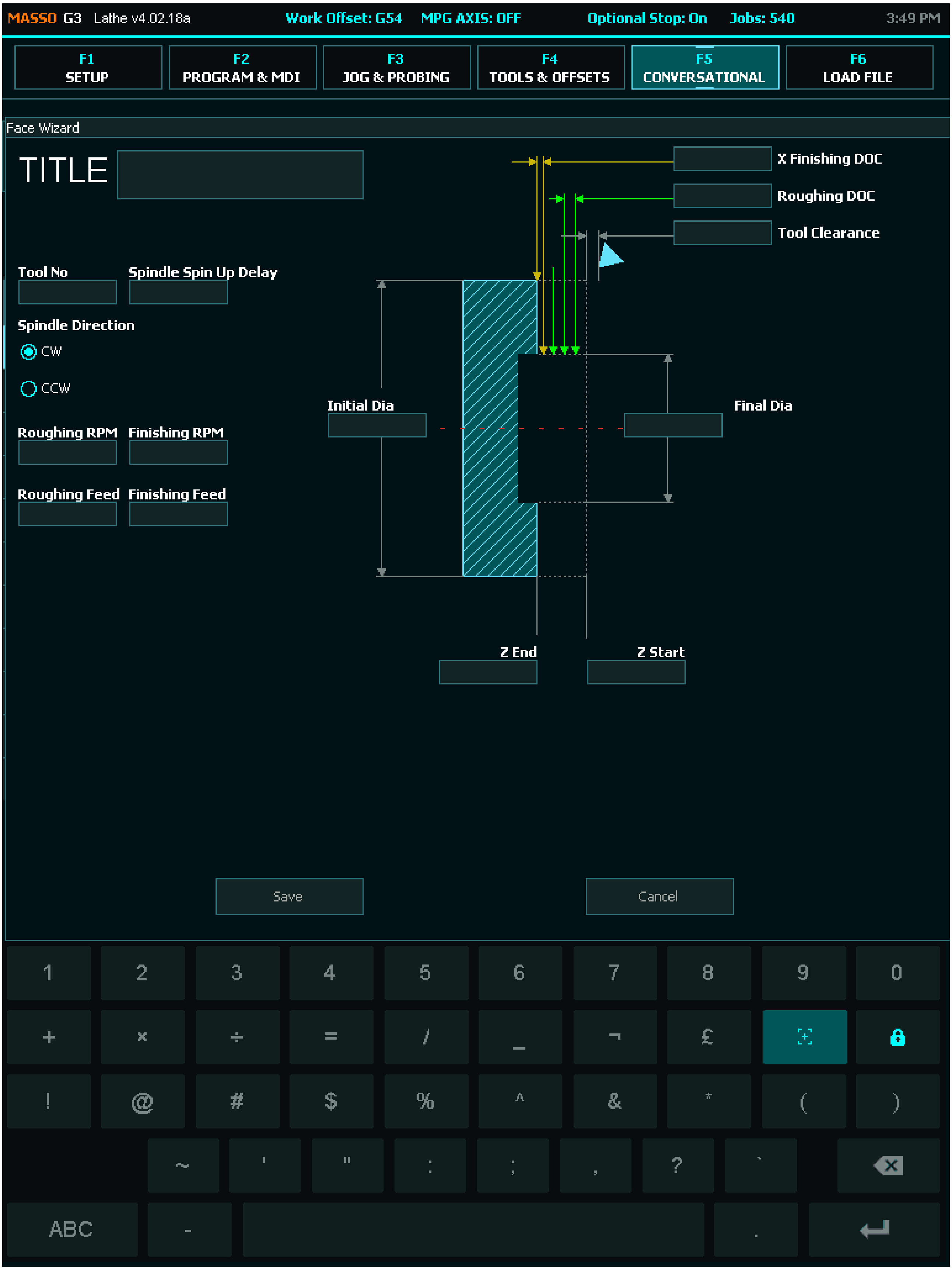
Outer diameter turn wizard



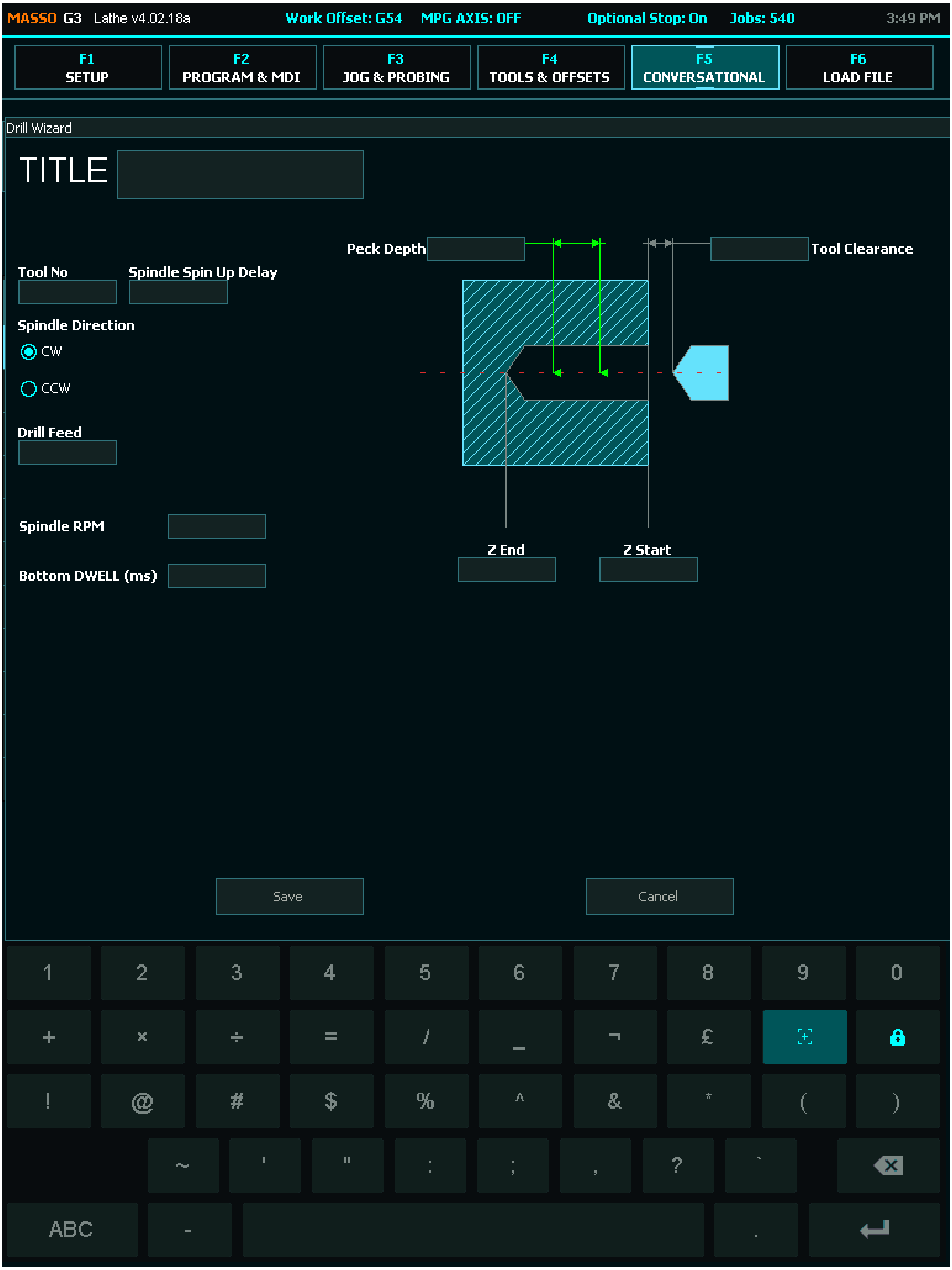
Inside turn wizard



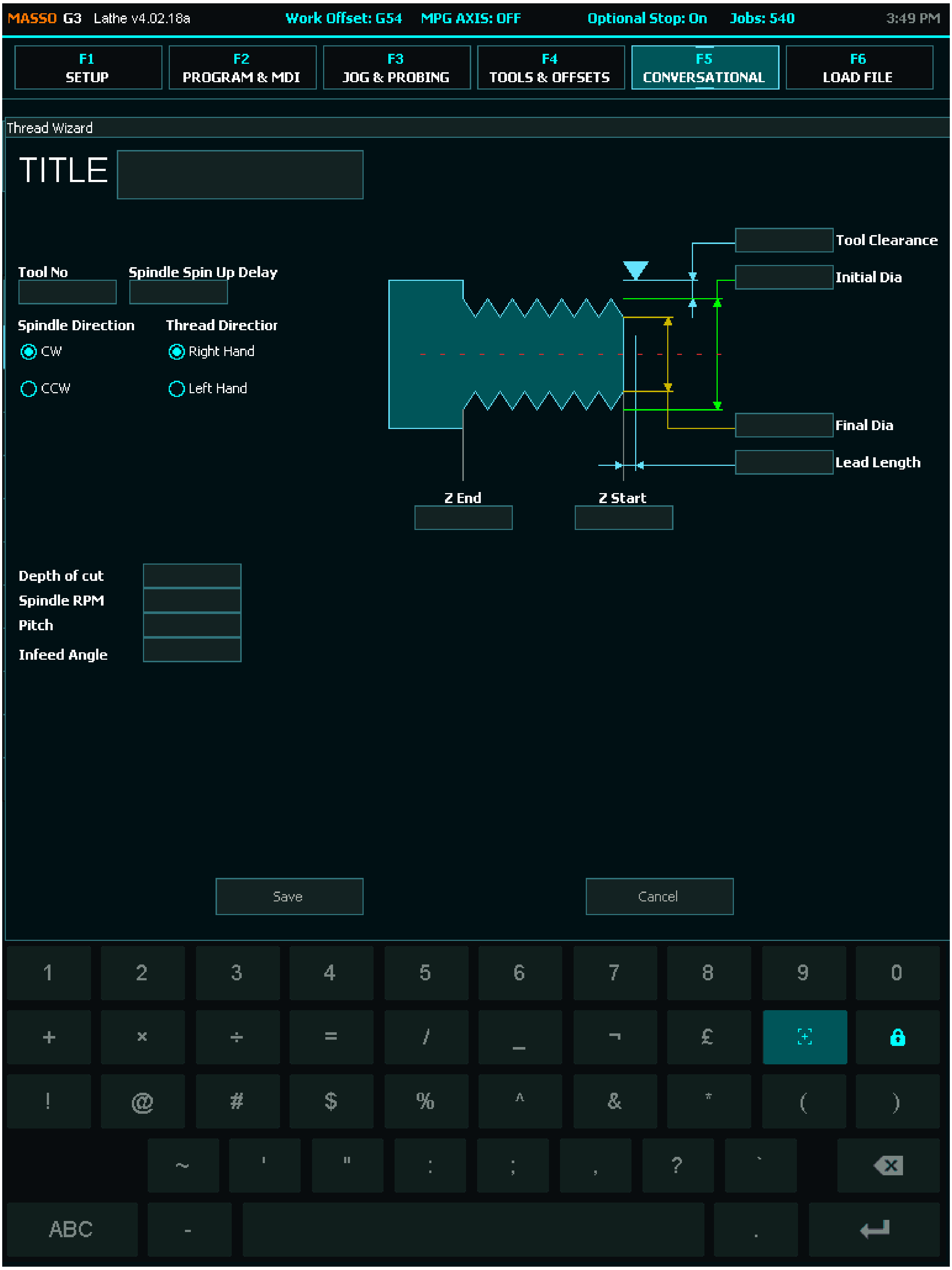
Facing wizard



Drilling wizard



Threading wizard

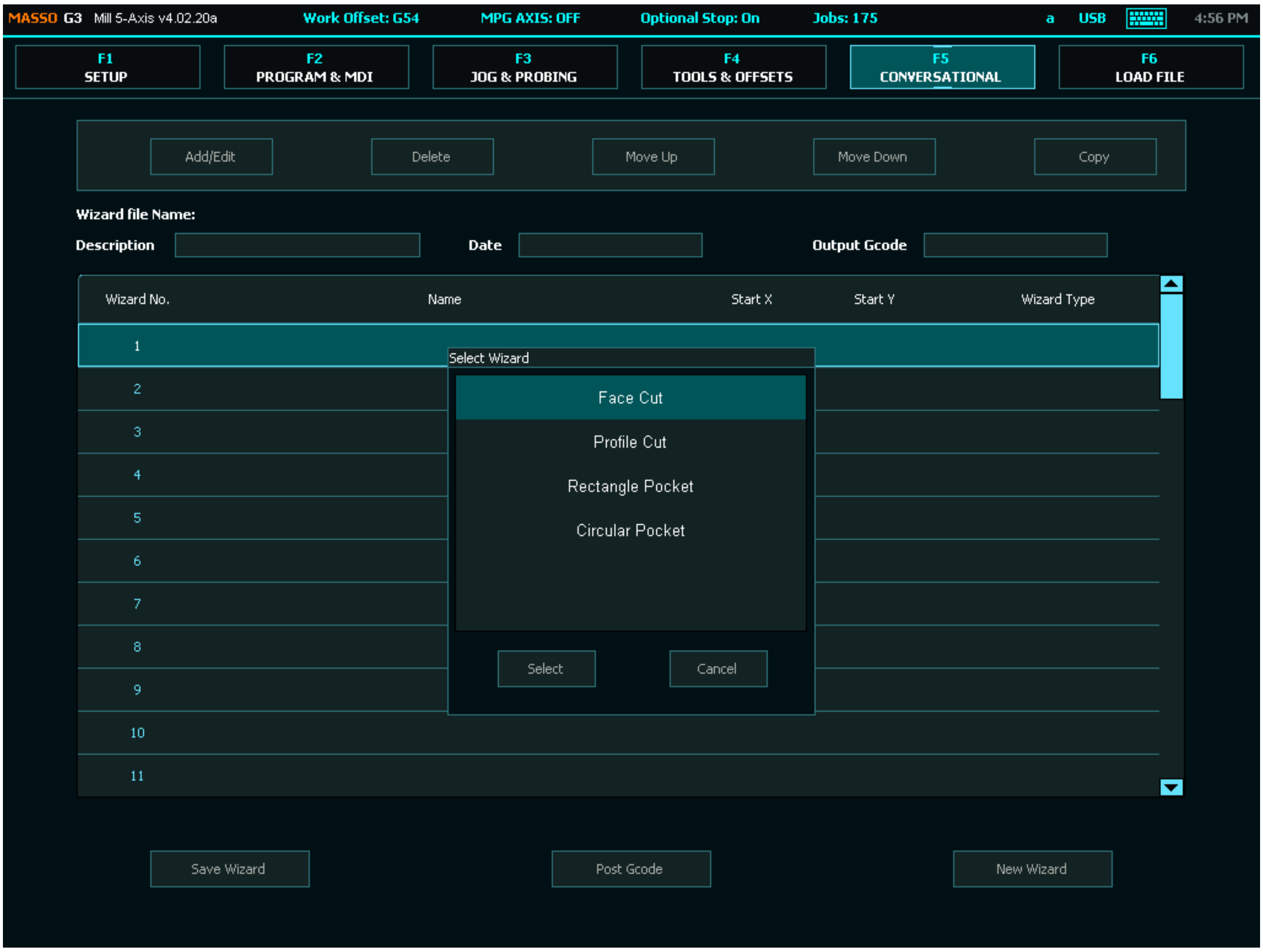

MASSO G3 Lathe v4.02.18a
Work Offset: G54
MPG AXIS: OFF
Optional Stop: On
Jobs: 540
3:49 PM
F1 SETUP
F2 PROGRAM & MDI
F3 JOG & PROBING
F4 TOOLS & OFFSETS
F5 CONVERSATIONAL
F6 LOAD FILE
Thread Wizard
TITLE
Tool No
Spindle Spin Up Delay
Spindle Direction
CW
CCW
Thread Direction
Right Hand
Left Hand
Tool Clearance
Initial Dia
Final Dia
Lead Length
Z End
Z Start
Depth of cut
Spindle RPM
Pitch
Infeed Angle
Save
Cancel
ABC

6.12.2. Mill Conversational Wizards

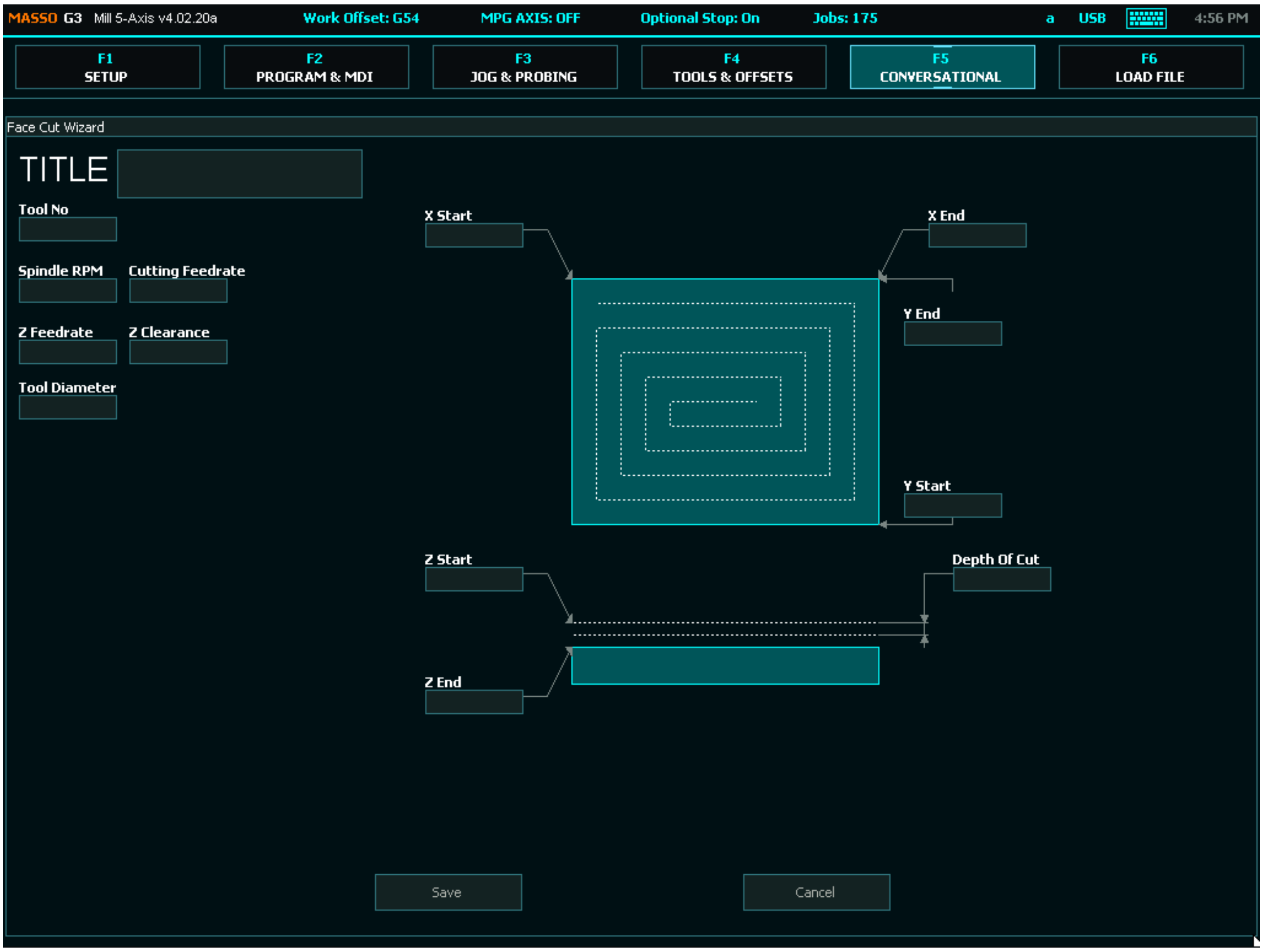
MASSO has built-in conversational wizards to easily generate gcode programs for basic machining operations by entering basic information.

List of wizards available for Milling Machines:

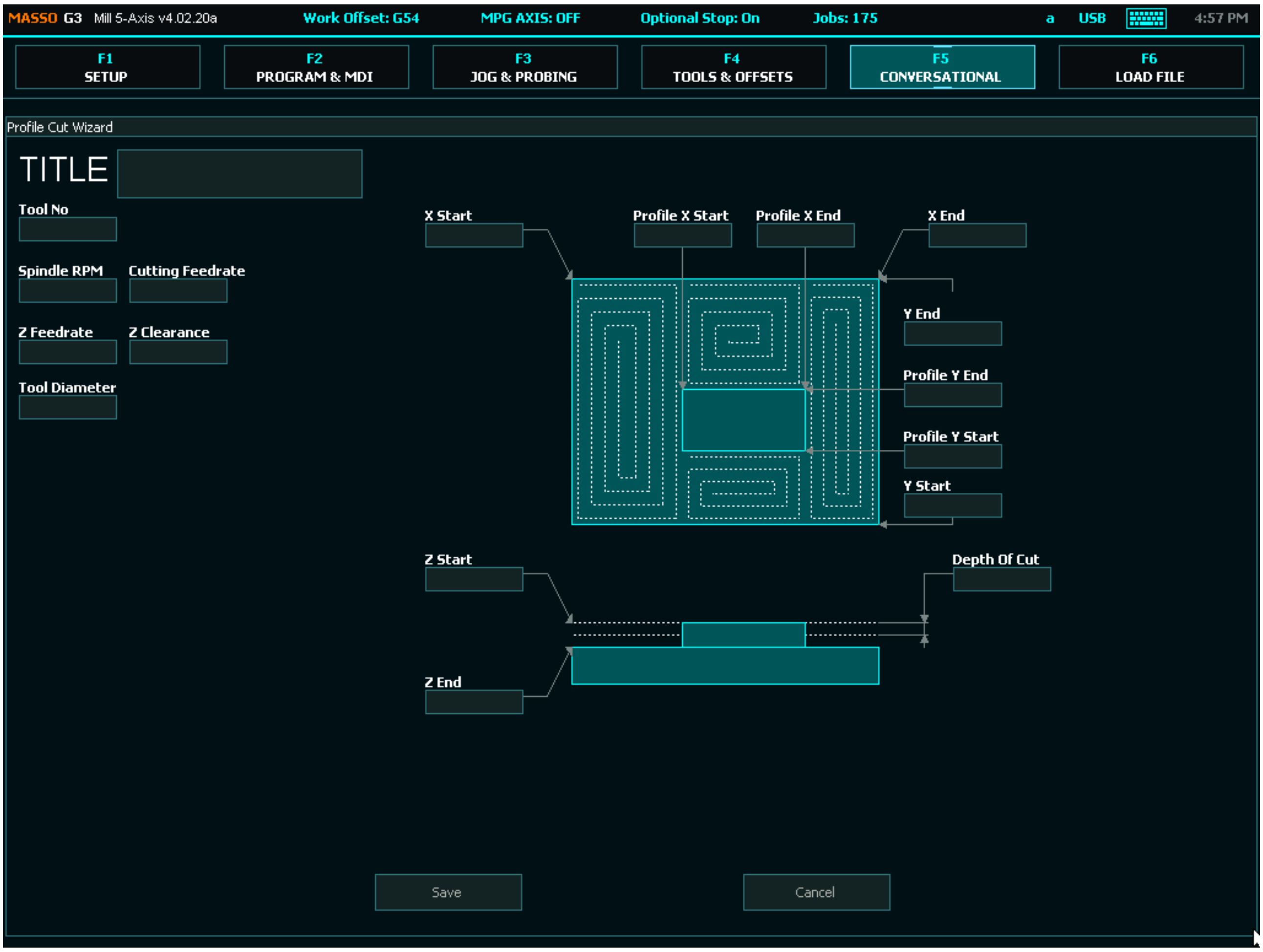
- Face cut wizard
- Profile cut wizard
- Rectangular pocket wizard
- Circular pocket wizard



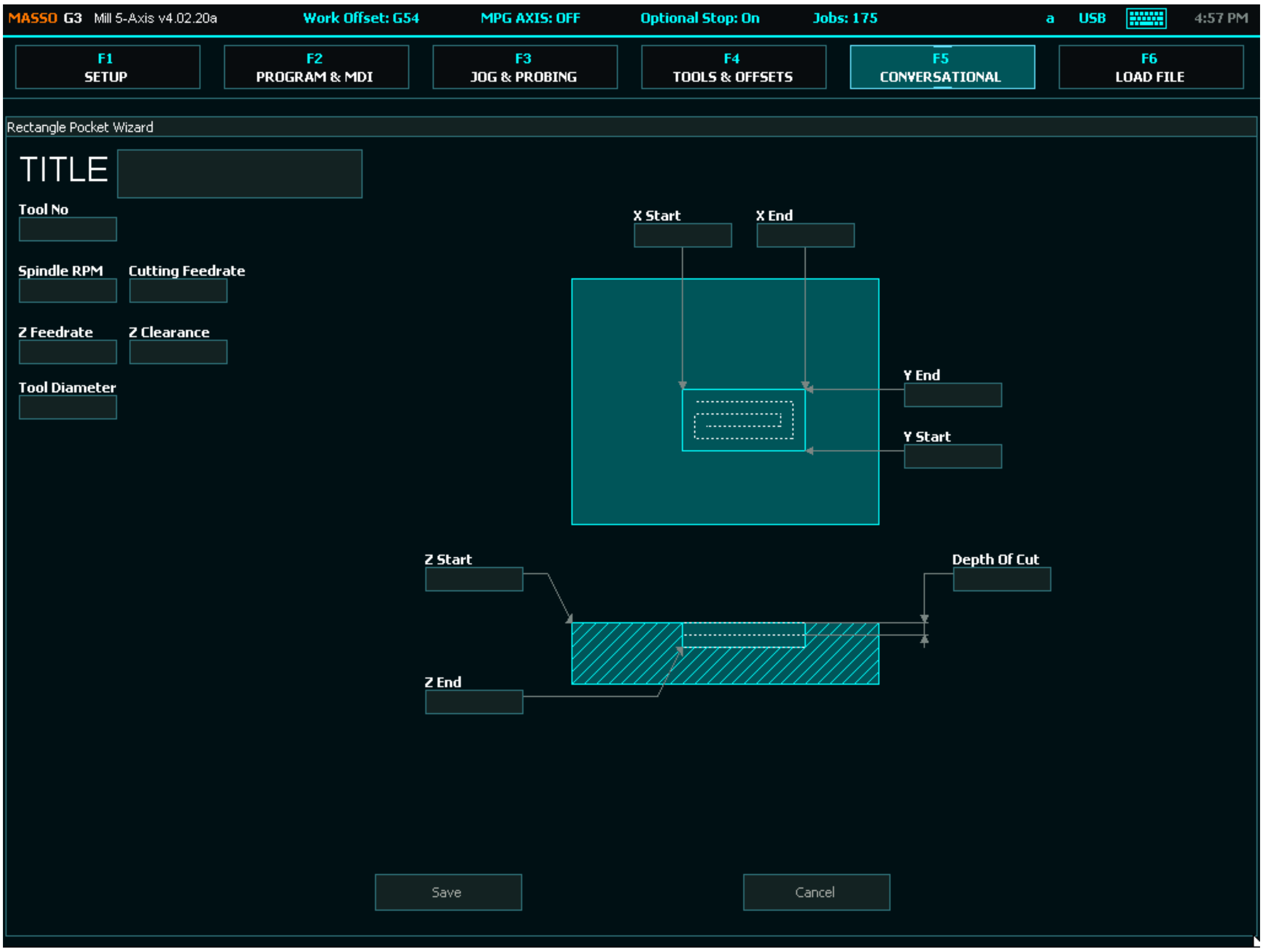
Face cut wizard



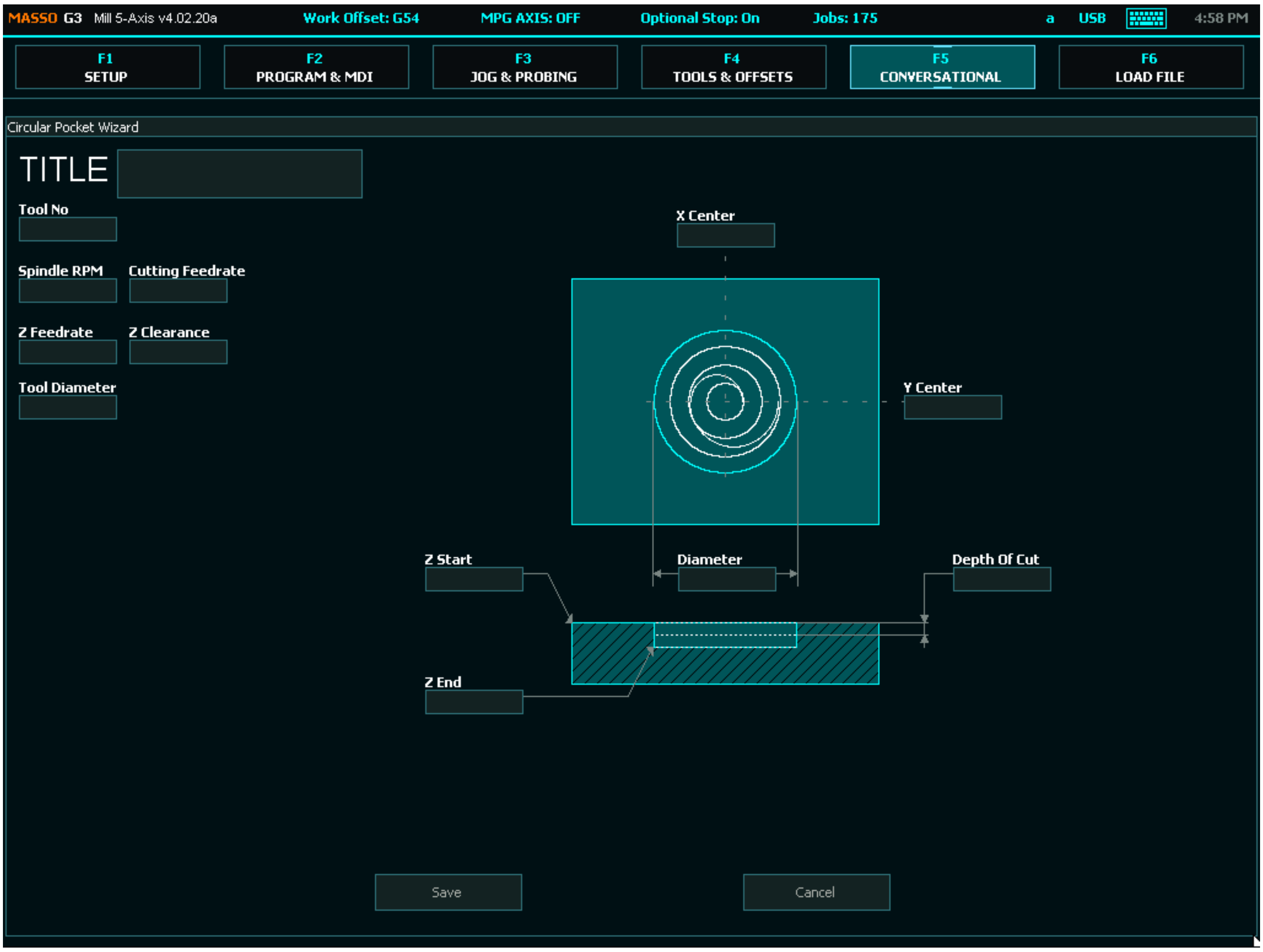
Profile cut wizard



Rectangular pocket wizard



Circular pocket wizard


MASSO G3 Mill 5-Axis v4.02.20a
Work Offset: G54
MPG AXIS: OFF
Optional Stop: On
Jobs: 175
a
USB
4:58 PM
F1
SETUP
F2
PROGRAM & MDI
F3
JOG & PROBING
F4
TOOLS & OFFSETS
F5
CONVERSATIONAL
F6
LOAD FILE
Circular Pocket Wizard
TITLE
Tool No
Spindle RPM
Cutting Feedrate
Z Feedrate
Z Clearance
Tool Diameter
X Center
Y Center
Z Start
Diameter
Depth Of Cut
Z End
Save
Cancel

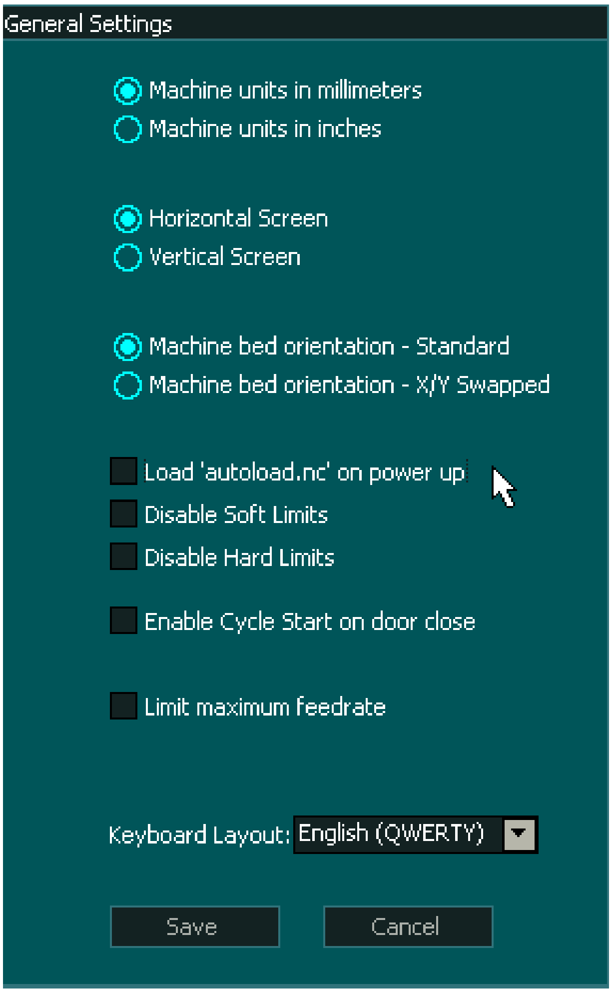
6.13. Auto Loading G-code

G-Code files can be automatically loaded by MASSO for special production runs and below are the different ways of automatically loading gcode files.

Automatically loading gcode file on power up or when connecting USB pen drive:

- Go to **"F1-Setup"** screen and open the "**General Settings"** window.
- Tick the **Load 'autoload.nc' on power up** option and click **Save** button.
- Now MASSO will look for a file **autoload.nc** on the USB Flash drive every time it powers up or if a USB Flash drive is connected. Once the file is found, its automatically loaded and pressing cycle start will start the job.

INFORMATION: The autoload files must be in root folder of the USB Flash drive.

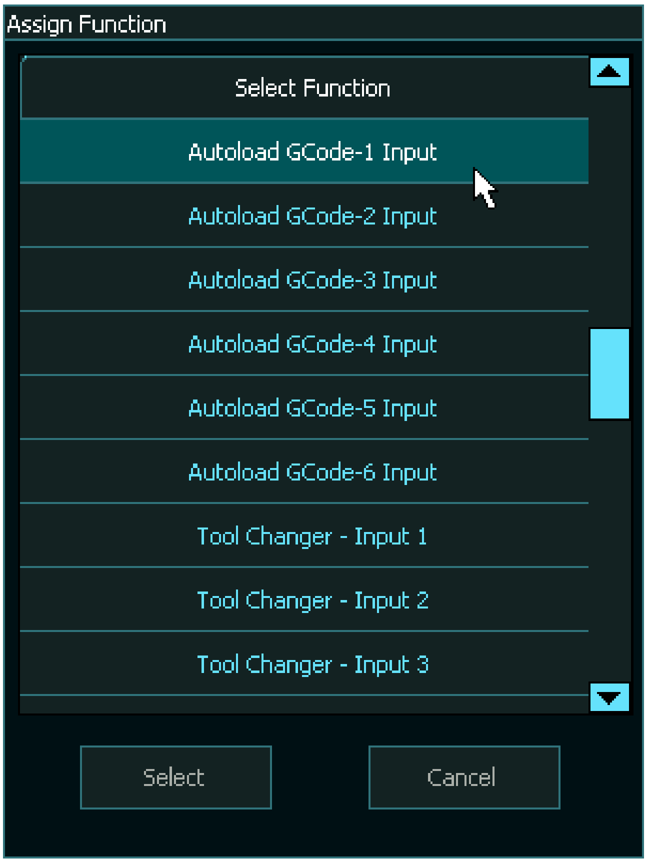


Loading gcode file on Input signal going high:

- Go to **"F1-Setup"** screen and go to the "**INPUTS"** list.
- From the **INPUTS** list select one of the free inputs and select **Autoload GCode-1 Input** option and double click to assign the function to the input.
- When this input goes **HIGH,** MASSO will look for a file **autoload1.nc** on the USB pen drive, once the file is found, its automatically loaded and pressing cycle start will start the job.

INFORMATION: You can assign up to 6 autoload functions on inputs.

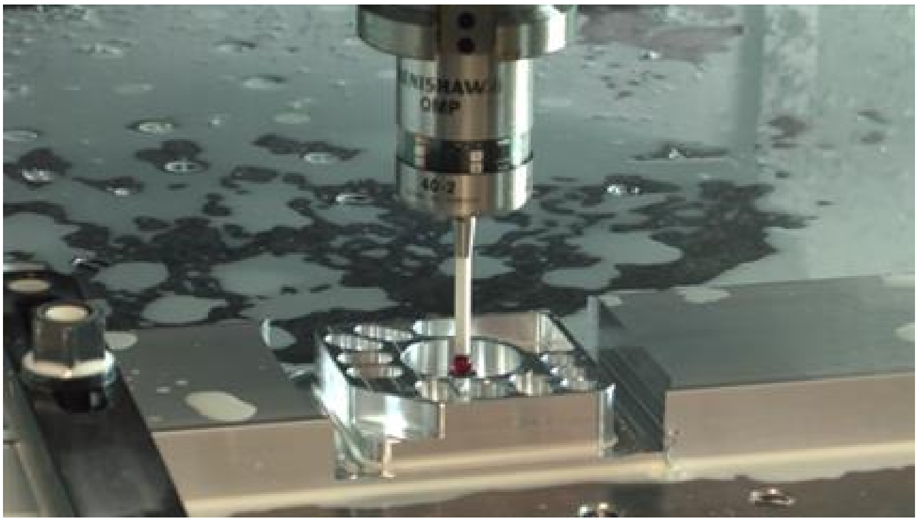
INFORMATION: The autoload files must be in root folder of the USB pen drive.



6.14. Probing

MASSO supports interactive part probing option that allows the user to probe parts and set work offsets. The following probing features are available:

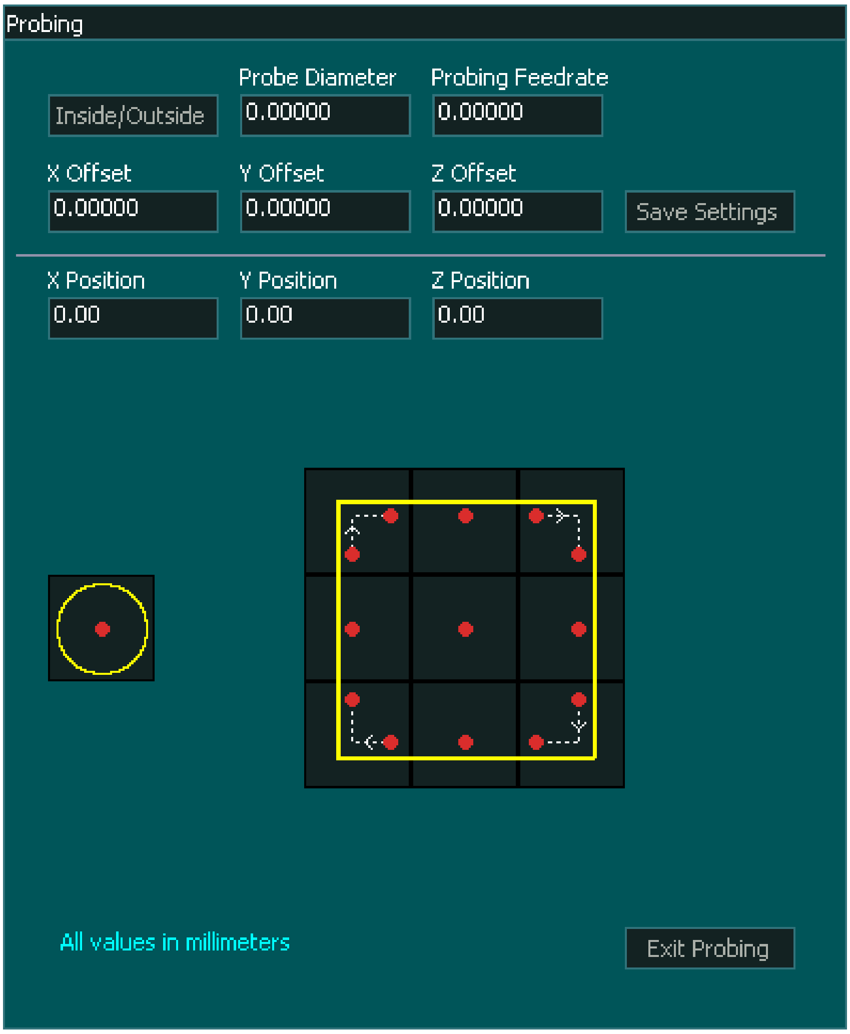
- Top of part.
- Sides of part.
- Corners of part.
- Auto find center of holes.

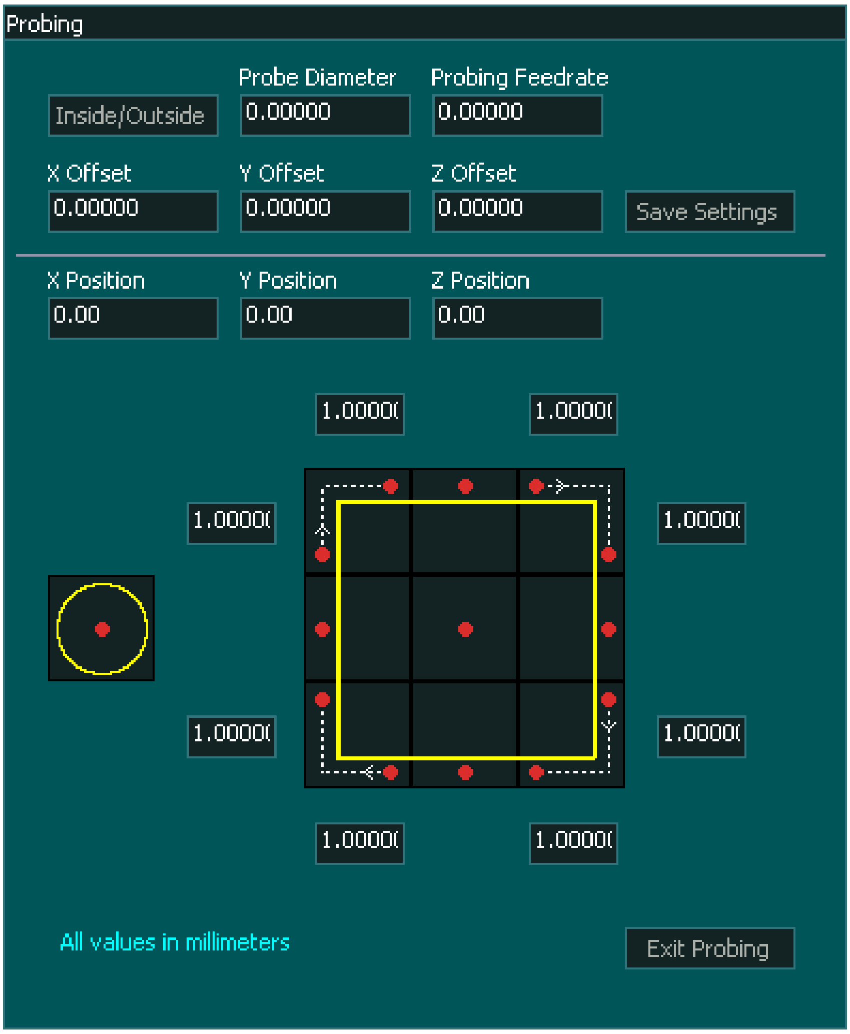


INFORMATION: Touch probe wiring instruction **CLICK HERE**

INFORMATION: Touch plate wiring instruction **CLICK HERE**

INFORMATION: ***Save Settings*** button needs to be pressed for a change of probing mode to take effect.


Probing
Probe Diameter
Probing Feedrate
Inside/Outside
0.00000
0.00000
X Offset
Y Offset
Z Offset
0.00000
0.00000
0.00000
Save Settings
X Position
Y Position
Z Position
0.00
0.00
0.00
All values in millimeters
Exit Probing



Scan the QR code to watch the MASSO video tutorial on YouTube

Or, [Click here to view the video]

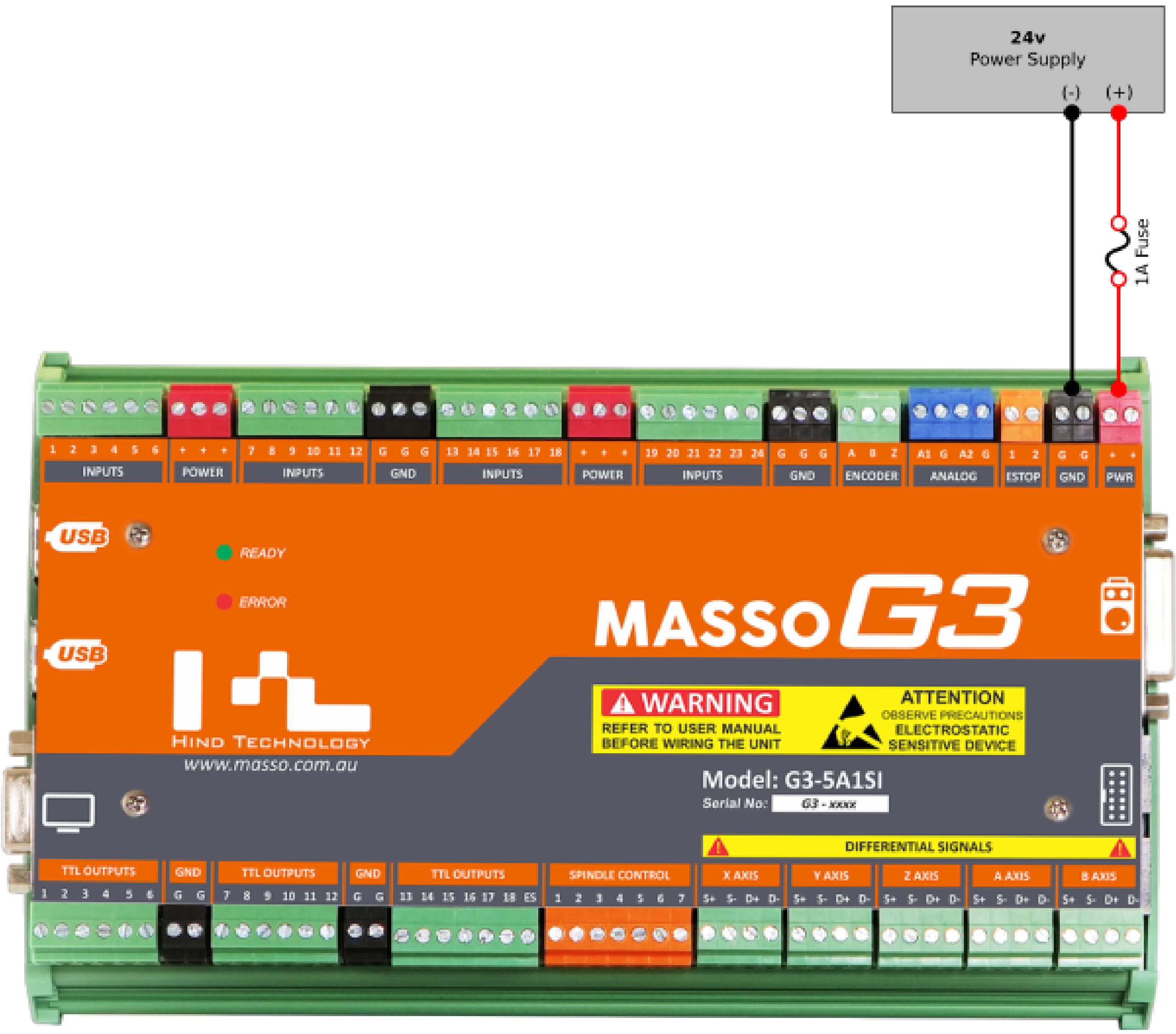
7. Quick Start Guides

7.1. Safe work practices when wiring MASSO

The purpose of this document is to provide information on good work practices while setting up and wiring your MASSO. If you are unsure about the wiring of your machine especially mains voltage equipment, please consult a certified service technician.

Install a Fuse

> **WARNING:** The installation of a 1 amp fuse between your Power Supply and MASSO is required to protect against an accidental short circuit of the auxiliary power connectors on MASSO, such an event can damage the controller beyond repair.



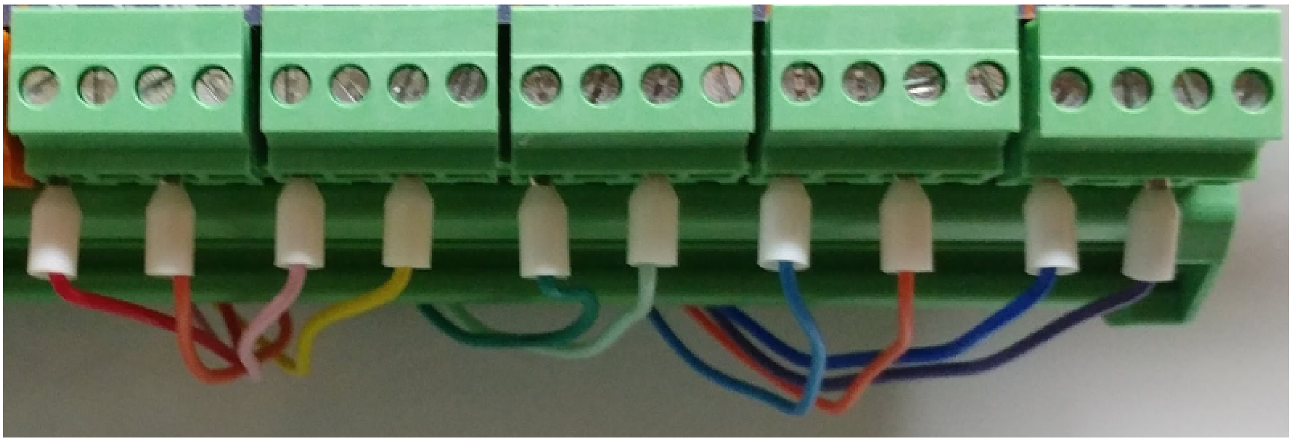
General

- When connecting, disconnecting or making wiring changes to MASSO turn off the power at the mains. This will ensure that if you should you accidentally touch a connection point while working on your system it will not immediately damage your system.

- Check your wiring after making wiring changes to ensure you have correctly wired your system before turning back on.

- Carry out wiring in a tradesman like manner keeping the wires neat where they connect to the screw terminals as a stray wire not captured can accidentally touch the terminal next to it and cause damage. While the use of Bootlace Ferrules are not required they can help keep your wires tidy and eliminate this problem

- Use coloured wires and keep records of how you have wired your MASSO and external devices. This will assist greatly with troubleshooting should you have an issue at a later date.

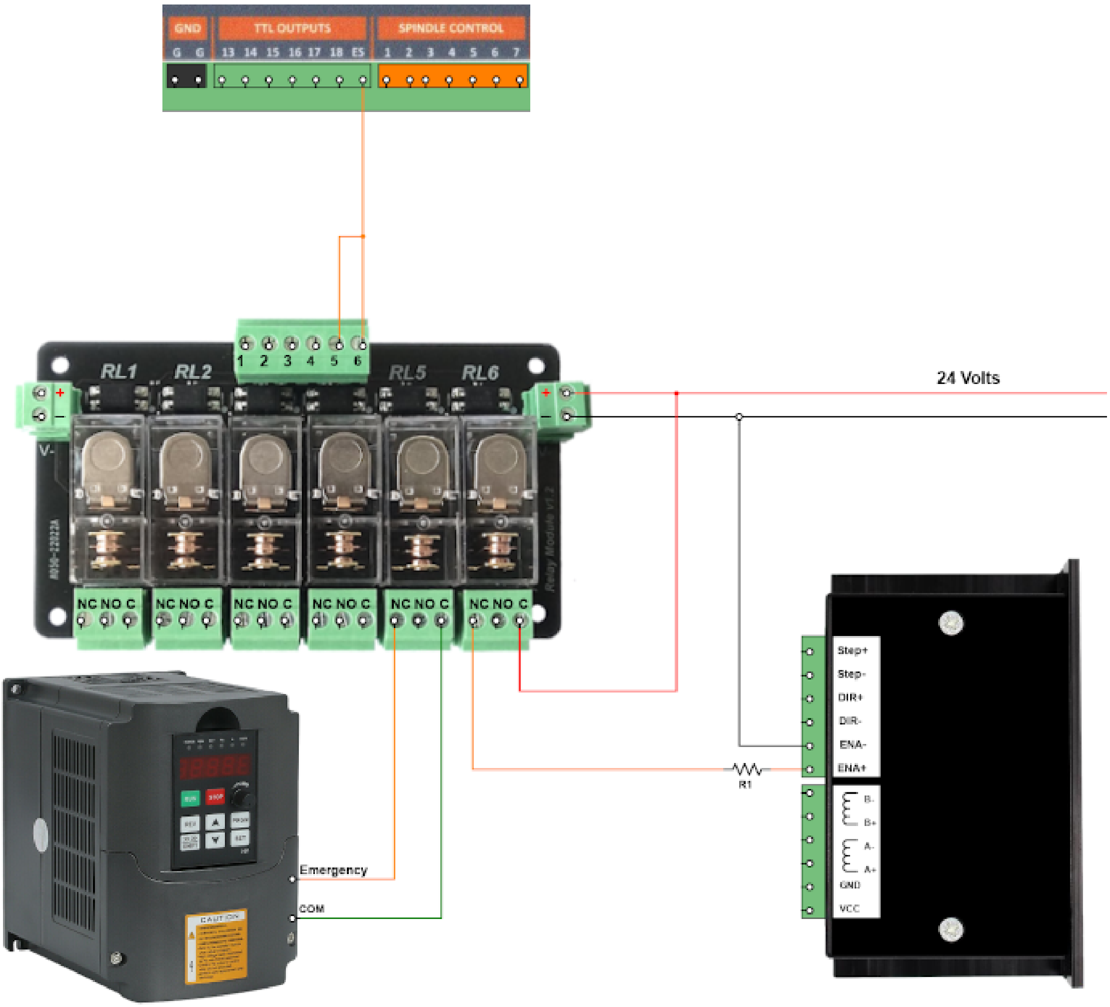


Sample colour coded wiring with Bootlace Ferrules

EStop

WARNING: E-Stop wiring must be done as per your country or region's safety regulation. MASSO will put the machine in feed hold and stop spindle on E-Stop press but all drives and actuators MUST be disabled directly by E-Stop signal from the E-Stop button. MASSO's E-Stop input is only designed to alert the user that the an E-Stop has been pressed.

- An EStop output is provided on MASSO which will allow you to connect a TTL Relay module to disable your drives, spindle and other external equipment. The output is labeled ES on MASSO.



CAUTION: This diagram is for demonstration purposes only to illustrate the concept. Please consult your stepper or servo drive and VFD manuals for the correct method of connection.

INFORMATION: Up to two of the MASSO relay inputs can be connected to the ES output. If more relay contacts are required use the TTL relay output to drive a relay with multiple contacts.

INFORMATION: Note that relays will operate when the Estop is released and release when Estop is engaged.

INFORMATION: If using a MASSO G2 Relay output 7 is the EStop ouput.

VFD Wiring

WARNING: Please exercise extreme care when setting up your VFD and Spindle. These are not toys and can lead to injury or death if not handled correctly. If you have any doubt contact a suitably qualified electrical technician to assist with your installation. VFD's are complex devices that **MUST** be installed by a certified person and treated with respect not only because they contain High voltages but also because incorrect configuration of a VFD can destroy both the VFD and the Spindle.

- Ensure you power down your VFD before making wiring changes

Plasma Wiring

WARNING: Please exercise extreme care when setting up your plasma. These are not toys and can lead to injury or death if not handled correctly. If you have any doubt contact a suitably qualified electrical technician to assist with your installation. Plasma's are complex devices that **MUST** be installed by a certified person and treated with respect not only because they contain High voltages but also because incorrect connection of a plasma can cause damage to your MASSO.

- Earthing is very important to the proper operation of any plasma machine. Correct earthing not only allows the Arc to work as it should and produce good quality cuts it also reduces noise generated by the plasma from causing issues with THC and MASSO operation. Please earth your plasma in accordance with best practices and the manufacturer's instructions.

Control of External mains operated devices

WARNING: The wiring of Mains operated devices MUST be installed by a certified person in accordance with the electrical regulations of your country.

- While the MASSO relay module is rated for 240V 5amp it is recommended that you do not mix low voltage and mains voltages on the same relay module. A better option is to use the MASSO relay output to operate a separate relay or relays located elsewhere within your control cabinet. Keep all of the mains relays together and shielded against accidental contact.

7.2. Setup MASSO Mill

Quick Start Guide MASSO-G3 Mill Configuration

These notes have been created to assist new users to set up key configuration properties in MASSO.

This is not a full configuration guide but seeks to provide configuration guidance. Some items need to be configured in the correct order or things will not work as expected. It will also point out common pitfalls and hints for first time users. I understand that users are keen to see things moving as quickly as possible but usually going slowly and carefully in small steps is far quicker than rushing ahead.

This guide does not seek to show how to connect the various hardware that you will connect to MASSO.

Getting Started

To configure MASSO you first need to connect a minimum of following items: Power supply, Monitor, Keyboard and mouse. Ideally you would also connect your Estop Switch, drives, limit switches, auto touch off, and VFD though you can connect these as you configure each of these components.

Power

Please note that a **1 amp fuse must be connected** in the feed from your Power supply on the MASSO G3. An accidental short circuiting of the auxiliary power terminals built into MASSO will cause damage to the main board if the fuse is not installed.

[Safe working Practices when wiring MASSO](#)

Load your Software

Please follow the instructions on below link to get your Software loaded.

> **Hint:** Most people have trouble loading software because you do not press the F1 repeatedly within the first 4 seconds of MASSO being turned on. If the software load screen does not appear on the screen please turn off and try again.

[Loading software to MASSO G3 instructions](#)

Additional resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Estop Switch

An Estop switch is important and MASSO will not work without one. Please ensure you have your Estop connected.

EStop Wiring

Hint: How the Estop switch is wired will depend on whether you have a pendant or not.

WARNING: E-Stop wiring must be done as per your country or region's safety regulation. MASSO will put the machine in feedhold and stop spindle on E-Stop press but all drives and actuators **MUST** be disabled directly by E-Stop signal from the E-Stop button. MASSO's E-Stop input is only designed to alert the user that the an E-Stop has been pressed.

Hint: When Estop is pressed the axis will decelerate to a stop. If an instant stop is wanted on your drives you need to wire the drive's enable circuit through an Estop Relay contact. A TTL output called ES is provided to allow you to connect a TTL relay which will release when the Estop is pressed. This can be used to stop external hardware. eg. VFD disable, disable motor drives etc.

Additional resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Axis configuration

Axis calibration instructions

Distance per revolution: How far your axis travels in one revolution of the motor.

Pulses per revolution: How many steps it will take for your motor to complete 1 revolution

Maximum feedrate: Defines your axis rapid speed.

Acceleration setting: Determines how quickly your axis accelerates to your chosen feedrate.

Travel Minimum: This value determines the extent of travel for the axis in the negative direction

Travel Maximum: This value determines the extent of travel for the axis in the positive direction

Invert direction: If your axis travels in the wrong direction, put a check in this box to reverse it.

Backlash: Enter your axis backlash. Note that it must not exceed 10mm or 0.3937”

Hint: The biggest mistake new users make is to ignore the maximum and minimum travel setting. If you leave these at 0 your axis will not move as these form part of MASSO soft limit system. Please note that disabling soft limits under general settings only disables them while machining but you are still bound by them when it comes to jogging your axis. It is recommended that you enter very large maximum and minimum values into your axis until you are ready to properly configure them. That way you will be able to jog around your table without running into a limit. The Maximum travel MUST be larger than the Minimum travel value or the axis will move in one direction only.

Rotary Axis

For information on how to setup and calculate a rotary axis please see the Quick Start guide on setting up a

Rotary Axis

Setting up a Rotary Axis

Jogging

Keyboard key shortcuts page

- To jog your machine you must be in the F3 Jogging screen.
- Jogging can be done on the F3 screen with either Mouse, Touch screen, Keyboard or Pendant.
- If you cannot Jog use the Mouse to click the jog buttons as users have had issues with faulty Keyboards, pendants and touch screens in the past. Using the mouse is the best test for jogging.

Hint: If the Axis DRO is not showing movement then the physical axis will not move. Please check your Axis settings above and especially your minimum and maximum travel values. If you reach a travel limit the button will turn red and the word **Limit** will be displayed on the button to let you know.

Hint: If your axis does not move check that you do not have a value of 0 in any of the following settings: Motor: Distance per revolution, Drive: Pulses per revolution, Maximum feedrate or Acceleration. Leaving a value of 0 in any of these 4 parameters on any axis will cause issues. If you are not using an axis please configure it with dummy values.

Pendant

No software configuration is required to make the MASSO MPG pendant work. Simply plug it in and it will work. To make the Estop button on the pendant work you need to wire the Estop in accordance with the Estop Instructions as per the below links. Once the Estop is wired through the pendant, removing the pendant will cause the E-Stop alarm and you will need to plug it back in to remove the Estop condition.

[MPG pendant wiring instructions](#)

[Wiring only one e stop on MPG pendant instructions](#)

Hint: The biggest problem new users have with pendants come from using 3rd party pendants with incompatible MPG's built into them. They may look the same but internally they use different components. The MASSO Pendant can be purchased from here: [MASSO MPG pendant](#)

Hint: MASSO cannot use USB pendants of any type.

Homing Switches and setting up homing

- These can be mechanical, optical, magnetic or proximity sensors.
- Each axis must have a homing switch including software slaved axis which are used for auto squaring.
- The one thing they all have in common is they must normally show Low on the F1 screen and change to High when triggered. Use the spacebar to toggle the input logic if yours is reversed.

Hint: If homing speed is too high the axis may overshoot the sensor and not be able to back off. If the sensor cannot be cleared within 10mm or 3/8” a homing alarm will indicate.

Homing setup instructions

Additional resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Hard Limits

The homing inputs double as hard limit inputs after the machine has been homed. To work, all hard limit switches must be outside the envelope of axis travel or the hard limit will trip before it reaches the full travel of your axis. Soft limits should be used first and Hard limits as a last resort. Tripping a hard limit will not instantly stop the axis but it will decelerate to a stop. Hard limits can be disabled under general settings.

Hint: if you mount your homing sensors/switch on the moving carriage and put a trigger at each end of the axis travel then only one sensor/switch can work for both homing and Hard limit triggering at each end of the axis travel.

Soft Limits

- Setting up soft limits is important to prevent your machine from crashing due to gcode command that might result in motion outside your machines physical limits.
- Set up incorrectly it will restrict machine travel and in extreme cases prevent the machine from moving at all.

Minimum and maximum travel setup instructions

Additional resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Auto Tool Zero

This feature is used to automatically calculate and adjust the length of each tool. MASSO takes a measurement when you home your machine and will return to the touch off point when a tool change is requested.

Please note that the thickness of the auto tool zero touch off is irrelevant as it is a reference point only. It uses the difference between where you zero your cutter and the initial measurement it took when homing to determine the length of each tool when making a tool change.

CAUTION: Never change a tool after you have homed your machine unless instructed to do so by MASSO. If you must change a tool without MASSO requesting it then do it before homing or home your machine immediately after to get a new reference. Otherwise your next tool change and all the ones that follow will be wrong.

Automatic tool length setup instructions

Additional resource video

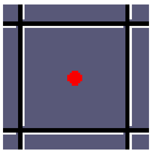
Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

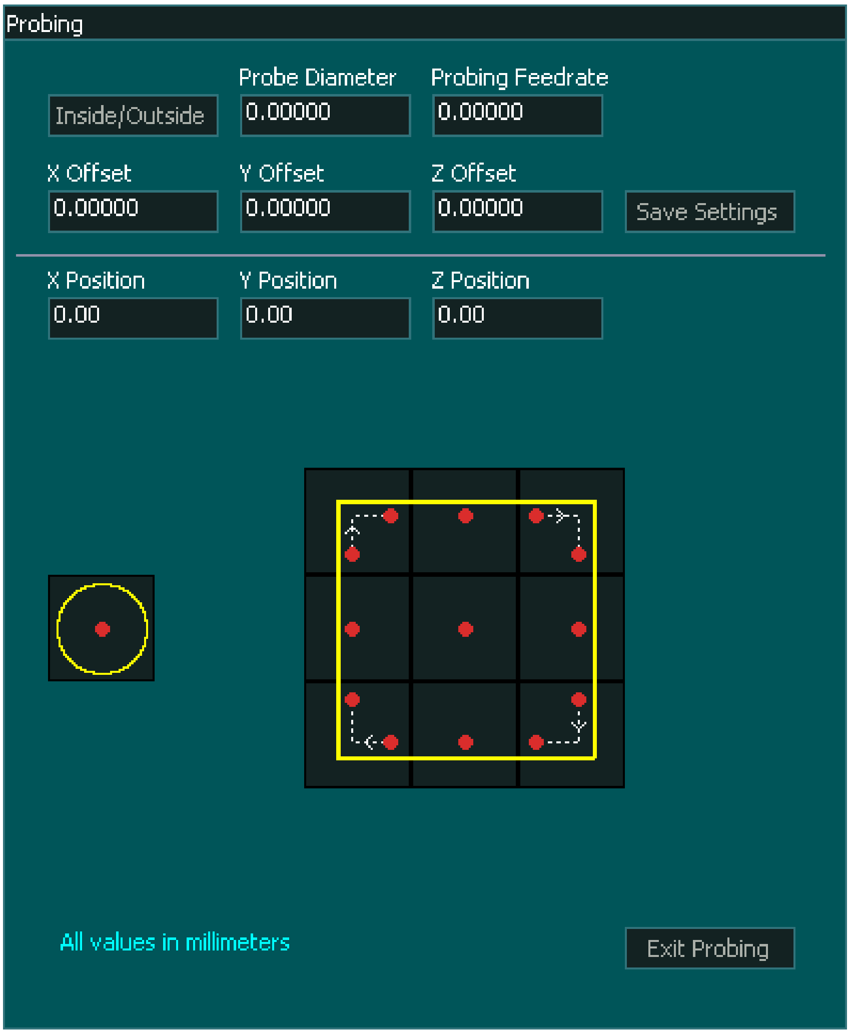
Probing

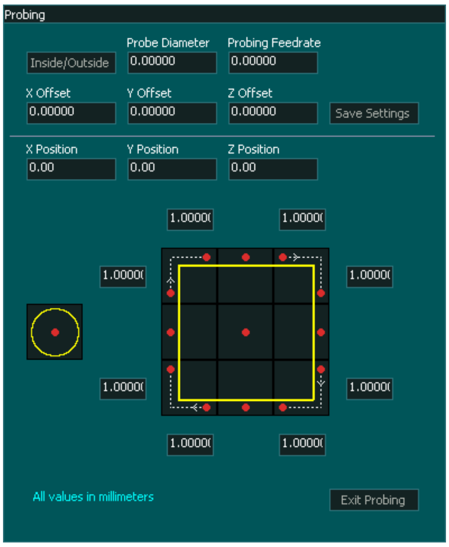
This document only covers Z height probing though there are many more probing routines built into MASSO. Z height probing can be done with either inside or outside probing screens.

Part probing instructions

- For probing your Z height enter the thickness of your touch off plate into Z Offset.
- If using a probing tool, Z offset is zero and you enter a value into the Probe diameter.
- Set a Probing feed rate and enter click save settings.
- Probe by clicking the center square. 
- Once probing is complete MASSO will automatically update the DRO with the new value.

Hint: If you want to reference your cutter to the surface of the spoilboard you can enter the negative of the nominal material thickness into Set Z and it will work everything out for you. eg for 18mm material enter -18 onto Set Z.


Probing
Probe Diameter
Probing Feedrate
Inside/Outside
0.00000
0.00000
X Offset
Y Offset
Z Offset
0.00000
0.00000
0.00000
Save Settings
X Position
Y Position
Z Position
0.00
0.00
0.00
All values in millimeters
Exit Probing



Controlling Spindle using a VFD

WARNING: Please exercise extreme care when setting up your VFD and Spindle. These are not toys and can lead to injury or death if not handled correctly. If you have any doubt contact a suitably qualified electrical technician to assist with your installation. VFD's are complex devices that MUST be installed by a certified person and treated with respect not only because they contain High voltages but also because incorrect configuration of a VFD can destroy both the VFD and the Spindle.

There are various VFD connection examples (provided as a reference only) within the documentation, please note that it is not practical to provide examples of every VFD model and please see the one that suits your VFD model.

- MASSO provides a 0-10v signal to control spindle speed (RPM).
- Two open collector optical switches for forward (clockwise) and reverse (counter-clockwise) signals.

Spindle setup instructions

Spindle VFD wiring examples

HINT: The biggest issue that users have following the VFD install video is they ignore the first instruction of the video to follow all of the steps. Some steps may seem unnecessary like setting the VFD to work manually but this is one of the most important. If you cannot get it to work manually with simple on/off switches and a potentiometer it will not work when connected to MASSO no matter what you do. As tempting as it is to connect everything at once, please do it step at a time and test as you go. Doing this can take a few extra minutes but can save you hours or days of work figuring out what is wrong.

HINT: The Spindle will not turn unless you issue a speed for it to run at. eg **S10000** and a **M3** or **M4** command.

7.3. Setup MASSO Plasma

Quick Start Guide MASSO-G3 Plasma Configuration

These notes have been created to assist new users to set up key configuration properties in MASSO Plasma.

This is not a full configuration guide but seeks to provide configuration guidance. Some items need to be configured in the correct order or things will not work as expected. It will also point out common pitfalls and hints for first time users. I understand that users are keen to see things moving as quickly as possible but usually going slowly and carefully is far quicker than rushing ahead. This does not seek to show how to connect the various hardware that you will connect to MASSO Plasma but will point to various references to assist.

INFORMATION: MASSO Plasma does not have a THC built in to it. For more information see the section below on THC installation

Getting Started

To configure MASSO you first need to connect a minimum of Power supply, Monitor, Keyboard and mouse. Ideally you would also connect your Estop Switch, drives, limit switches, auto touch off, and VFD though you can connect these as you configure each of these components.

Power

Please note that a **1 amp fuse must be connected** in the feed from your Power supply on the MASSO G3.

The accidental short circuiting of the auxiliary power terminals built into MASSO will cause damage to the main board if the fuse is not installed.

Safe working Practices when wiring MASSO

Load your Software

Loading software to MASSO G3

Please follow the instructions on this page to get your Software loaded.

Hint: Most people have trouble because you do not press the F1 repeatedly within the first 4 seconds of MASSO being turned on. If the software load screen does not appear on the screen please turn off and try again.

Additional resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Estop Switch

An Estop switch is important and MASSO will not work without one. Please ensure you have your Estop connected.

EStop Wiring

Hint: How the Estop switch is wired will depend on whether you have a pendant or not.

Hint: When Estop is pressed the axis will decelerate to a stop. If an instant stop is wanted on your drives you need to wire the drive's enable circuit through an Estop Relay contact. A TTL output called ES is provided to allow you to connect a TTL relay which will release when the Estop is pressed. This can be used to stop external hardware. eg. VFD disable, disable motor drives etc.

Additional Resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, [Click here to view the video]

Axis configuration

[Axis calibration]

Distance per revolution: How far your axis travels in one revolution of the motor.

Pulses per revolution: How many steps it will take for your motor to complete 1 revolution

Maximum feedrate: Defines your axis rapid speed.

Acceleration setting: Determines how quickly your axis accelerates to your chosen feedrate.

Travel Minimum: This value determines the extent of travel for the axis in the negative direction

Travel Maximum: This value determines the extent of travel for the axis in the positive direction

Invert direction: If your axis travels in the wrong direction, put a check in this box to reverse it.

Backlash: Enter your axis backlash. Note that it must not exceed 10mm or 0.3937"

> **Hint:** The biggest mistake new users make is to ignore the maximum and minimum travel setting. If you leave these at 0 your axis will not move as these form part of Masso soft limit system. Please note that disabling soft limits under general settings only disables them while machining but you are still bound by them when it comes to jogging your axis. It is recommended that you enter very large maximum and minimum values into your axis until you are ready to properly configure them. That way you will be able to jog around your table without running into a limit. The Maximum travel MUST be larger than the Minimum travel value or the axis will move in one direction only.

Jogging

[Keyboard-and-key-shortcuts]

To jog your machine you must be in the F3 Jogging screen.

Jogging can be done on the F3 screen with either Mouse, Touch screen, Keyboard or Pendant.

If you cannot Jog use the Mouse to click the jog buttons as users have had issues with faulty Keyboards, pendants and touch screens in the past. Using the mouse is the best test for jogging.

Hint: If the Axis DRO is not showing movement then the physical axis will not move. Please check your Axis settings above and especially your maximum and minimum travel. If you reach a travel limit the button will turn red and the word limit will be displayed on the button to let you know.

Hint: If your axis does not move check that you do not have a value of 0 in any of the following settings: Motor: Distance per revolution, Drive: Pulses per revolution, Maximum feedrate or Acceleration. Leaving a value of 0 in any of these 4 parameters on any axis will cause issues. If you are not using an axis please configure it with dummy values.

Pendant

[MPG pendant]

[Wiring only one e stop on MPG pendant]

No software configuration is required to make the MASSO Pendant work. Simply plug it in and it will work. To make the Estop button on the pendant work you need to wire the Estop in accordance with the Estop Instructions. See above. Once the Estop is wired through the pendant removing the pendant will cause MASSO to Estop and you will need to plug it back in to remove the Estop condition.

Hint: The biggest problem new users have with Pendants come from using 3rd party pendants with incompatible MPG's built into them. They may look the same but internally they use different components. The MASSO Pendant can be purchased from here:

[MASSO MPG pendant]

> **Hint:** MASSO cannot use USB pendants of any type.

Homing Switches and setting up homing

[Homing home inputs]

These can be Mechanical, optical, magnetic or proximity sensors.

Each axis must have a homing switch including software slaved axis which are used for auto squaring.

The one thing they all have in common is they must normally show Low on the F1 screen and change to High when triggered. Use the spacebar to toggle the input logic if yours is reversed.

> Hint: If homing speed is too high the axis may overshoot the sensor and not be able to back off. If the sensor cannot be cleared within 10mm or 3/8” a homing alarm will indicate.

Additional resources

[Homing Sensor Quick Start Guide]

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Hard Limits

The homing switches double as hard limit switches. To work all hard limit switches must be outside the envelope of axis travel or the hard limit will trip before it reaches the full travel of your axis. Soft limits should be used first and Hard limits as a last resort. Tripping a hard limit will not instantly stop the axis but it will decelerate to a stop. Hard limits can be disabled under general settings.

Hint: if you mount your Homing switch on the moving carriage and put a trigger at each end of the axis travel the one sensor can be both homing switch and limit switch triggering at each end of the axis travel.

Soft Limits

Minimum and maximum travel

Setting up soft limits is important to prevent your machine from crashing at the extremes of travel.

Set up incorrectly it will restrict machine travel and in extreme cases prevent the machine from moving at all.

Additional resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Probing

A big part of running your Plasma will include Probing to set the torch height above the material.

You can find how to connect your torch touch here:

Torch Touch (floating head) Signal

For Probing cycles G38.2 is used from within your Gcode to set your torch height.

G38.2 – Straight Probe Cycle

Jump to Line

INFORMATION: When using the Jump to line MASSO will search backwards in the Gcode file to locate the last M5 command and use this as it's starting line. If the line you have selected is an M5 command it will use that line. If there is no previous M5 command it will return to the start of the Gcode file.

Torch Breakaway

The torch breakaway signal is used to stop plasma and machine axis movements if the plasma torch is hit during a cut.

Details of the torch breakaway signal can be found here:

Torch Breakaway Signal

Torch On / Off

An input can be designated Plasma On / Off and is used to start and stop the Plasma.

You can configure any of the MASSO G3 TTL outputs as the Plasma on/off and connect it to your Plasma via the MASSO Relay Module

MASSO Relay Module

More information on connect your Plasma on/off can be found here:

Hypertherm 45, 65 & 85

THC installation

A THC is not required for Plasma but it is helpful in keeping the torch the required distance from the material you are cutting. The distance you keep the torch above the material will influence the quality of the cut and since metals are subject to warping and can be bent a THC will keep the distance you set constant.

The installation of a THC onto your MASSO is covered separately under the section

How THC Works

This will give you take you through the basic principals of how the THC interfaces with MASSO and explains the Gcode commands specific to the THC functionality

The document also shows examples of the 2 methods of connecting your THC to MASSO and explains why one method is preferred over the other.

7.4. Setup MASSO Lathe

Quick Start Guide MASSO-G3 Lathe Configuration

These notes have been created to assist new users to set up key configuration properties in MASSO.

This is not a full configuration guide but seeks to provide configuration guidance. Some items need to be configured in the correct order or things will not work as expected. It will also point out common pitfalls and hints for first time users. I understand that users are keen to see things moving as quickly as possible but usually going slowly and carefully in small steps is far quicker than rushing ahead.

This guide does not seek to show how to connect the various hardware that you will connect to MASSO.

Getting Started

To configure MASSO you first need to connect a minimum of following items: Power supply, Monitor, Keyboard and mouse. Ideally you would also connect your Estop Switch, drives, limit switches, auto touch off, and VFD though you can connect these as you configure each of these components.

Power

Please note that a **1 amp fuse must be connected** in the feed from your Power supply on the MASSO G3. An accidental short circuiting of the auxiliary power terminals built into MASSO will cause damage to the main board if the fuse is not installed.

[Safe working Practices when wiring MASSO]

Load your Software

Please follow the instructions on below link to get your Software loaded.

> **Hint:** Most people have trouble loading software because you do not press the F1 repeatedly within the first 4 seconds of MASSO being turned on. If the software load screen does not appear on the screen please turn off and try again.

[Loading software to MASSO G3 instructions]

Additional resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Estop Switch

An Estop switch is important and MASSO will not work without one. Please ensure you have your Estop connected.

EStop Wiring

Hint: How the Estop switch is wired will depend on whether you have a pendant or not.

WARNING: E-Stop wiring must be done as per your country or region's safety regulation. MASSO will put the machine in feedhold and stop spindle on E-Stop press but all drives and actuators **MUST** be disabled directly by E-Stop signal from the E-Stop button. MASSO's E-Stop input is only designed to alert the user that the an E-Stop has been pressed.

Hint: When Estop is pressed the axis will decelerate to a stop. If an instant stop is wanted on your drives you need to wire the drive's enable circuit through an Estop Relay contact. A TTL output called ES is provided to allow you to connect a TTL relay which will release when the Estop is pressed. This can be used to stop external hardware. eg. VFD disable, disable motor drives etc.

Additional resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Axis configuration

Axis calibration instructions

Distance per revolution: How far your axis travels in one revolution of the motor.

Pulses per revolution: How many steps it will take for your motor to complete 1 revolution

Maximum feedrate: Defines your axis rapid speed.

Acceleration setting: Determines how quickly your axis accelerates to your chosen feedrate.

Travel Minimum: This value determines the extent of travel for the axis in the negative direction

Travel Maximum: This value determines the extent of travel for the axis in the positive direction

Invert direction: If your axis travels in the wrong direction, put a check in this box to reverse it.

Backlash: Enter your axis backlash. Note that it must not exceed 10mm or 0.3937”

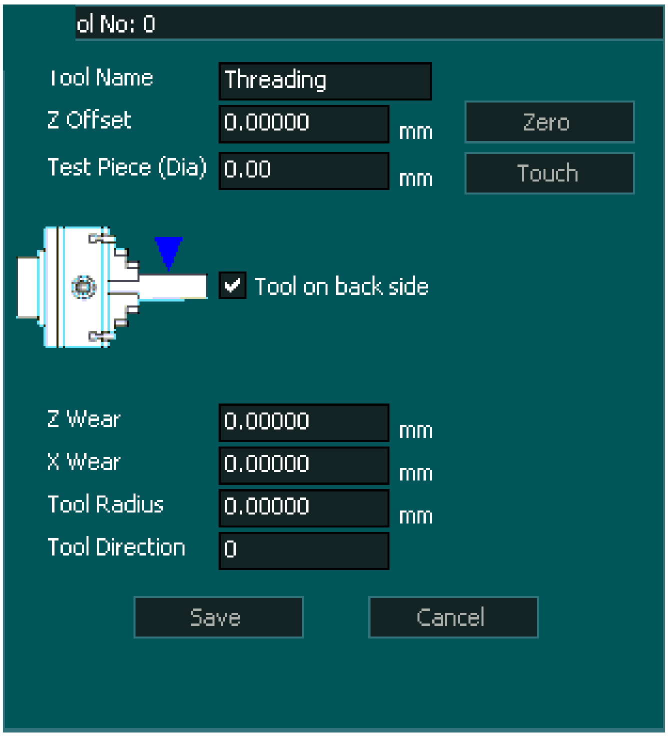
Hint: The biggest mistake new users make is to ignore the maximum and minimum travel setting. If you leave these at 0 your axis will not move as these form part of MASSO soft limit system. Please note that disabling soft limits under general settings only disables them while machining but you are still bound by them when it comes to jogging your axis. It is recommended that you enter very large maximum and minimum values into your axis until you are ready to properly configure them. That way you will be able to jog around your axis without running into a limit. The Maximum travel **MUST** be larger than the Minimum travel value or the axis will move in one direction only.

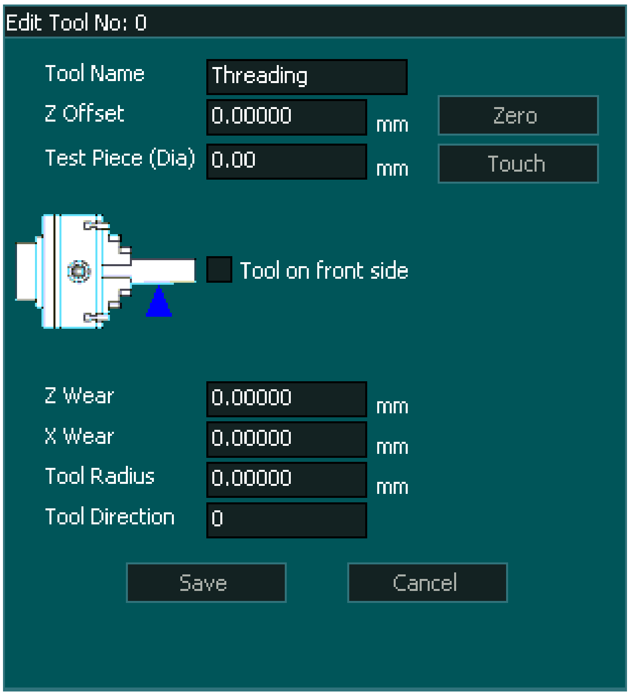
Understanding Lathe coordinate system

It is important to understand the MASSO Lathe coordinate system and how it works with front and rear tools

- The coordinate system is fixed no matter whether your tool is front or rear mounted.
- To assist with setting up your machine the +X, -X, +Z & -Z axis are marked on the screen. X0 is located in the center.
- When creating Gcode ensure you use a post processor designed for a rear mounted tool only regardless of whether your tool is front or rear mounted.
- When defining your tool in the tool table you need to specify if the tool is front or rear mounted. If the tool is front mounted MASSO will automatically perform the necessary coordinate calculations to machine your workpiece correctly. This means you can use the same Gcode file to machine with both a front and rear mounted tool.
- MASSO Lathe works in diameter mode

CAUTION: Use a post processor designed for a rear mounted tool only regardless of whether your tool is front or rear mounted. Failure to do so will cause unintended results.




Edit Tool No: 0
Tool Name
Threading
Z Offset
0.00000
mm
Zero
Test Piece (Dia)
0.00
mm
Touch
Tool on front side
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0.00000
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X Wear
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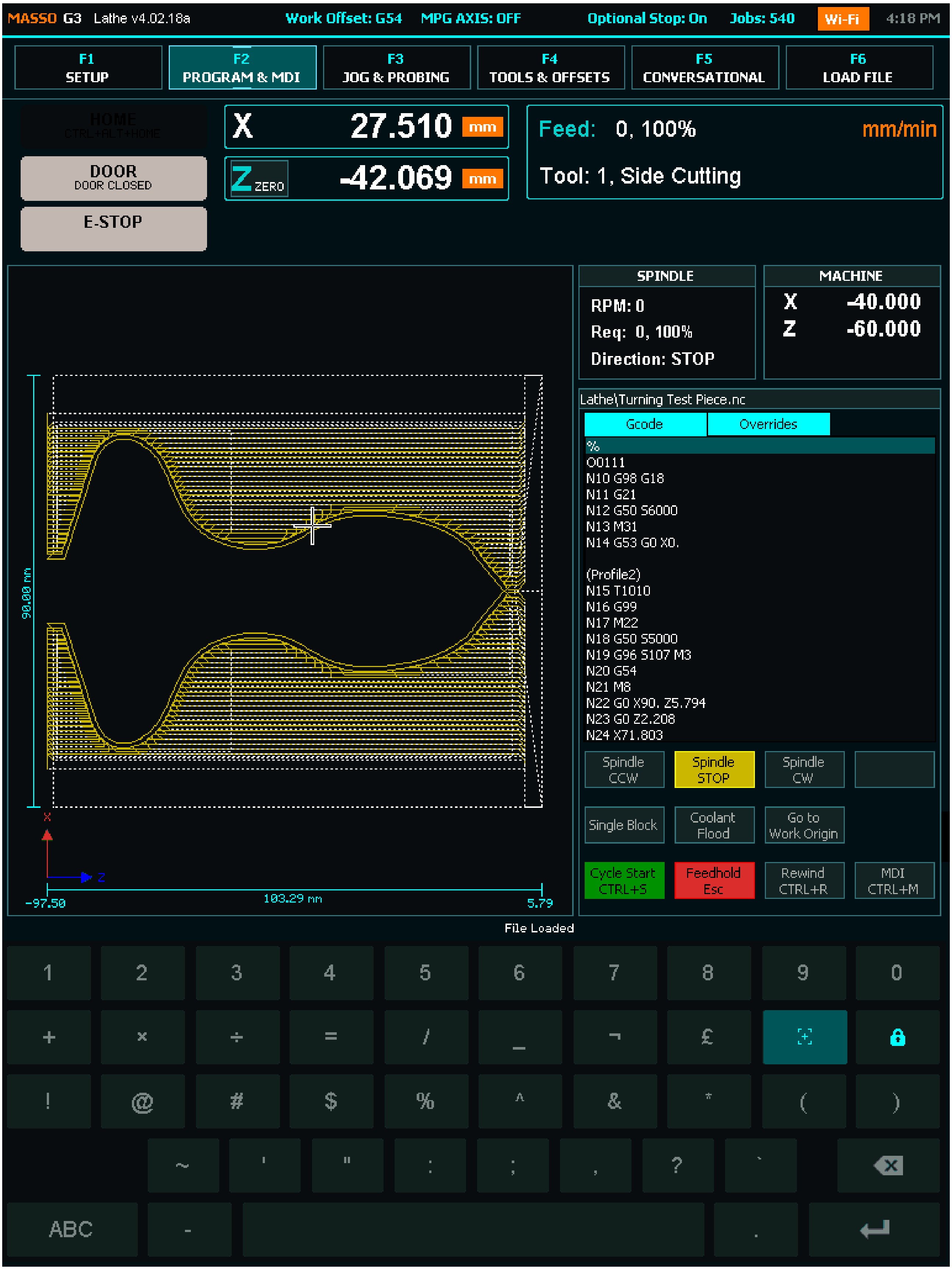
mm
Tool Radius
0.00000
mm
Tool Direction
0
Save
Cancel


MASSO G3 Lathe v4.02.18a
Work Offset: G54
MPG AXIS: OFF
Optional Stop: On
Jobs: 540
Wi-Fi
4:18 PM
F1 SETUP
F2 PROGRAM & MDI
F3 JOG & PROBING
F4 TOOLS & OFFSETS
F5 CONVERSATIONAL
F6 LOAD FILE
DOOR
DOOR CLOSED
E-STOP
X 27.510 mm
Z ZERO -42.069 mm
Feed: 0, 100%
mm/min
Tool: 1, Side Cutting
SPINDLE
RPM: 0
Req: 0, 100%
Direction: STOP
MACHINE
X -40.000
Z -60.000
Lathe\Turning Test Piece.nc
Gcode
Overrides
%
O0111
N10 G98 G18
N11 G21
N12 G50 S6000
N13 M31
N14 G53 G0 X0.
(Profile2)
N15 T1010
N16 G99
N17 M22
N18 G50 S5000
N19 G96 S107 M3
N20 G54
N21 M8
N22 G0 X90. Z5.794
N23 G0 Z2.208
N24 X71.803
Spindle CCW
Spindle STOP
Spindle CW
Single Block
Coolant Flood
Go to Work Origin
Cycle Start CTRL+S
Feedhold Esc
Rewind CTRL+R
MDI CTRL+M
90.00 mm
X
Z
-97.50
103.29 mm
5.79
File Loaded
1 2 3 4 5 6 7 8 9 0
+ × ÷ = / _ ¬ £
! @ # $ % ^ & * ( )
~ ' " : ; , ? `
ABC - .

Jogging

Keyboard key shortcuts page

- To jog your machine you must be in the F3 Jogging screen.
- Jogging can be done on the F3 screen with either Mouse, Touch screen, Keyboard or Pendant.
- If you cannot Jog use the Mouse to click the jog buttons as users have had issues with faulty Keyboards, pendants and touch screens in the past. Using the mouse is the best test for jogging.

Hint: If the Axis DRO is not showing movement then the physical axis will not move. Please check your Axis settings above and especially your minimum and maximum travel values. If you reach a travel limit the button will turn red and the word **Limit** will be displayed on the button to let you know.

Hint: If your axis does not move check that you do not have a value of 0 in any of the following settings: Motor: Distance per revolution, Drive: Pulses per revolution, Maximum feedrate or Acceleration. Leaving a value of 0 in any of these 4 parameters on any axis will cause issues. If you are not using an axis please configure it with dummy values.

Pendant

No software configuration is required to make the MASSO MPG pendant work. Simply plug it in and it will work. To make the Estop button on the pendant work you need to wire the Estop in accordance with the Estop Instructions as per the below links. Once the Estop is wired through the pendant, removing the pendant will cause the E-Stop alarm and you will need to plug it back in to remove the Estop condition.

MPG pendant wiring instructions

Wiring only one e stop on MPG pendant instructions

Hint: The biggest problem new users have with pendants come from using 3rd party pendants with incompatible MPG's built into them. They may look the same but internally they use different components. The MASSO Pendant can be purchased from here: MASSO MPG pendant

Hint: MASSO cannot use USB pendants of any type.

Homing Switches and setting up homing

- These can be mechanical, optical, magnetic or proximity sensors.
- Each axis must have a homing switch including software slaved axis which are used for auto squaring.
- The one thing they all have in common is they must normally show Low on the F1 screen and change to High when triggered. Use the spacebar to toggle the input logic if yours is reversed.

Hint: If homing speed is too high the axis may overshoot the sensor and not be able to back off. If the sensor cannot be cleared within 10mm or 3/8” a homing alarm will indicate.

Homing setup instructions

Additional resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Hard Limits

The homing inputs double as hard limit inputs after the machine has been homed. To work, all hard limit switches must be outside the envelope of axis travel or the hard limit will trip before it reaches the full travel of your axis. Soft limits should be used first and Hard limits as a last resort. Tripping a hard limit will not instantly stop the axis but it will decelerate to a stop. Hard limits can be disabled under general settings.

Hint: if you mount your homing sensors/switch on the moving carriage and put a trigger at each end of the axis travel then only one sensor/switch can work for both homing and Hard limit triggering at each end of the axis travel.

Soft Limits

- Setting up soft limits is important to prevent your machine from crashing due to gcode command that might result in motion outside your machines physical limits.
- Set up incorrectly it will restrict machine travel and in extreme cases prevent the machine from moving at all.

Minimum and maximum travel setup instructions

Additional resource video

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Spindle

- Spindle uses 0-10 volt signal to control speed normally via a VFD.
- If your spindle does not have speed control you can still do threading as the spindle encoder will track spindle speed for the threading operation however constant surface speed will not function as this requires active speed control.

Spindle control

Spindle Encoder

The spindle encoder is used for threading cycles.

Please read and understand the information on the Spindle encoder page. Pay special attention to the maximum frequency allowed and stay below this value.

Information on installing your encoder can be found using the link below.

Spindle Encoder

Lathe Tool Calibration

Follow the link below to learn more about the Lathe tool calibration process.

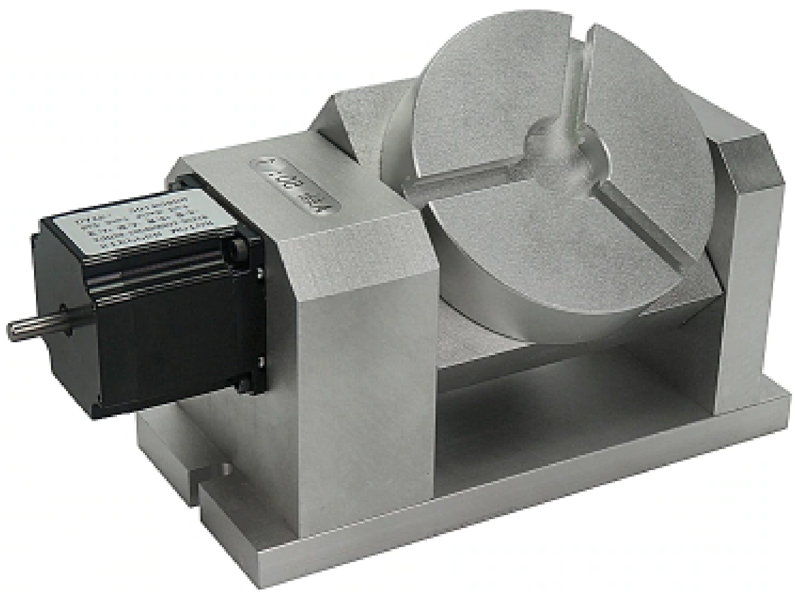
Tool Calibration Process

7.5. Setup Rotary Axis

There are 2 types of rotary axis used on a CNC machine. The Maximum and minimum travel settings will change depending on which type or rotary axis you are setting up.

- The first and most common is a 4th axis traditionally use on a Mill. This is usually the A axis and it rotates the stock in one axis only while the Z axis moves along it's length in the manner of a lathe.
- The second is as part of a 5 axis machine where the A & B axis are used to move the stock in 3D space for machining.

Rotary 4th Axis



5 Axis

Rotary axis settings are angular and not linear. There is no advantage to using huge step rates with large gear ratios. Breaking one rotation into a million steps will not help accuracy and give you a rotary axis that is slow. A value of 8000 to 10000 Pulses per revolution should be more than enough for most applications. Only when you are turning huge diameters 1 or 2 metres in diameter will you benefit from large Drive: Pulse per Revolution rates.

INFORMATION: Make your Motor: Degrees per revolution = 360 and this way you will always get a whole number for the Drive: Pulses per revolution. It is also easier to calculate and will make more sense when you are reading it.

How to Calculate Rotary axis settings

Gather the following information:

The number of steps per revolution of your motor. For example most steppers are 1.8 deg motors with 200 steps.

The gearing reduction ratio between the stepper and the rotary axis output. If you do not have any gearing the ration is 1.

Microstepping set on your motor drive.

- Calculate pulses per revolution as follows:
- Motor: Degrees per revolution = 360
- Drive: Pulses per Revolution = Motor steps per revolution x Gearing x Microstepping
- Maximum Feed rate = Set a value that suits your rotary axis capabilities. Remember that this is in degrees per minute and not RPM
- Acceleration = This value will depend on your machine's drives and cannot be calculated. These are found by actual testing on your machine.
- Maximum and Minimum Travel = If this is a Mill Rotary 4th axis by setting large maximum and minimum travel will allow you to use it like a wood lathe and sand your masterpiece if your machined part is suitably shaped and your maximum feed rate is fast enough..
- Maximum and Minimum Travel = If this rotary axis is used as part of a 5 axis machine you may need to limit the travel of the axis to prevent it running into hard stops. Set the travel values accordingly.
- Backlash = Measure and set according to your machine's measured backlash.

WARNING: Always calculate the rotary axis setting. Do not run axis calibration. Unlike a linear axis which can vary due to component tolerances, a rotary axis will always calculate accurately.

INFORMATION: MASSO has a rotary axis unwind built into the G28 command. G28-return-to-machine-home

My Rotary Axis moves Slow

This is caused by confusing linear and rotary speeds. Your axis will move at the rate of the slowest axis and reasonable linear speeds can be very slow when changed to degrees per minute

and in the worse case scenario can make the machine look like they are not moving at all. A feed rate of 10 inch per minute will take 36 minutes for the rotary axis to complete 1 rotation. Check out Rapid Rotary to get a better understanding.

Additional resources

https://www.ganotechnologies.com/cnc/rapidrotary/

Homing switch

A homing switch may be set up on your rotary axis to home the axis.

- These can be mechanical, optical, magnetic or proximity sensors.
- Each axis must have a homing switch including software slaved axis which are used for auto squaring.
- The one thing they all have in common is they must normally show Low on the F1 screen and change to High when triggered. Use the spacebar to toggle the input logic if yours is reversed.

INFORMATION: If you do not wish to install one then set the rotary axis to Home in the Homing settings and MASSO will zero out the machine coordinates for the Rotary axis when you home the machine. This is a common setup for a rotary 4th axis.

Homing setup instructions

MASSO homing Sensor

Hard Limits

On a rotary axis the hard limit does not work as a rotary axis will pass the switch once every revolution. If you need to limit the axis travel please use your maximum and minimum travel limits.

7.6. Homing Sensor Identify & Connecting

Homing Switch Overview

This document provides wiring and input configuration information based on the type of switch and wiring you are using. Due to the large variety of switches on the market we are unable to provide individual support for your chose sensor. This document will help you identify and connect your chosen sensor or switch and provide information on how to connect. Please use this in concert with the information that came with sensor. This document seeks to help identify Electronic switches such as proximity, optical or hall effect with the use of a voltmeter and some basic testing.

Wiring also provided for mechanical switches such as lever, push button and magnetic reed switches at the bottom of the page. Use a continuity tester to identify if your switches are normally open or closed and wire accordingly. Always used normally closed if you have the option of additional safety.

HINT: All MASSO inputs are optically isolated and require a voltage of 5V to 24V from your sensor to register an input.

INFORMATION: To invert an inputs logic, highlight the input and press the spacebar on your keyboard. All Homing inputs must show **LOW** when not operated and change to **HIGH** when active.

INFORMATION: If you are unsure what homing switch to purchase and how to wire it then MASSO supplies a Homing switch with full wiring instructions available.

Powering your Homing sensors

Power for the homing sensors on **MASSO G2** can be provided from:

- Directly from the MASSO power supply distribution point.
- A separate power supply which shares a common ground, (-ve rail), with your MASSO power supply.

Power for the homing sensors on **MASSO G3** or **MASSO G3 Touch** can be provided from:

- Directly from the MASSO power supply distribution point.
- A separate power supply which shares a common ground, (-ve rail), with your MASSO power supply
- The Auxiliary power terminals built into MASSO. These are the Red and Black terminals found between the input and output terminals.

WARNING: The installation of a 1 amp fuse between your Power Supply and MASSO is required to protect against an accidental short circuit of the auxiliary power connectors on MASSO, such an event can damage the controller beyond repair.

CAUTION: Power and **Ground** terminals provided on the controller are only to be used for very low current signals. Connecting high current loads can damage the controller beyond repair.

How to wire the MASSO homing sensor

MASSO Homing Sensor

Identify your Electronic homing switch type

Complete the following testing matrix using the steps below to identify your sensor type and required wiring / input setting.

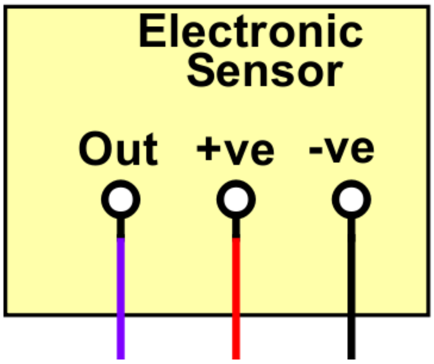
Step 1: Connect your sensor to a suitable power supply

Step 2: With sensor in normal state measure the voltage between the output & +ve and the output &-ve record the results in the table below. If the voltage is greater than 5 volts record a 1 otherwise record a 0. Ignore the polarity shown on the meter.

Step 3: Trigger the sensor and measure the voltage between the output & +ve and the output &-ve record the results in the table below. If the voltage is greater than 5 volts record a 1 otherwise record a 0. Ignore the polarity shown on the meter.

Electronic Homing Switch Matrix

	Output to -ve	Output to +ve	
Normal State			If the measured voltage is 5 volts or more write 1 in the box otherwise write 0 Ignore voltage polarity.
Triggered State			

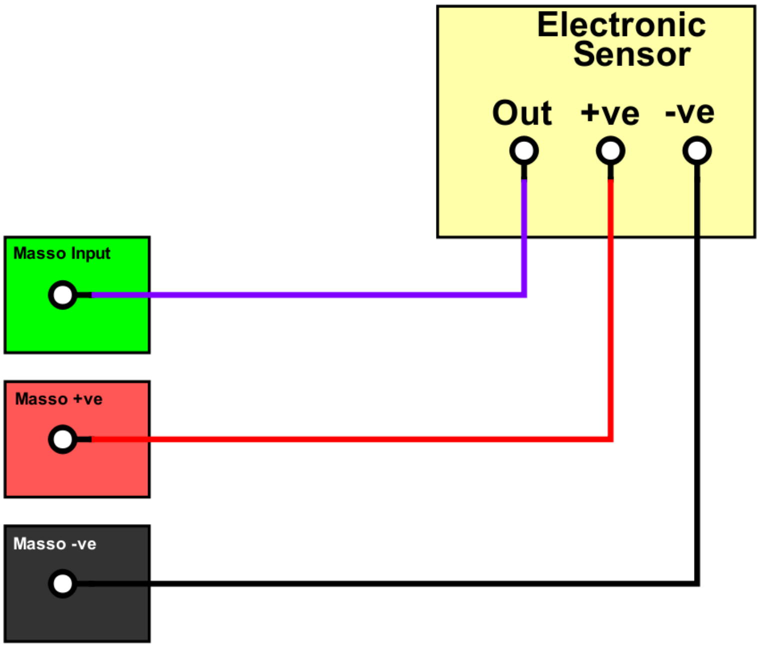


Step 4: Find the matching table below and use the wiring diagram and input configuration indicated.

Sensor Types and Wiring

Type 1

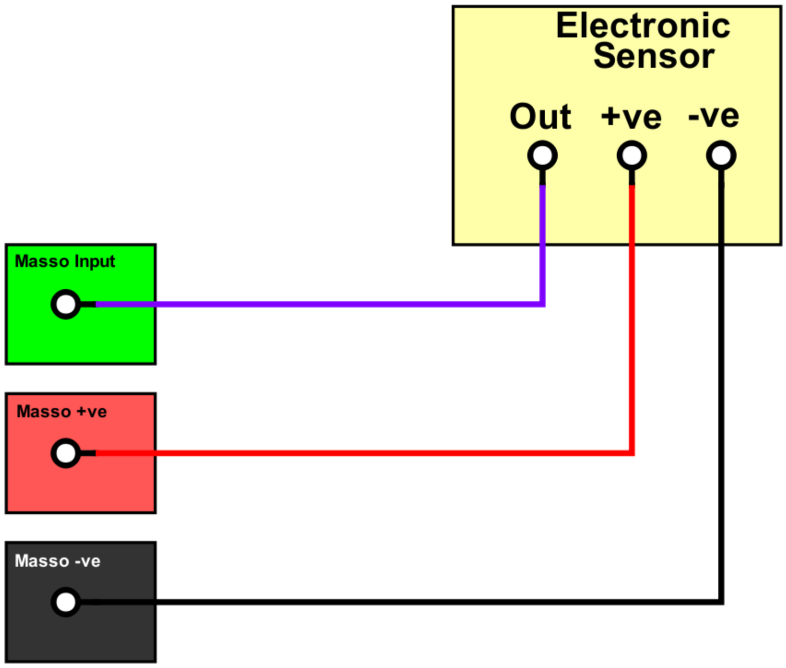
	Output to -ve	Output to +ve
Normal State	0	1
Triggered State	1	0



Type 2

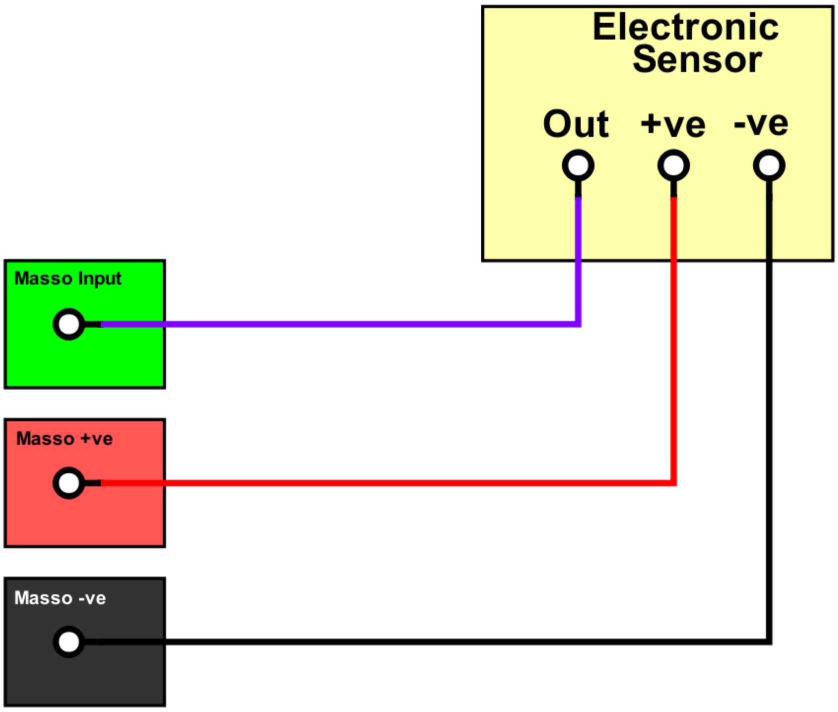
	Output to -ve	Output to +ve
Normal State	1	0
Triggered State	0	1

Note: Invert MASSO input for Type 2 sensor



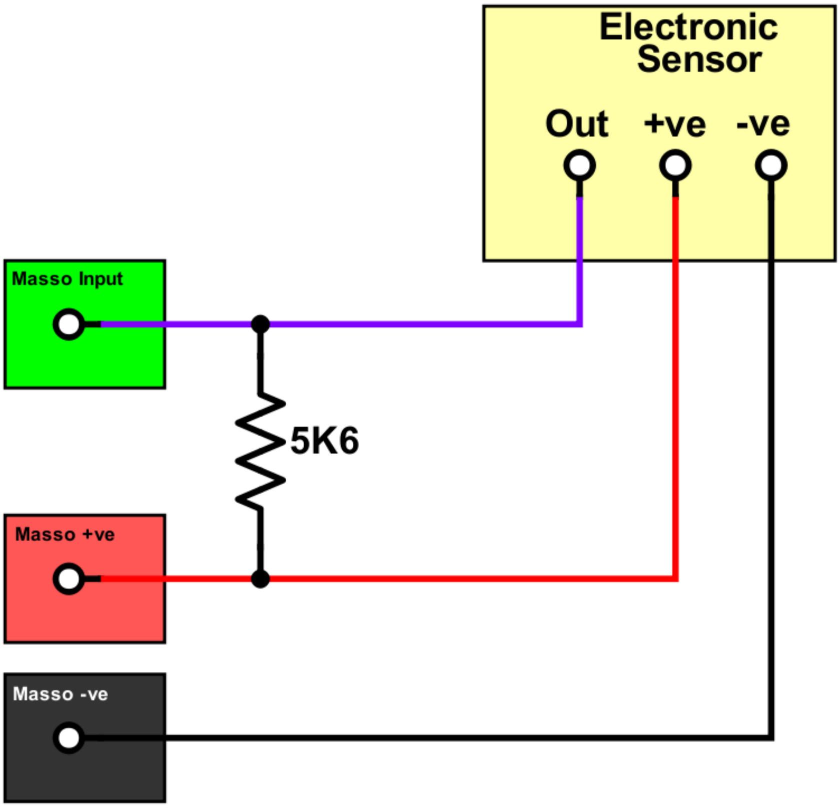
Type 3

	Output to -ve	Output to +ve
Normal State	0	0
Triggered State	1	0



Type 4

	Output to -ve	Output to +ve
Normal State	0	0
Triggered State	0	1



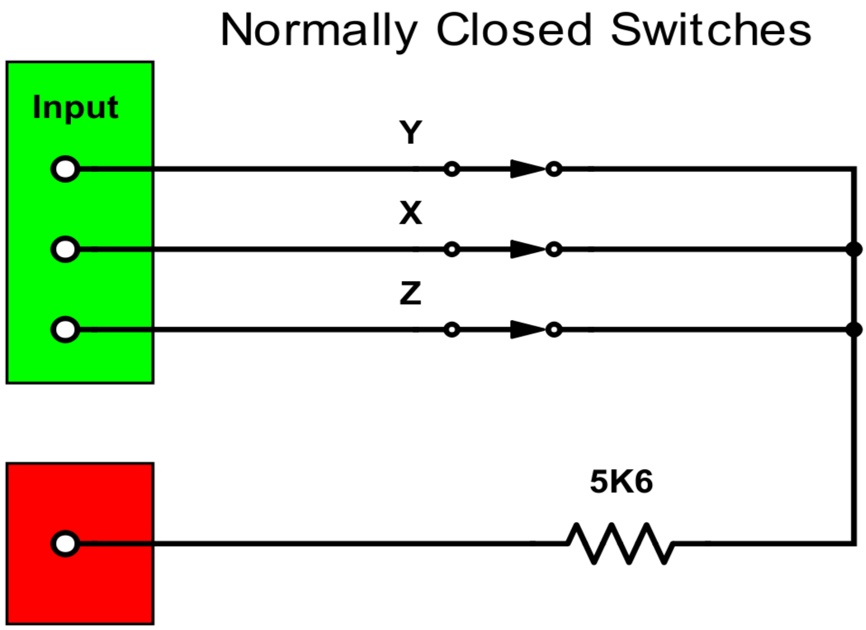
Note: Invert MASSO input for Type 4 sensor

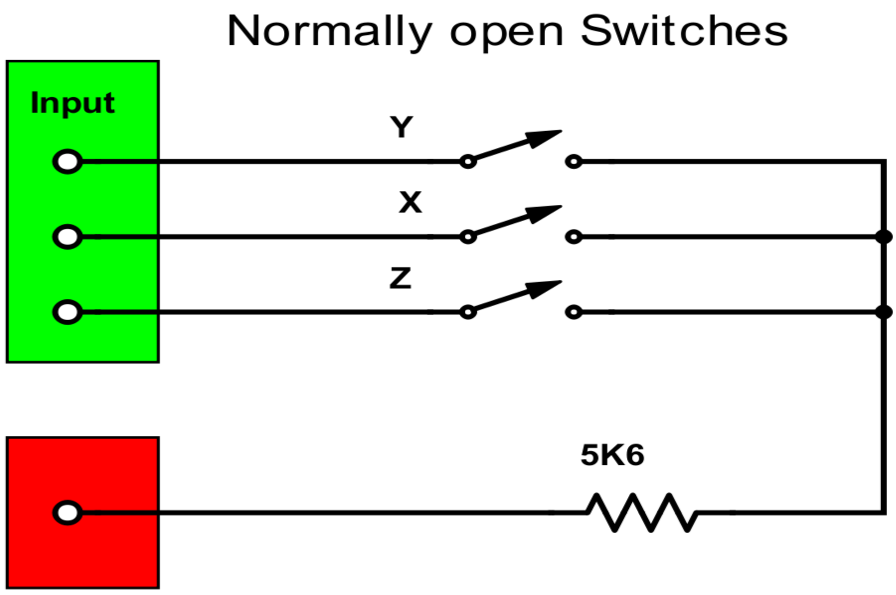
Mechanical Homing Switch connection

There are 2 ways of connecting Mechanical switches but the preferred method is using a normally closed switch which is the more fail safe method of the two. Should a homing switch wire break, the homing input will go high making MASSO think the Homing switch is already active so will attempt to back off the switch and will stop after 10mm.

In case of normally open switches a broken wire will not change the input and MASSO will drive the entire distance allowed before giving a homing alarm.

Note: Invert MASSO inputs when using Normally closed switches





Additional Resourses

For additional information on Homing and how to set it up please see our documentation on setting up homing.

Setting up Homing

Detailed video on setting up Homing settings in MASSO

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

8. Supported G-codes

8.1. G00 - Rapid Motion

This command is used to move one or more axis at the maximum feedrate to a specified location. If multiple axis are called they will all move together to the desired location in a straight line and arrive at the same time. The axis can be linear, angular or a combination of both.

Syntax & Parameters

G00 followed by the axis you wish to move and it's coordinate. Multiple axis may be specified on the same line.

X, Y, Z, A, B Value – specifies the axis you wish to move following the distance to move. The distance value will be the current machine units in use.

Example program

```
N10 G21  N20 G00 X10 Y20 Z30
```

In the above program the first line command G21 will first set the controller units to millimetres, then it will move the axis from its current location to next position of X 10mm, Y 20mm, & Z30 mm in a straight line at the maximum speed the machine axis will allow.

> **INFORMATION:** Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

> **INFORMATION:** The motion can be either in G90 Absolute or G91 Incremental mode.

8.2. G01 - Linear Interpolation Motion

This command is used to move one or more axis at the specified feedrate to a specified location. If multiple axis are called they will all move together to the desired location in a straight line and arrive at the same time. The axis can be linear, angular or a combination of both.

Syntax & Parameters

G01 followed by the axis you wish to move and it's coordinate. Multiple axis may be specified on the same line.

X, Y, Z, A, B Value – specifies the axis you wish to move following the distance to move. The distance value will be the current machine units in use.

F Value – The F value defines the feedrate at which the axis will move at. If the F value is not specified then the feedrate used from the last G01 command is used.

Example program

```
N10 G21  N20 G01 X10 Y20 Z30 F100  N30 G01 X0 Y0 Z0
```

In above program the first line command G21 will first set the controller units to millimetres, then it will move the axis to next position of X 10mm, Y 20mm, & Z 30mm in a straight line at 100mm/min feedrate. In the last line the axis will move to X 0mm, Y 0mm, & Z 0mm at 100mm/min feedrate.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

INFORMATION: The motion can be either in G90 Absolute or G91 Incremental mode.

8.3. G02 – Circular Interpolation (Clockwise)

This command runs a circular motion in a clockwise direction. The arc starts at the current position and the center is defined by the I, J values as an offset of the current position or R for radius. The X & Y values define the finish point. Masso uses Incremental I & J values for Arcs

Syntax & Parameters

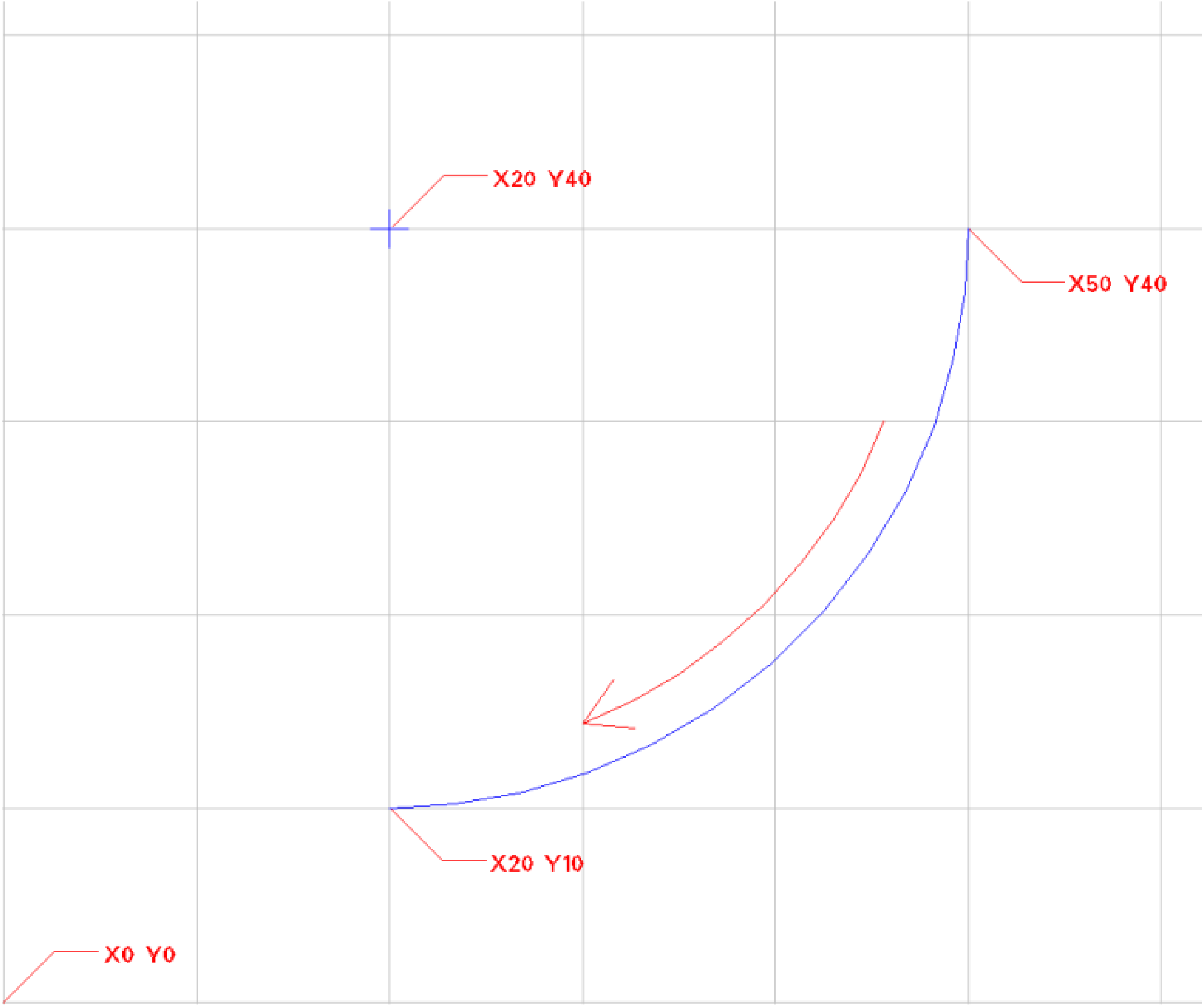
- **G02** starts an arc movement beginning at the X & Y coordinate location where the G02 was issued.
- **X Value** – This is the X coordinate defining the end point
- **Y Value** – This is the Y coordinate defining the end point
- **I Value** – are relative coordinates and define the X center coordinate as an offset of the starting point X coordinate.
- **J Value** – are relative coordinates and define the Y center coordinate as an offset of the starting point Y coordinate.
- **Z Value** - The addition of a Z value will describe a helical move.
- **R Value** - Is used to define the arc radius for arcs up to 90 degrees.

Caution: The use of R Value for arcs greater than 90 degrees do not work as it defines multiple centre points. For arcs greater that 90 degrees use IJK values for G02 commands.

Example program for making an Arc

```
N10 G00 X50 Y40 Z-1  N20 G02 X20 Y10 I-30 J0
```

- In the above example in the first line moves to position X50 Y40 Z-1
- An arc is made starting at position X50 Y40 and ending at coordinate X20 Y10 with center at position X20 Y40 moving in a clockwise direction. The Z height does not change.
- The Arc center is calculated as follows
- Starting position X50 + I-30 = Center X coordinate X20
- Starting position Y40 + J0 = Center Y coordinate Y40


X20 Y40
X50 Y40
X20 Y10
X0 Y0

8.4. G03 – Circular Interpolation (Counter Clockwise)

This command runs a circular motion in a counter clockwise direction. The arc starts at the current position and the center is defined by the I, J values as an offset of the current position or R for radius. The X & Y values define the finish point. Masso uses Incremental I & J values for Arcs

Syntax & Parameters

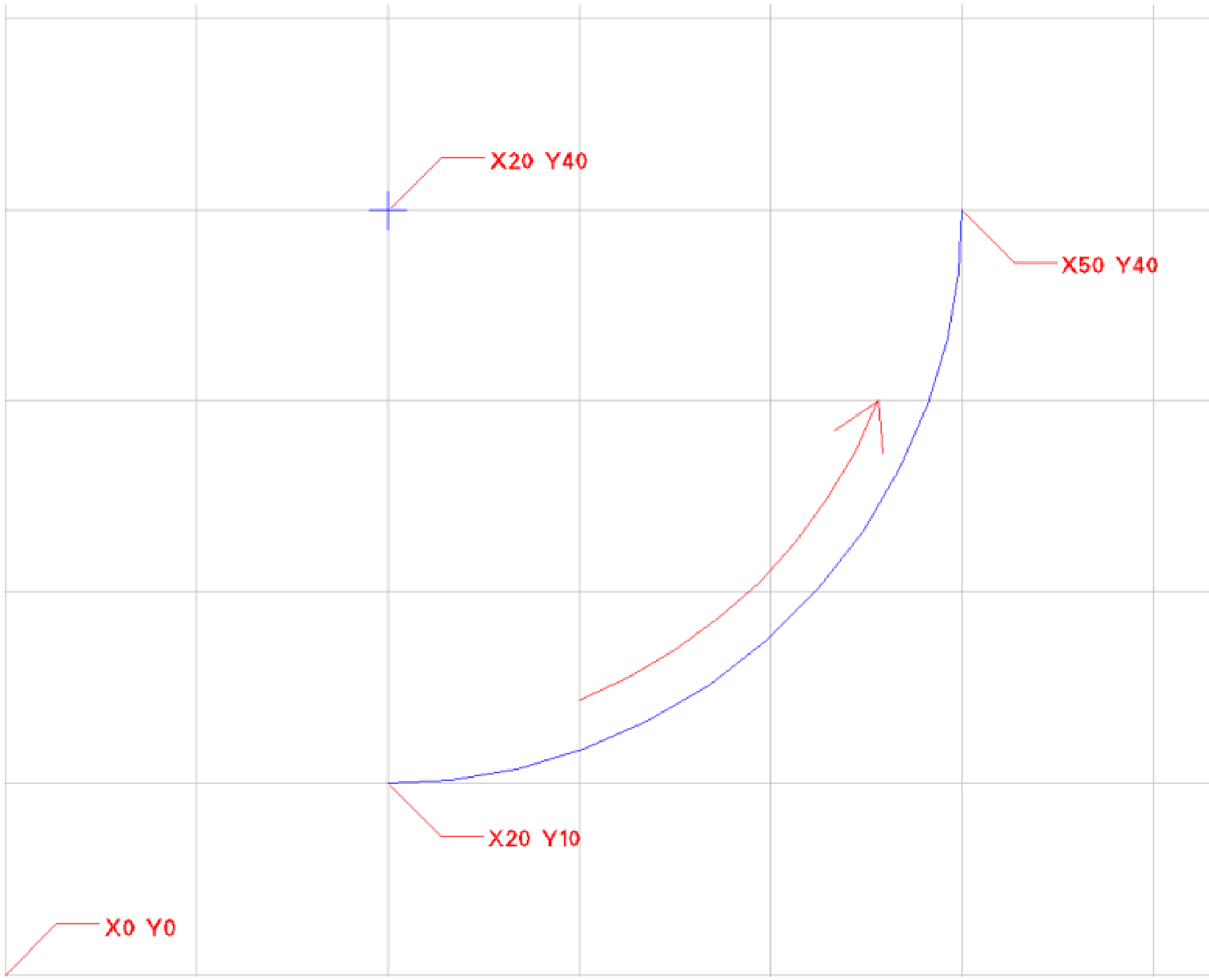
- **G03** starts an arc movement beginning at the X & Y coordinate location where the G03 was issued.
- **X Value** – This is the X coordinate defining the end point
- **Y Value** – This is the Y coordinate defining the end point
- **I Value** – are relative coordinates and define the X center coordinate as an offset of the starting point X coordinate.
- **J Value** – are relative coordinates and define the Y center coordinate as an offset of the starting point Y coordinate.
- **Z Value** - The addition of a Z value will describe a helical move.
- **R Value** - Is used to define the arc radius for arcs up to 90 degrees.

Caution: The use of R Value for arcs greater than 90 degrees do not work as it defines multiple centre points. For arcs greater that 90 degrees use IJK values for G03 commands.

Example program for making an Arc

```
N10 G00 X20 Y10 Z-1  N20 G03 X50 Y40 I0 J30
```

- In the above example in the first line moves to position X20 Y10 Z-1
- An arc is made starting at position X20 Y10 and ending at coordinate X50 Y40 with center at position X20 Y40 moving in a counter clockwise direction. The Z height does not change.
- The Arc center is calculated as follows
- Starting position X20 + I0 = Center X coordinate X20
- Starting position Y10 + J30 = Center Y coordinate Y40



Example program for making an Spiral

```
N10 G00 X20 Y10 Z0  N20 G03 X50 Y40 Z-0.5 I0 J30
```

- In the above example in the first line moves to position X20 Y10 Z0
- An arc is made starting at position X20 Y10 and ending at coordinate X50 Y40 with center at position X20 Y40 moving in a counter clockwise direction. The arc is the same as in the diagram above but the Z axis will decend from its current height to -0.5 units at a uniform rate over the arc to form a spiral path.
- The Arc centr is calculated as follows
- Starting position X20 + I0 = Center X coordinate X20
- Starting position Y10 + J30 = Center Y coordinate Y40

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

8.5. G04 – Dwell

This command is used to Dwell (pause) the execution of the next CNC program block by the specified time.

A program dwell time can be created at any point within a program.

Syntax & Parameters

- **P Value** - The P value is required with G04 and it defines the time to dwell/pause. This value is in milliseconds.

Example program

```
N10 G04 P2000
```

The above program will pause the program for 2 seconds.

8.6. G10 – Set Work Offset Values

This command is used to set work offsets values to different offset locations.

Syntax & Parameters

- **L2 Value** - Must be issued with G10.
- **P Value** - The P value is required with G10 and it define the work offset number to change between G54 and G59.
- P0 is used to set G54 work offset.
- P1 is used to set G55 work offset.
- P2 is used to set G56 work offset.
- P3 is used to set G57 work offset.
- P4 is used to set G58 work offset.
- P5 is used to set G59 work offset.
- **X, Y, Z, A, B Value** - specifies the axis you wish to offset following the distance value. The distance value will be the current machine units in use.

Example program

```
N10 G10 L2 P0 X10 Y10
```

The above program will add add 10 millimetres to the X and Y axis G54 offset.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

8.7. G17 – XY Plane Selection

This command is used to set current work plane to XY. This is the default work plane on power up.

Syntax & Parameters

- **G17**

Example program

```
N10 G17
```

The above gcode will set the system to XY work plane.

INFORMATION: This is the default work plane on power up.

8.8. G18 – ZX Plane Selection

This command is used to set current work plane to ZX.

Syntax & Parameters

- **G18**

Example program

```
N10 G18
```

The above gcode will set the system to ZX work plane.

8.9. G19 – YZ Plane Selection

This command is used to set current work plane to YZ.

Syntax & Parameters

- **G19**

Example program

```
N10 G18
```

The above gcode will set the system to YZ work plane.

8.10. G20 – Set Machine Units To Inches

This command is used to set machine units to Inches. All gcode values after this command will be processed as inches.

Syntax & Parameters

- **G20**

Example program

```
N10 G20
```

The above gcode will set the machine units to Inches.

8.11. G21 – Set Machine Units To Millimetres

This command is used to set machine units to Millimetres. All gcode values after this command will be processed as Millimetres.

Syntax & Parameters

- **G21**

Example program

```
N10 G21
```

The above gcode will set the machine units to Millimetres.

8.12. G28 – Return To Machine Home

CAUTION: This command can be used in different combinations and wrong command can result in unexpected rapid motion. Depending if the machine is in **Absolute** or **Incremental** mode the behavior of **G28** command will be very different, extra caution should be used when using this command.

This command is used to move the axis back to the home position of the axis after the machine was homed. Further axis commands can also be combined with G28 to achieve intermediate position.

Syntax & Parameters

- **G28** - Only G28 can be used, this will move all axis at rapid back to the home position.
- **X, Y, Z, A, B Value** - specifies the intermediate position you wish to move following the distance to move. The distance value will be the current machine units in use.
- Combining the G28 with a rotary axis in incremental mode G91 will allow the axis to unwind in 1 revolution or less. See example below.

Example program for moving all together axis to home position

```
N10 G28
```

The above gcode will move all axis of the machine at rapid back to the home position.

Example program all axis to machine 0.00

```
N10 G28 X0 Y0 Z0
```

The above gcode will move all axis to working coordinates X0 Y0 Z0 before moving to home position.

Example program all axis to machine 0.00

```
N10 G91 G28 X0 Y0 Z0  N20 G90
```

The above gcode will move all axis to home position as there is no intermediate position to go to first.

Example program to move Z axis first

```
N10 G91 G28 X0 Y0 Z8  N20 G90
```

The above gcode will first move the Z axis 8.00 units and then move all axis to their home positions

Rotary Axis Unwind within one rotation

```
G00 A900 (Rapids the A axis to A900 (2.5 turns))  G91 (Change to Incremental mode)  G28 A0 (Moves Axis by 0 degrees then moves to A0 within one rotation)  G90 (Return to Absolute mode)
```

- In the above example if you specify another coordinate eg: G28 A360 it will move an additional 360 degrees taking the axis to A1260 (3.5 turns) then move to A0 in less than 1 rotation.
- In this case it would be an additional 1/2 rotation to be back to home.

INFORMATION: If you do not change to incremental mode before the G28 A0 the axis will unwind the full 2.5 revolutions to A0 and then move to the home position. In this case no further move is needed.

8.13. G30 - Move to Parking Position

CAUTION: This command can be used in different combinations and wrong command can result in unexpected rapid motion. Depending if the machine is in **Absolute** or **Incremental** mode the behavior of **G30** command will be very different, extra caution should be used when using this command.

This command is used to move the Machine to the defined Parking position

- At times users may wish to have a dedicated park location to move the Spindle to, so that it is out of the way when loading and unloading material.

Syntax & Parameters

- **G30** - This first rapids the Z axis to its specified parking position and then the remaining axis will simultaneously move to their parking positions.
- The Park position is defined in the F4 Screen

Example program for moving all axis to Parking position

```
N10 G30
```

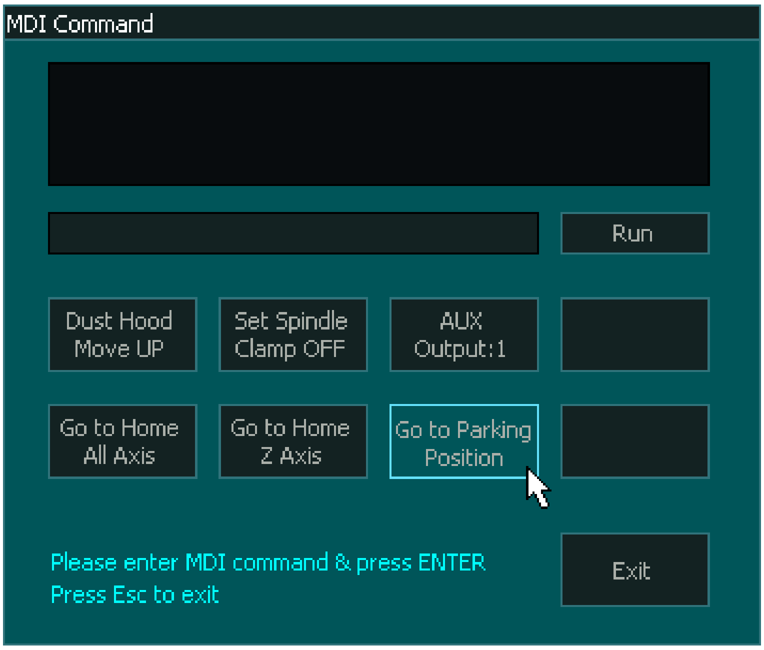
Defining the Parking Position

The Parking Position is defined in the F4 Screen using Machine Coordinates.

Work Offset	Work Offset Name	X	Y	Z	A	B
G 54		0.00000	202.42500	-5.44250	0.00000	0.00000
G 55		0.00000	0.00000	0.00000	0.00000	0.00000
G 56		0.00000	0.00000	0.00000	0.00000	0.00000
G 57		0.00000	0.00000	0.00000	0.00000	0.00000
G 58		0.00000	0.00000	0.00000	0.00000	0.00000
G 59		0.00000	0.00000	0.00000	0.00000	0.00000
Parking	Parking Position	100.00000	250.00000	-1.00000	2.00000	0.00000

Parking Commands

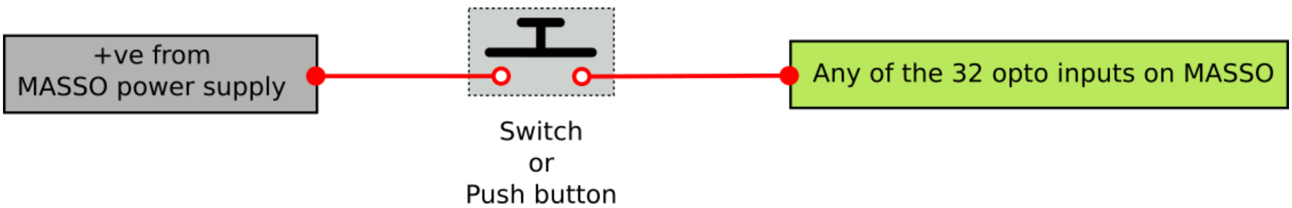
- **G30**
- **CTRL + ALT + P**
- **Click the Go to Parking Position button in the MDI Screen**
- **Go to Parking Position Button**



Go to Parking Position Button

- Configure an input as a Go to Parking Position Input

> Hold the button for 1 second to activate the feature.



8.14. G32 – Threading Cycle

This command is used on Lathe machines for running threading cycle synchronised with the spindle.

INFORMATION: Taper threading is not supported.

Syntax & Parameters

- **Z Value (required)** - specifies the end location of the Z axis for threading. The distance value will be the current machine units in use.
- **F Value (required)** - this is the thread pitch value. The distance value will be the current machine units in use.

Example program

```
N10 G21  N20 G00 Z0  N30 G32 Z-10 F1.5
```

- In the above program the first line sets the machine units to millimetres.
- The second line command moved the Z axis to work 0.00 millimetres.
- The third line starts the threading cycle to thread to Z -10 millimetres location while threading at 1.5 millimetre pitch.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

8.15. G38.2 – Straight Probe Cycle

This command is used for probing parts or fixtures. The axis specified in the G38.2 command will move until the probe touches, if the probe does not touch within the specified distance then the program stops and an alarm is displayed on the screen.

Syntax & Parameters

- X, Y, Z, A, B Value - specifies the axis you wish to move for probing following the distance to move. The distance value will be the current machine units in use.
- F Value - The F value defines the feedrate at which the axis will move at.

Example program

```
N10 G38.2 Z-10 F100
```

In the above program the Z axis will move to Z -10 and wait for the probe to touch. Once the probe touches, the Z axis will stop and the program will move to the next gcode line. If the probe is not touched before it reaches Z -10 location then the program stops and an alarm is displayed on the screen.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

8.16. G38.6 - Digitizing Probing Cycle

WARNING: The incorrect use of this Gcode can cause damage to your probing equipment, the item being probed and personal injury. Please understand and exercise care.

INFORMATION: This function is only available for MASSO G3 in version 4.03 or higher.

This command is used for digitizing parts using a touch probe or similar. Typically used to create a cloud point capture of a 3d object or to map uneven material surface for engraving with the use of auto leveling software.

- The axis specified in the G38.6 command will move until the probe touches.
- The X,Y & Z touchpoint data is saved to "MASSO Probe data.txt"
- If the "MASSO Probe data.txt" does not exist then the MASSO will create a new file.
- If the "MASSO Probe data.txt" exists then the data will be added to the end of the existing file.
- If the probe does not touch within the specified distance then a "Probing error at:" entry is made in the "MASSO Probe data.txt" file, the program will Stop and a Probing Error Alarm will be displayed.
- All coordinates used with G38.6 are working coordinates.
- All recorded coordinates in the "MASSO Probe data.txt" file are working coordinates.

Syntax & Parameters

- X, Y, Z Value - specifies the axis you wish to move for probing following the coordinate to move to. The coordinate value is a working coordinate.
- F Value - The F value defines the feed rate at which the axis will move.

Example program

```
N10 G1 X20 Y10 F1000  N20 G38.6 Z-3 F100  N30 G0 Z2
```

In the above example the machine moves to X20 Y10

The Z axis will probe down to working coordinate -3 and if the probe detects a touch it will stop and record the X, Y & Z working coordinates in the "MASSO Probe data.txt" file.

If the probe does not record by the time it reaches Z -3 it will stop and record Probing error at: 20.00000, 10.00000 in the "MASSO Probe data.txt" file. A Probing error Alarm will display in the screen.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

Sample Data File

0.00000, 0.00000, -0.88750

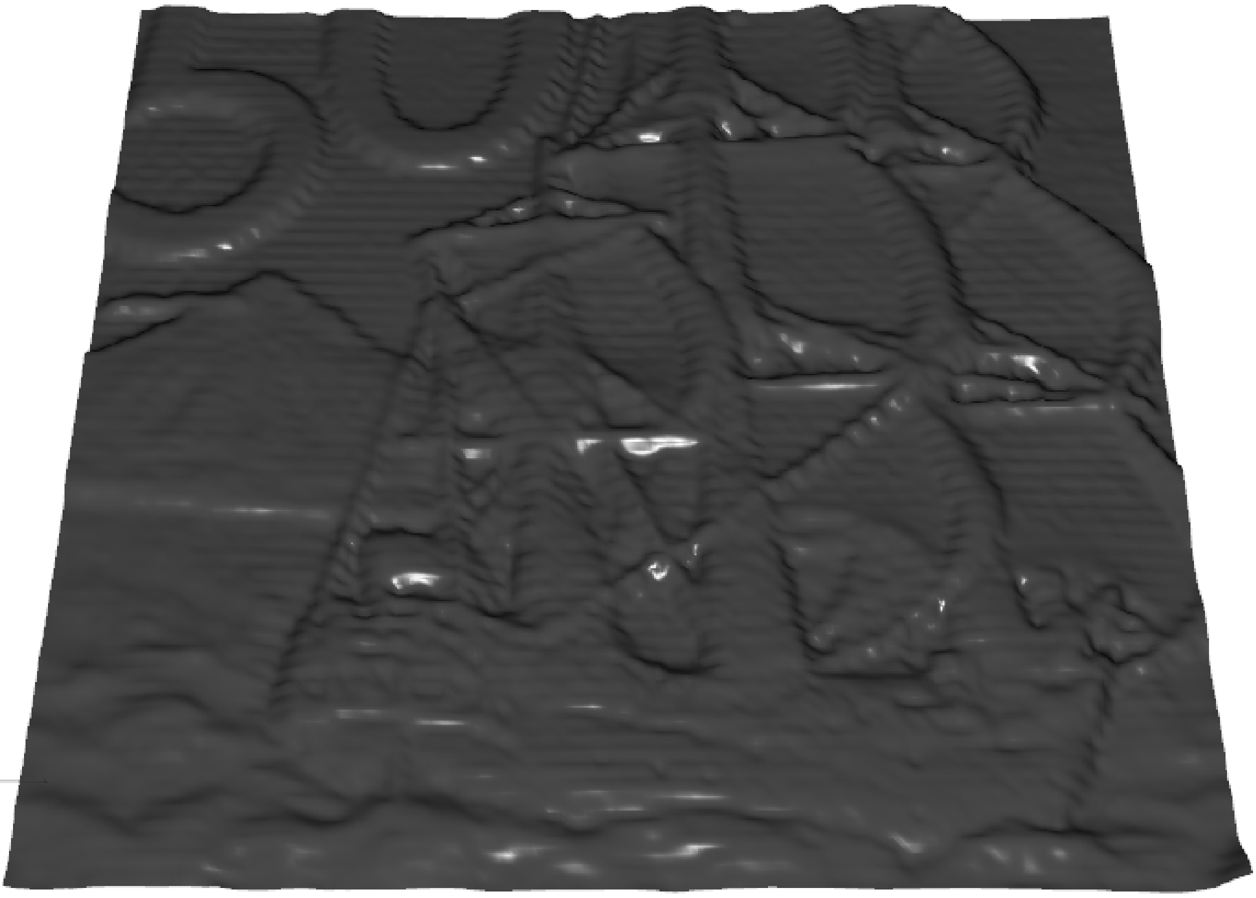
0.13310, 0.00000, -0.90749

0.26619, 0.00000, -0.91750

0.38597, 0.00000, -0.92249

Probing error at: 0.00000, -0.92000

Sample Digitized item



8.16.1. Auto Levelling using G38.6

About Auto Levelling

Auto leveling allows you to map the surface of your material and then by probing the surface using the G38.6 digitizing probing cycle and then applying the resulting height map to adjust your original Gcode file.

This is done using 3rd party software such as AutolevellerAE

This is an open source software that can be used to generate the Gcode file to do the initial probing of the material and then the resultant MASSO Probe data.txt file can be loaded in to the software along with your project Gcode file to create a new Gcode file with the coordinates adjusted to suit the material surface.

AutolevellerAE can be down loaded here: http://www.autoleveller.co.uk

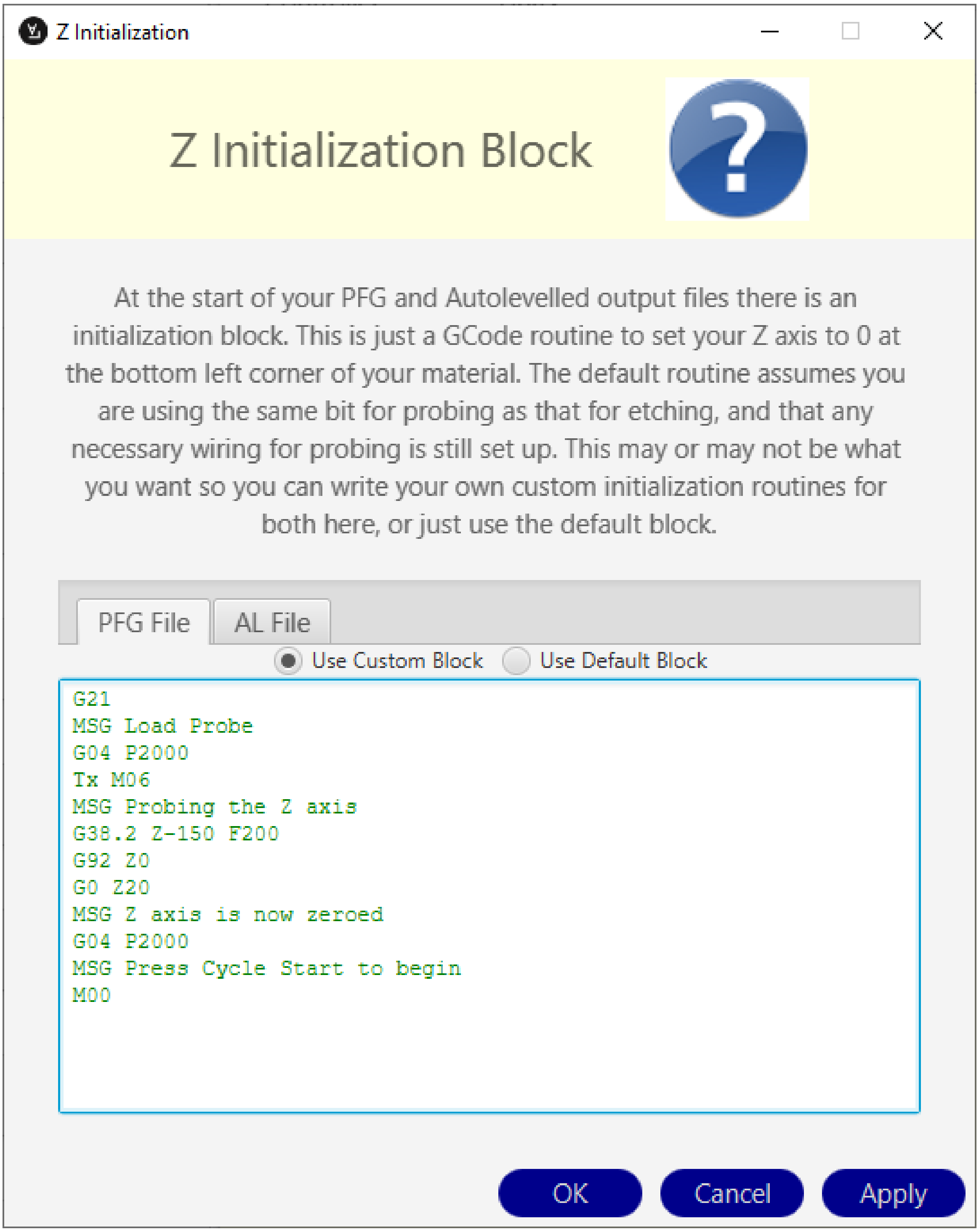
The following does not seek to teach you how to use this Auto Leveller software but how to set up the custom parameters to use it with MASSO.

MASSO has no association with this software.

Setting up the Z initialization routine

Under **Options** menus at the top of the screen select Z initialization routine

-



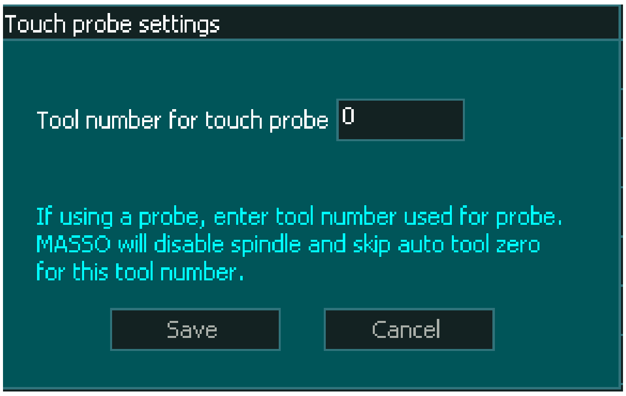
- Under **Options** menus at the top of the screen select Z initialization routine
- Select **Use Custom Block**
- Enter your start up routine in here.

In this example

- Machine is set to Metric (G21)
- Message is displayed "Load Probe"

- 2 second delay
- Tool change command to executed.
- Replace Tx with the tool number defined in the F1 screen Touch Probe setting. In the example below the touch probe is Tool 0 so you would replace Tx M06 with T0 M06
- Message is displayed "Probing the Z axis"
- The Z axis probes down to the surface at 200mm/min. When the probe touches the surface it stops. (You may need to change the Z-150 value to suit your machine. The Z value in the G38.2 probing cycle is a Machine Coordinate)
- The Z axis coordinates are set to Z0 using G92 temporary work offset.
- The Z axis moves 20mm up from the surface to Z20
- Message is displayed "Z axis is now zeroed"
- 2 second delay
- Message is displayed "Press Cycle Start to begin"
- M00 Program stop and wait for cycle start.

- After you have a entered your initialization Gcode press Apply followed by OK



INFORMATION: It is important to define a touch probe tool and use this tool while probing even if you do not have an auto tool changer. The Touch Probe tool disables the spindle while it is selected and is an important safety feature

Custom Z Initialization Block

Please change to suit your machine.

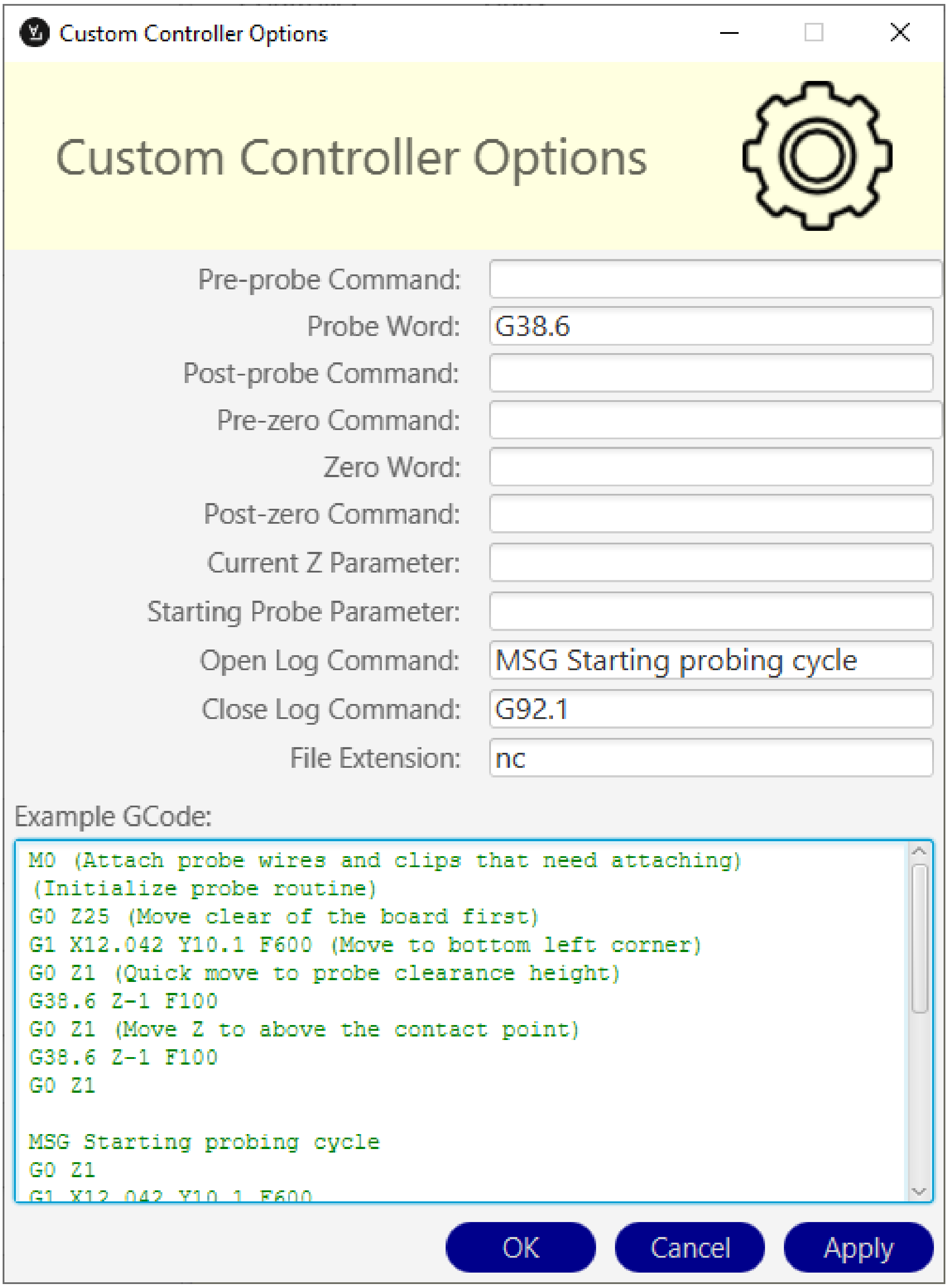
This routine will automatically change your tool to the Probing tool and will automatically use the G38.2 probing routine to zero the Z axis to the correct starting height.

```
G21  MSG Load Probe  G04 P2000  Tx M06  MSG Probing the Z axis  G38.2 Z-150 F200  G92 Z0  G0 Z20  MSG Z axis now zeroed  G04 P2000  MSG Press Cycle Start to begin  M00
```

INFORMATION: The auto zero probing routine uses G92 to set Z zero. If you stop the file before it finishes you can remove the temporary work offset by going to MDI and issue a G92.1

Custom Controller Options

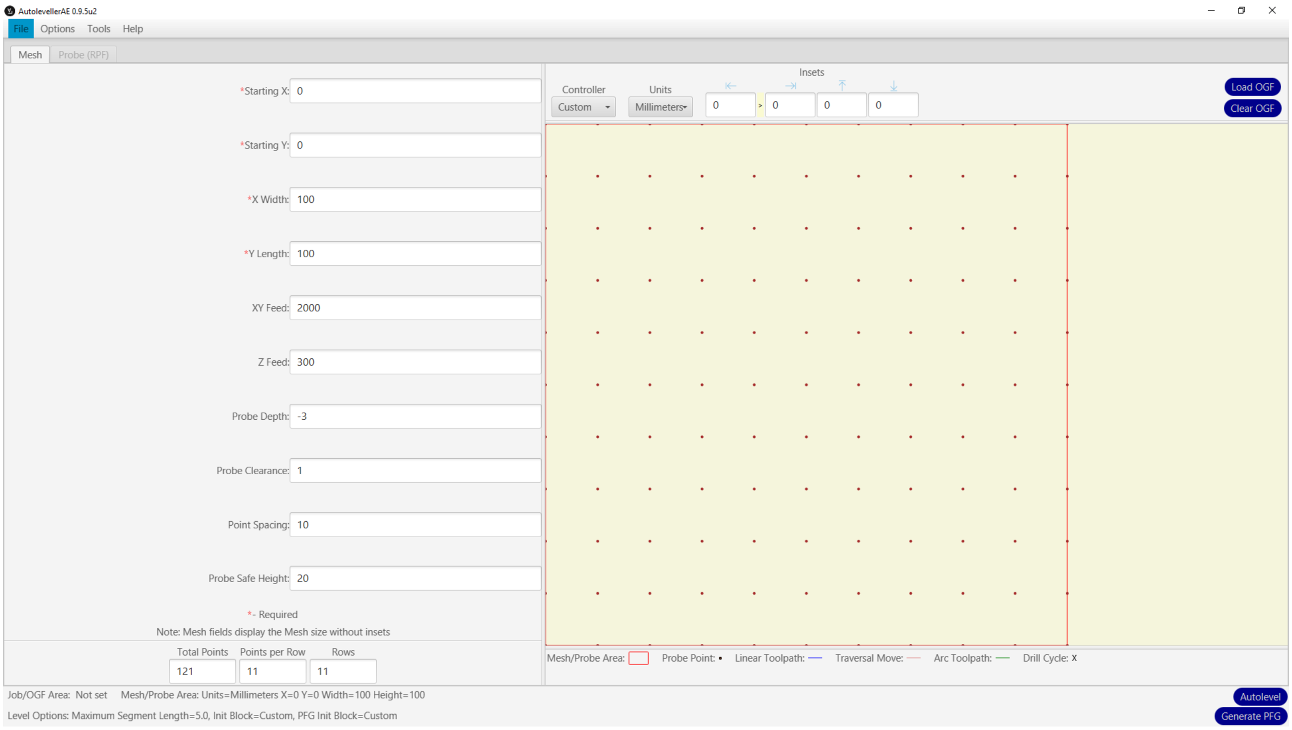
From the **Options** Menu at the top of the screen select Custom Controller Options



- From the **Options** Menu at the top of the screen select Custom Controller Options
- **Probe Word:** G38.6
- **Open Log Command:** MSG Probing Complete
- **Close Log Command:** G92.1
- **File Extension:** Enter nc

INFORMATION: If you have values showing in the parameter fields that are grayed out they can be ignored.

Create a Probing Mesh



- Starting X: Enter the X working coordinate you wish to start probing from.
- Starting Y: Enter the Y working coordinate you wish to start probing from.
- X Width: Enter the X working coordinate you wish to finish probing.
- Y Length: Enter the Y working coordinate you wish to finish probing.
- XY Feed: Enter the feed rate you wish to travel between probing locations.
- Z Feed: Enter the feed rate you wish to prove the Z axis.
- Probe Depth: Enter the Z axis working coordinate for the end of probing. This is the depth that probing will stop and a "Probing error at:" entry is made in the "MASSO Probe data.txt" file before moving to the next coordinate.
- Probe Clearance: Enter the Z height working coordinate that the Z axis will rise up to after each probe. If you make this too high probing will take longer than needed and if you make it too low you may hit the part while moving to the next probing position.
- Point Spacing: Enter the distance between the probing locations.
- Probe Safe Height: This is used at the end of the probing cycle to rise the Z axis above the surface.

Once you are happy with the parameters press **Generate PFG** to create the probing Gcode file.

INFORMATION: This software can also be used to create cloud point captures of 3D objects using the same process. Select a point spacing that suits the item you are probing. A finer Point Spacing will render a more detailed data capture which you can pass to other software for rendering to a 3D model.

Create an Auto Leveled file

Basic overview

- Load your Gcode file Called OGF in the software.
- Load the Captured MASSO Probe Data.txt File saved to your MASSO Flash drive under the File Menu Raw Data File (RPF)
- Adjust parameters as needed. Please see the Autoleveller software manual for full details on how to use this aspect of the software.
- Press Autolevel to generate adjusted Gcode file to run on MASSO.

WARNING: The incorrect use of this Gcode can cause damage to your probing equipment, the item being probed and personal injury. Please understand and exercise care.

Probing Check sheet

Setting up the PFG File

- Set your X & Y start coordinates of the probe to match the X & Y position where the cutting takes place or you will scan the wrong position.
- Set the Probing depth to be sufficient to probe the full depth of the surface. Where possible stay within the travel of your touch probe to reduce the chance of damage to the probe.
- Set the Probe clearance height to the minimum needed to clear any part of the surface being probed for the most efficient probing cycle.
- Set the Point Spacing to suit the type of surface you are mapping. Course for Auto levelling and fine for 3d rendering.
- Set the Safe probe height high enough to clear clamps and other obstructions at the end of the file.

Getting Ready to probe

- Load the probing PFG File
- Load the Probing tool. Tx M06 where Tx is the tool number defined in the MASSO F1 Screen Touch probe parameter.
- Set your X & Y zero position of the probe to match the X & Y zero point of the cutter or you will scan the wrong position.
- Move to the Start X Y position you selected for probing. This may not be X0 Y0
- Set the Z zero point of the probe above the surface of the subject being probed if you are using the auto zero probing routing shown in the example above.
- Run the Gcode file.

8.17. G53 – Move In Absolute Machine Coordinates

This command is used move one or more axis to a specified location. If multiple axis are called they will all move together to the desired location in a straight line and arrive at the same time. The axis can be linear, angular or a combination of both.

Syntax & Parameters

- **G53** followed by the axis you wish to move and it's coordinate. Multiple axis may be specified on the same line.
- **X, Y, Z, A, B Value** - specifies the axis you wish to move following the distance to move. The distance value will be the current machine units in use.
- **G00** - G00 can also be used in combination to move at rapid feedrate.

Example program to move at rapid feedrate

```
N10 G00 G53 X10 Y20
```

In the above program the axis will move to X 10 and Y 20 of the absolute machine coordinates at rapid feedrate.

Example program to move at a specified feedrate

```
N10 G53 X10 Y20 F100
```

In the above program the axis will move to X 10 and Y 20 of the absolute machine coordinates at 100 millimeters/minute feedrate.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

8.18. G54 to G59 – Select Work Offset Coordinate System

The G54 to G59 commands are used to select the current work offset for use.

> The user can use the **F4** screen or **G10** command to set the offset values.

Syntax & Parameters

- **G54 to G59**

Example program

```
N10 G55
```

In the above program the work offset G55 is selected to offset the machining position.

8.19. G73 – High Speed Peck Drilling

This command is Canned Cycle used for high speed peck drilling.

Syntax & Parameters

- **G73** followed by axis, R, Q, K & F values.
- **X, Y, Z, A, B Value** - specifies the axis you wish to move following the distance to move. The distance value will be the current machine units in use.
- **R Value** - This is the retract position in the Z axis. This value must be specified.
- **Q Value** - The Q value is peck (incremental) value. A positive non zero Q value must be specified.
- **K Value** - This is number of time the cycle needs to be repeated.
- **F Value** - The F value defines the feedrate at which the axis will move at.

Example program

```
N10 G99 G73 X10 Y10 Z-8 R2 Q1 F100  N20 X20  N30 X30
```

- The first line moves the X & Y axis to 10mm position with retract plane set to 2mm, drilling to Z -8mm, peck of 1mm at 100 mm/minute feedrate and starts drilling.
- The second line moves X axis to 20mm position and drill a hole as per the same values.
- The third line moves X axis to 30mm position and drill a hole as per the same values.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

8.20. G80 – Cancel Modal Motion

This command is used to cancel Canned Cycles such as G73, G81, G82 & G83.

Syntax & Parameters

- **G80**

Example program

```
N10 G99 G73 X10 Y10 Z-8 R2 Q1 F100  N20 X20  N30 G80
```

- The first line moves the X & Y axis to 10mm position with retract plane set to 2mm, drilling to Z -8mm, peck of 1mm at 100 mm/minute feedrate and starts drilling.
- The second line moves X axis to 20mm position and drill a hole as per the same values.
- The third line cancels the G73 canned cycle.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or if G20 or G21 command in use.

INFORMATION: After using G80 the current mode is cancelled and replaced with G00 Rapid motion until it is changed in Gcode.

8.21. G81 – Drilling Cycle

This command is Canned Cycle used for drilling cycle.

Syntax & Parameters

- **G81** followed by axis, R & F value.
- **X, Y, Z, A, B Value** - specifies the axis you wish to move following the distance to move. The distance value will be the current machine units in use.
- **R Value** - This is the retract position in the Z axis. This value must be specified.
- **F Value** - The F value defines the feedrate at which the axis will move at.

Example program

```
N10 G99 G81 X10 Y10 Z-8 R2 F100  N20 X20  N30 X30
```

- The first line moves the X & Y axis to 10mm position with retract plane set to 2mm, drilling to Z -8mm at 100 mm/minute feedrate and starts drilling.
- The second line moves X axis to 20mm position and drill a hole as per the same values.
- The third line moves X axis to 30mm position and drill a hole as per the same values.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or if G20 or G21 command in use.

8.22. G82 – Drilling Canned Cycle With Dwell

This command is Canned Cycle used for drilling cycle with dwell (pause) at the bottom of hole.

Syntax & Parameters

- **G82** followed by axis, R, P & F values.
- **X, Y, Z, A, B Value** - specifies the axis you wish to move following the distance to move. The distance value will be the current machine units in use.
- **R Value** - This is the retract position in the Z axis. This value must be specified.
- **P Value** - This is the dwell (pause) at the bottom of hole. This value is in milliseconds.
- **F Value** - The F value defines the feedrate at which the axis will move at.

Example program

```
N10 G99 G82 X10 Y10 Z-8 R2 P1000 F100  N20 X20  N30 X30
```

- The first line moves the X & Y axis to 10mm position with retract plane set to 2mm, drilling to Z -8mm with 1 second dwell at bottom of the hole at 100 mm/minute feedrate and starts drilling.
- The second line moves X axis to 20mm position and drill a hole as per the same values.
- The third line moves X axis to 30mm position and drill a hole as per the same values.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

8.23. G83 – Peck Drilling For Deeper Holes

This command is Canned Cycle used for peck drilling deeper holes.

Syntax & Parameters

- **G83** followed by R, Q, K & F values.
- **X, Y, Z, A, B Value** - specifies the axis you wish to move following the distance to move. The distance value will be the current machine units in use.
- **R Value** - This is the retract position in the Z axis. This value must be specified.
- **Q Value** - The Q value is peck (incremental) value. A positive non zero Q value must be specified.
- **F Value** - The F value defines the feedrate at which the axis will move at.

Example program

```
N10 G99 G83 X10 Y10 Z-8 R2 Q1 F100  N20 X20  N30 X30
```

- The first line moves the X & Y axis to 10mm position with retract plane set to 2mm, drilling to Z -8mm, peck of 1mm at 100 mm/minute feedrate and starts drilling.
- The second line moves X axis to 20mm position and drill a hole as per the same values.
- The third line moves X axis to 30mm position and drill a hole as per the same values.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

8.24. G90 – Set Distance Mode To Absolute

This command is used to set mode to absolute. This is the default mode on power up.

Syntax & Parameters

- **G90**

Example program

```
N10 G90
```

The above gcode will set the machine units to absolute.

8.25. G91 – Set Distance Mode To Incremental

This command is used to set mode to incremental.

Syntax & Parameters

- **G91**

Example program

```
N10 G91
```

The above gcode will set the machine units to incremental.

8.26. G92 – Temporary Work Offset

This command is used set temporary work offset values. The temporary work offsets are used in combination to the main work offsets G54 to G59.

Syntax & Parameters

- **G92** followed by axis values.
- **X, Y, Z, A, B Value** - specifies the axis you wish to move following the distance to move. The distance value will be the current machine units in use.

Example program

```
N10 G92 X10 Y20
```

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

INFORMATION: When A G92 work offset is used and a DRO is zeroed the offset value will show on the DRO instead of 0. Use G92.1 to clear the temporary work offset.

INFORMATION: G92 work offsets can be cancelled by using G92.1 in Gcode or using MDI

8.27. G92.1 – Cancel Temporary Work Offset

This command is used cancel the G92 temporary work offset values.

Syntax & Parameters

- **G92.1**

Example program

```
N10 G92.1
```

The above program cancels the temporary work offset values.

8.28. G93 – Inverse Time Mode

This command is used set the current feed rate mode to Inverse Time Mode.

Syntax & Parameters

- **G93**
- **X, Y, Z, A & B** These are the destination coordinates of the axis.
- **F** Value This is the Feedrate. The move will be completed it 1/F minutes or 60/F seconds.
- **G01, G02 and G03** It is Mandatory to include a Feedrate for these commands
- **G00** No Feedrate is required

Example program

```
N10 G93  N20 G01 X1 A1 F30      #This will move TO position X1 A1 in 2 seconds
   N30 G00 X0 A0          #This will Rapid to X0 A0
```

The above program sets the feedrate mode to Inverse Time Mode.

8.29. G94 – Units Per Minute Mode

This command is used set the current feed rate mode to Units per Minute Mode. When in this mode the feedrate F value is in units per minute.

Syntax & Parameters

- **G94**

Example program

```
N10 G94
```

The above program sets the feedrate mode to Units per Minute Mode.

8.30. G95 - Feed Per Revolution

G95 (Feed Per Revolution) is a modal G-code that instructs the control to interpret feed commands as mm per revolution (mm/rev) or inches per revolution of the spindle.

Syntax & Parameters

- **G95**
- **F Value** The F value specifies the distance travelled per revolution of the spindle used to calculate the G95 feed rate.
- **S Value** This specifies the spindle speed used to calculate the G95 feed rate

Example program

```
N10 G21  N20 S800 M3  N30 G95  N40 G01 X20 F0.1
```

The above program code would cause the X axis to advance 10mm for every revolution of the spindle until the X axis reaches 20mm.

The Feed rate will be 80mm per minute

G95 feed rate above is calculated as follows

(Spindle speed) x (Specified feed rate) = G95 feed rate

800 x 0.1 = 80mm

INFORMATION: G96 spindle speed has no effect on the G95 feed rate.

8.31. G96 – Turn on Constant Surface Speed (CSS)

This command is used to enable Constant Surface Speed (CSS) mode in lathe version.

Syntax & Parameters

- **G96** followed by D & S values.
- **D Value** - This is to set the maximum spindle RPM that the spindle can achieve in CSS mode as the tool gets closer to the center.
- **S Value** - To set surface speed value. The units will be the current machine units in use. Metric uses meters per minute. Imperial uses feet per minute.

Example program

```
N10 G21  N20 G0 X50  N30 G96 D12000 S200  N40 M3  N50 G1 X1 F80
```

- In the above example CSS mode is enabled with a surface speed of 200 meters per second and the maximum RPM is set to 12000.
- The X axis starts at X 20 from the center and moves towards the center at a feed rate of 80mm/min. Spindle speed starts at a calculated 3185 rpm and the speed increases the closer it moves to the spindle center. It reaches the specified maximum of 12000 rpm 5.2mm from the center at which time the speed remains at 12000rpm until the X axis reaches the final position of 1mm.

INFORMATION: Units are defined as either inches or mm depending on your machines setup or G20 or G21 command in use.

8.32. G97 – Turn off Constant Surface Speed (CSS)

This command is used to disable Constant Surface Speed (CSS) mode and set to RPM mode in lathe version.

Syntax & Parameters

- **G97**

Example program

```
N10 G97
```

- In the above example CSS mode is disabled and the system is set back to RPM mode.

8.33. G98 – Canned Cycle – Retract Back To The Initial Z

This command is used in combination with canned cycles to retract Z axis to the position before canned cycles was started.

Syntax & Parameters

- **G98**

Example program

```
N10 G98 G73 X10 Y10 Z-8 R2 Q1 F100
```

- In the above program, after finishing the drilling cycle the Z axis will retract back to the position before the drilling cycle.

8.34. G99 – Canned Cycle – Retract Back To R Plane

This command is used in combination with canned cycles to retract the Z axis to the R plane value.

Syntax & Parameters

- **G99**

Example program

```
N10 G99 G73 X10 Y10 Z-8 R2 Q1 F100
```

- In the above program, after finishing the drilling cycle the Z axis will retract to the value defined by the R word.

8.35. MSG - Print message to screen

INFORMATION: This gcode is available only on MASSO G3 in version 4.02 or later

This command allows the user to add messages to their Gcode which will be displayed on the screen in the tool path area.

These can be used as training aids, instructions or reminders of when to do something.

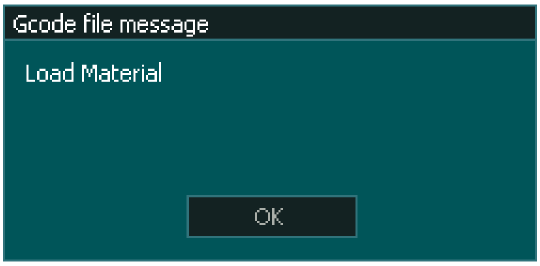
Syntax & Parameters

- **MSG** - followed by a space and then the message to be displayed on screen

Example program to display the message "**Load Material** " on the screen

```
N10 MSG Load Material
```

- Message length is limited to a single line of 34 characters and messages that exceed this length will only display the first 34 characters.
- Messages can be cancelled by pressing the OK button on the message display.
- Messages will remain on screen until cancelled or overwritten by the next message, or a System message.



Example program to display the message "**Change tool to V-Bit {90 deg 0.5"}**" on the screen before a tool change

```
N10 MSG Change tool to V-Bit {90 deg 0.5"}  N20 M01  N30 T3 M06
```

INFORMATION: Messages can be used with M00 & M01 to stop the machine so that the user can read the message before proceeding if required.

- Messages can be written into the post processor to automatically add this type of message.
- The M01 in the example will stop the machine until the Cycle Start is pressed allowing the user time to read the message when they are ready. There is no need to press OK in this instance because it will immediately be overwritten by the system tool change message.
- If Optional Stop **CTRL+O** is turned off then the machine will not stop and the user will not see the message as it will immediately be overwritten by the System message to Change tool

Example program to display multiple messages on the screen

```
N10 MSG READ DIAL FOR BACKLASH MEASUREMENT  N20 G04 P3000  N30 MSG ENTER THIS VALUE INTO MASSO BACKLASH  N40 G04 P3000  N50 MSG TEST COMPLETE
```

INFORMATION: Messages can be used with G04 Pauses to display messages in a timed sequence.

- In some applications it may be desirable to provide instructions in a timed sequence. Using a G04 pause between messages will allow them to be displayed for the specified time before it is overwritten by the next message.

The video clip below shows an example of using the MASSO MSG gcode to create a backlash test sequence with instructions for the tester to carry out at each step of the process.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

9. Supported M-codes

9.1. M00 – Program Stop

This command stops the program. Pressing cycle start will resume the program.

Syntax & Parameters

- **M00**

Example program

```
N10 G00 X0 Y0  N20 G00 X10  N30 M00  N40 G00 Y10
```

- The first line will move both X and Y axis to 0.00 position.
- In line two the X axis will move to X 10 position.
- In line three the program will stop and wait for user to press cycle start.

9.2. M01 – Optional Program Stop

This command stops the program if optional stop is turned on. Pressing cycle start will resume the program. You can press CTRL + O when on the F2-Program & MDI screen page to toggle between Optional Stop ON/OFF and the status is displayed on the bottom status bar.

Syntax & Parameters

- **M01**

Example program

```
N10 G00 X0 Y0  N20 G00 X10  N30 M01  N40 G00 Y10
```

- The first line will move both X and Y axis to 0.00 position.
- In line two the X axis will move to X 10 position.
- In line three the program will stop and wait for user to press cycle start is optional stop is set to On, else will run line four and move Y axis to 10.

9.3. M02 – Program End

This command ends the program.

Syntax & Parameters

- **M02**

Example program

```
N10 G00 X0 Y0  N20 G00 X10  N30 M02  N40 G00 Y10
```

- The first line will move both X and Y axis to 0.00 position.
- In line two the X axis will move to X 10 position.
- In line three the program will stop and will not run line four.

9.4. M03 – Spindle ON (Clockwise)

This command starts the spindle in clockwise direction at the RPM set by the S command

Syntax & Parameters

- **M03** - Clockwise command followed with or without S value.
- **S** - The S value defines the required RPM. If the S value is not given then the last S value is automatically used.

Example program

```
N10 M03 S1200
```

In this example the spindle is started in clockwise direction at 1200 RPM.

9.5. M03 – Plasma Torch ON

In plasma version this command switches On the plasma torch.

Syntax & Parameters

- **M03**

Example program

```
N10 M03
```

In this example the plasma torch is switched On.

9.6. M04 – Spindle ON (Counter Clockwise)

This command starts the spindle in counter clockwise direction at the RPM set by the S command

Syntax & Parameters

- **M04** - Clockwise command followed with or without S value.
- **S** - The S value defines the required RPM. If the S value is not given then the last S value is automatically used.

Example program

```
N10 M04 S1200
```

In this example the spindle is started in counter clockwise direction at 1200 RPM.

9.7. M05 – Spindle OFF

This command stops the spindle.

Syntax & Parameters

- **M05**

Example program

```
N10 M05
```

In this example the spindle will be stopped.

9.8. M05 – Plasma Torch OFF

In plasma version this command switches Off the plasma torch.

Syntax & Parameters

- **M05**

Example program

```
N10 M05
```

In this example the plasma torch is switched Off.

9.9. M06 – Tool Change

WARNING: When using an auto tool changer the **M06** must be preceded by an **M05** or the drawbar will not release and can result in damage to the tool changer.

CAUTION: This command can be used in different combinations and wrong command can result in unexpected loading of tool.

INFORMATION: Valid tool numbers are T0 to T99

This command is used to change tool immediately and can be used with T value.

Syntax & Parameters

- **M06**
- **T Value –** specifies the tool number to change, this value can be used before M06 or after M06 but will have a very different process of tool loading.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, [Click here to view the video]

Example program

```
N10 M05   N20 T5 M06
```

In above program the M05 stops the spindle then T5 tells the system that we would like to load tool number

5 and M06 is used to tell the system to load the tool.

9.10. M07 – Turn Mist Coolant On

This command turns On the Mist Coolant output.

Syntax & Parameters

- **M07**

Example program

```
N10 M07
```

In this example the Mist Coolant is turned On.

9.11. M08 – Turn Flood Coolant On

This command turns On the Flood Coolant output.

Syntax & Parameters

- **M08**

Example program

```
N10 M08
```

In this example the Flood Coolant is turned On.

9.12. M09 – To Turn All Coolant Off

This command turns Off both Mist Coolant and Flood Coolant output.

Syntax & Parameters

- **M09**

Example program

```
N10 M09
```

In this example if any of the Mist Coolant or Flood Coolant was On then this code swithces them Off.

9.13. M10 – Chuck Or Rotary Table Clamp On

This command turns On the Chuck Clamp output.

CAUTION: For safety, output LOW means the clamp is On and an interlock signal from the spindle drive must be wired for safety so that the clamp does not open while the spindle/chuck is spinning.

Syntax & Parameters

- **M10**

Example program

```
N10 M10
```

In this example the Chuck Clamp is switched On.

9.14. M11 – Chuck Or Rotary Table Clamp Off

This command turns Off the Chuck Clamp output.

CAUTION: For safety this output HIGH means the clamp is Off and an interlock signal from the spindle drive must be wired for safety so that the clamp does not open while the chuck is spinning.

Syntax & Parameters

- **M11**

Example program

```
N10 M11
```

In this example the Chuck Clamp is switched Off.

9.15. M30 – End The Program And Rewind

This command ends the program and moves back to the first line of the gcode file.

Syntax & Parameters

- **M30**
- **L** Value When added to the M30 command causes the program to be repeated for the specified number of cycles. L10 will run the Gcode 10 times before rewinding stopping
- **L0** Value When L0 is added to M30 the Program will rewind and repeat on an infinite loop.

Example program

```
N10 G00 X0 Y0  N20 G00 X10  N30 M30  N40 G00 Y10
```

- The **N10** line will move both X and Y axis to 0.00 position.
- In line **N20** the X axis will move to X 10 position.
- In line **N30** the program will stop and the file will rewind back to line **N10**, pressing cycle start will start the program from **N10** line.

Infinite Loop

```
N10 G00 X0 Y0  N20 G00 X10   N30 M30 L0
```

- This program executes lines N10 to N30 before rewinding back to N10 and starting again automatically. It will continue until it is manually stopped.

Repeat 20 times

```
N10 G00 X0 Y0   N20 G00 X10   N30 M30 L20
```

- This program executes lines N10 to N30 before rewinding back to N10 and starting again until it has completed 20 cycles at which time it will rewind to N10 and stop.

9.16. M62 – Turn On Digital Output Synchronized With Motion

INFORMATION: From MASSO software version 3.47, to use **M62** command please use **M64** command as **M62** command has been changed.

INFORMATION: MASSO G2 does not support **M62** command from version 3.47, please use **M64**.

This command is used to switched ON any of the 16 auxiliary outputs synchronized with the start of the next motion command.

CAUTION: If no motion is commanded, the output will not turn ON. It is best to specify motion immediately following the M62 command.

Syntax & Parameters

- **M62**
- **P Value -** The P value is required and defines the output number to switch On. This value can be between 1 to 16.

Example program

```
N10 G0 X0  N20 M62 P1  N30 X10  N40 M63 P1  N50 X20
```

- In the above example the the X axis moves to X0 position, then auxiliary output 1 is turned ON when the X axis starts to move towards X10 position. Once the axis reaches X10 position and starts moving to X20 position, the auxiliary output 1 is turned OFF.

INFORMATION: For M62 P# to work you must assign an output as an auxiliary output in **F1-Setup** screen under **OUTPUTS** list.

9.17. M63 – Turn Off Digital Output Synchronized With Motion

INFORMATION: From MASSO software version 3.47, to use **M63** command please use **M65** command as **M63** command has been changed.

INFORMATION: MASSO G2 does not support **M63** command from version 3.47, please use **M65**.

This command is used to switched OFF any of the 16 auxiliary outputs synchronized with the start of the next motion command.

CAUTION: If no motion is commanded, the output will not turn OFF. It is best to specify motion immediately following the M63 command.

Syntax & Parameters

- **M63**
- **P Value -** The P value is required and defines the output number to switch On. This value can be between 1 to 16.

Example program

```
N10 G0 X0  N20 M62 P1  N30 X10  N40 M63 P1  N50 X20
```

- In the above example the the X axis moves to X0 position, then auxiliary output 1 is turned ON when the X axis starts to move towards X10 position. Once the axis reaches X10 position and starts moving to X20 position, the auxiliary output 1 is turned OFF.

INFORMATION: For M63 P# to work you must assign an output as an auxiliary output in **F1-Setup** screen under **OUTPUTS** list.

9.18. M64 – Turn On Digital Output Immediately

This command is used to switched ON any of the 16 auxiliary outputs. If this command is used between motion commands then the motion will come to full stop before switching ON the output.

Syntax & Parameters

- **M64**
- **P Value -** The P value is required and defines the output number to switch On. This value can be between 1 to 16.

Example program

```
N10 M64 P1  N20 M64 P4
```

- The **N10** line will switch ON the auxiliary output 1.
- The **N20** line will switch ON the auxiliary output 4.

INFORMATION: For M64 P# to work you must assign an output as an auxiliary output in **F1-Setup** screen under **OUTPUTS** list.

9.19. M65 – Turn Off Digital Output Immediately

This command is used to switched OFF any of the 16 auxiliary outputs. If this command is used between motion commands then the motion will come to full stop before switching OFF the output.

Syntax & Parameters

- **M65**
- **P Value -** The P value is required and defines the output number to switch On. This value can be between 1 to 16.

Example program

```
N10 M65 P1  N20 M65 P4
```

- The **N10** line will switch OFF the auxiliary output 1.
- The **N20** line will switch OFF the auxiliary output 4.

INFORMATION: For M65 P# to work you must assign an output as an auxiliary output in **F1-Setup** screen under **OUTPUTS** list.

9.20. M666 – Plasma – Turn THC Function Off

This command is used to switched OFF the THC automatic Z axis control function in the plasma version.

Syntax & Parameters

- **M666**

Example program

```
N10 M666
```

The above program switches Off the THC function.

9.21. M667 – Plasma – Turn THC Function On

This command is used to switched On the THC automatic Z axis control function in the plasma version.

Syntax & Parameters

- **M667**
- **F Value (optional) -** this is the feedrate of the Z axis that the will be used to move torch up/down when in THC mode.

Example program

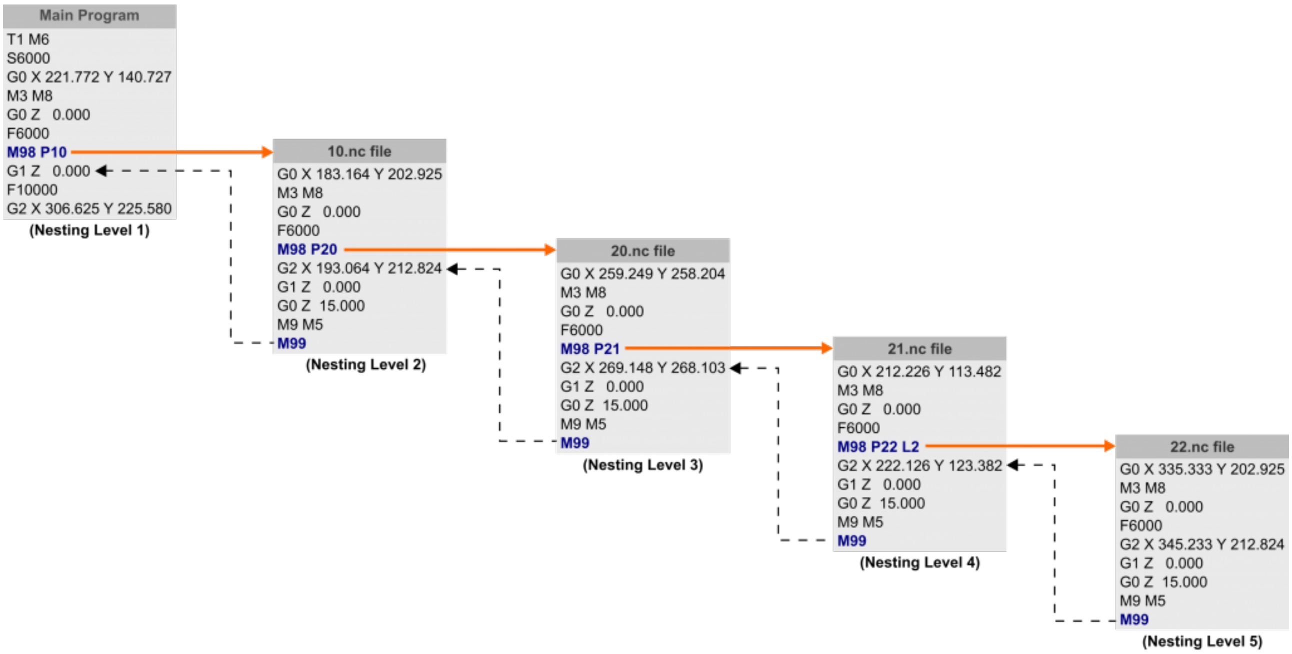
```
N10 M667 F50
```

The above program switches On the THC function and sets Z axis feedrate during THC control to 50.

9.22. M98 & M99 – Sub Program Call

MASSO supports Sub-Program Call using M98 & M99 codes. Subprograms with upto 5 levels of nesting is supported, with this feature sub programs can be called from the main program without the need to rewrite the same program again and again.

When a sub program is called, MASSO looks for a separate **".nc"** file and runs that as a sub-program. Having a separate file approach means that programs that have common features can now be used used with other programs.



INFORMATION: All sub-program files must be on the root folder of the USB Flash drive.

INFORMATION: Loading a subprogram directly, not via a sub-program call, will cause MASSO to hang.

INFORMATION: Subroutine toolpaths are not drawn on the screen during program load.

M98 Sub-Program Call

Syntax & Parameters

- **M98**
- **P Value** - The P value is used to define the sub program file name.
- **L Value** - The L value can be used to run the sub program multiple times.

Example program

```
N10 M98 P10 L5
```

The above program will look for the **10.nc** file as set by the **P** value and will run it **5** times as set by **L** value.

NOTE: If the **10.nc** file is not found an error message on the screen is displayed and program goes into feedhold. When a program is loaded from F6 screen, MASSO checks that all sub-program files are on the USB and if a file is missing an error is shown to the user

M99 End Sub-Program or Return

M99 command is used to End Sub-Program or Return back to the main program.

Syntax & Parameters

- **M99**

Example program

```
N10 M99
```

When the above line is found in a sub program file, the control returns back to the main program.

10. CAM Post Processors

10.1. Plasma POST Processor Requirements

G Codes

- **G00** - Rapid move.
- **G01** - Linear interpolation.
- **G02** - Circular interpolation (Clockwise). Note: **I**, **J** & **K** value are relevant to the **X**, **Y** and **Z** values. **R** for radius and **F** for feedrate.
- **G03** - Circular interpolation (Counter Clockwise). Note: **I**, **J** & **K** value are relevant to the **X**, **Y** and **Z** values. **R** for radius and **F** for feedrate.
- **G04** - Dwell, P value in milliseconds.
- **G38.2** - Probing cycle used to find the top of the workpiece.
- **G92** - Temporary Work Offset, used to zero to the top of the workpiece. Used with G38.2 command.

M Codes

- **M03** - Plasma On, will switch on the output signal to turn on the plasma arc.
- **M05** - Plasma Off, will switch off the output signal to turn off the plasma arc.
- **M666** - Turn THC function Off, will switch off the internal THC control logic and during this time the Z axis position will not be changed by the torch height signals, only gcode commands can change the Z position.
- **M667** - Turn THC function On, will switch on the internal THC control logic and during this time the Z axis position will be changed by the torch height signals. THC will only work when the torch arc is first switched on via the M3 command.

Important information

- Torch touch to trigger switch offset distance is managed by MASSO and is setup during machine calibration, there is no need to set this value in CAM or POST.
- The touch feedrate and machine maximum Z travel during touch to find the top of the material might be defined in CAM or POST. For example the Z-120 value can be a variable that the user can set as per the maximum machine Z travel in the torch touch code G38.2 Z-120 F200

Examples

Making a clockwise arc from X10 and Y20 position to X20 and Y10 position:

```
G01 X10 Y20 F200  G02 X20 Y10 J-10
```

Finding the top of the workpiece, the below two lines are required to find the top of the workpiece and then setting the Z offset to 0.00 so that the piercing and cutting heights can be referenced from this point:

```
G38.2 Z-120 F200  G92 Z0
```

10.2. Artcam

MASSO Post Processors for Artcam

- Artcam 2010 CLICK HERE to download **(Released: 1/11/2019)**
- Artcam 2015 - 2018 CLICK HERE to download **(Released: 1/11/2019)**

10.3. BobCAD-CAM

Masso Post Processors for Mill and Plasma

CLICK HERE to downloaded the latest Post Processor for Mill and Plasma direct from the Bobcam site. Users will need a support account for the website. Masso posts can be found under Mill_Router and under Plasma. MASSO Post Processor for Lathe

CLICK HERE to download the Lathe POST processor for BobCAD-CAM V29 **(Released: 15/05/2018)**

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

10.4. Fusion 360

Autodesk POST Processor For Mill. Plasma and Lathe

HSMWORKS INVENTOR HSM™ FUSION 360™

Autodesk Mill, Plasma & Lathe Post Processors

Direct download from Autodesk website: [Goto Autodesk MASSO page]

10.5. SheetCAM

Tangential Knife POST Processor

CLICK HERE to download the POST **version 1.0 (14/02/2018)** processor file

Waterjet POST Processor

CLICK HERE to download the POST **version 0.1 (11/09/2018)** processor file with **M62 P1** / **M63 P1 turn the Water Jet on/off**

Plasma POST Processor without THC

CLICK HERE to download the POST **version 0.1 (11/09/2018)** processor file

Plasma POST Processor with THC

CLICK HERE to download the POST **version 0.4 (09/08/2019)** processor file

10.6. Vectric VCarve and Vectric Aspire

MASSO Post Processors for Vectric Aspire and VCarve Pro

- Post Processors for Rotary Axis Vectric Aspire & VCave Pro all versions
- CLICK HERE to download **(Released: 01/11/2019)**
- Post Processors for Vectric Aspire and VCarve Pro V6.5
- CLICK HERE to download **(Released: 01/11/2019)**
- Post Processors for Vectric Aspire and VCarve Pro V7.5
- CLICK HERE to download **(Released: 01/11/2019)**
- Post Processors for Vectric Aspire and VCarve Pro V8.5
- CLICK HERE to download **(Released: 01/11/2019)**
- Post Processors for Vectric Aspire and VCarve Pro V9.5
- CLICK HERE to download **(Released: 01/11/2019)**
- Post Processors for Vectric Aspire and VCarve Pro V10.5
- CLICK HERE to download **(Released: 01/11/2019)**
- Post Processors for Vectric Cut 3D
- CLICK HERE to download **(Released: 01/11/2019)**
- Post Processors for Vectric PhotoVCarve
- CLICK HERE to download **(Released: 01/11/2019)**

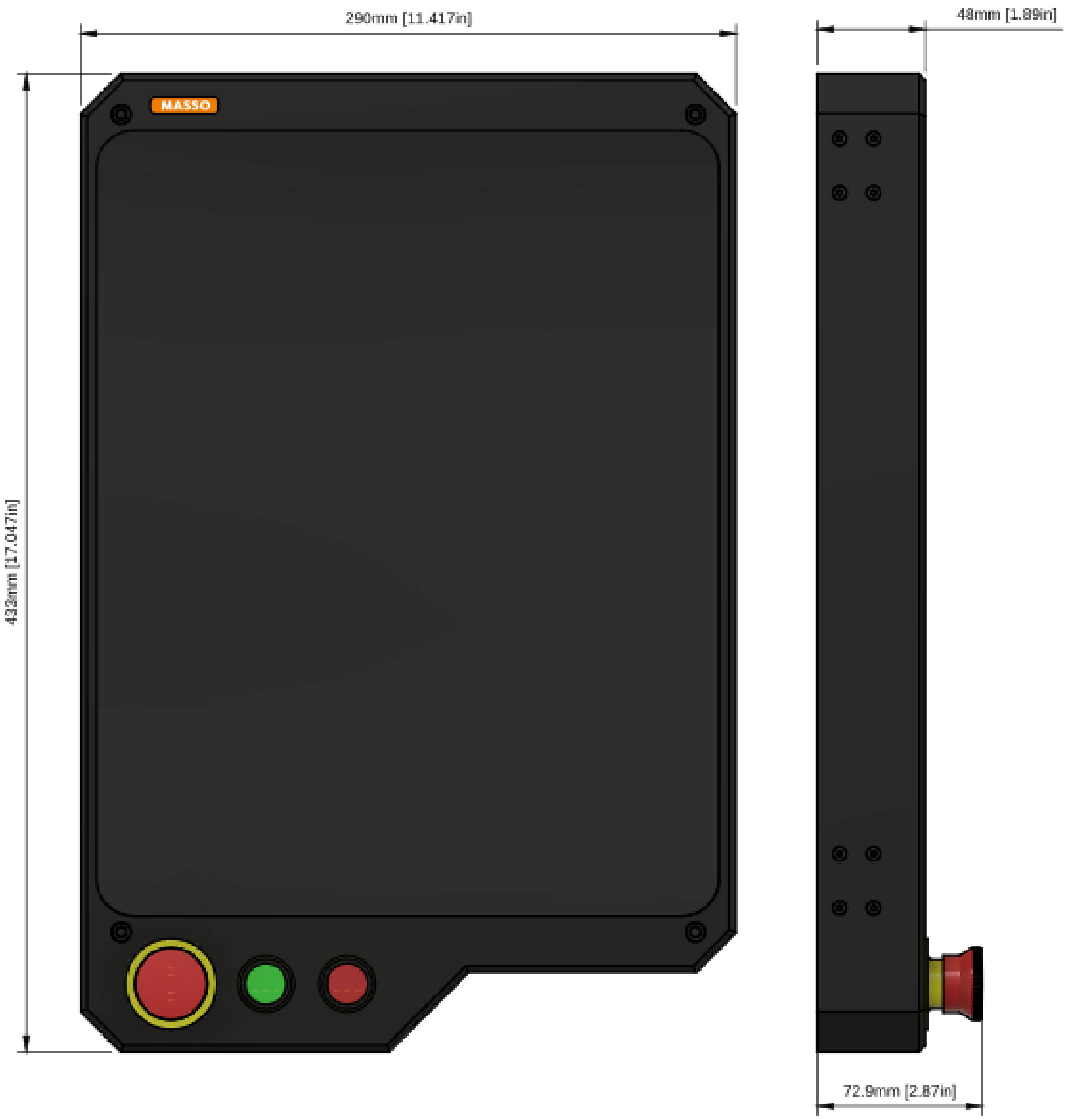
Scan the QR code to watch the MASSO video tutorial on YouTube

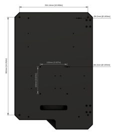
Or, Click here to view the video

11. Setup and Calibration

11.1. Mounting and Mechanical Data

MASSO G3 Touch





MASSO G3


208 mm (8.2 inch)
122 mm (4.8 inch)
56 mm (2.20 inch)
MASSO G3
WARNING
ATTENTION
Model: G3-5A15I
www.MASSO.com.au
35mm DIN Rail

11.2. E-Stop Wiring

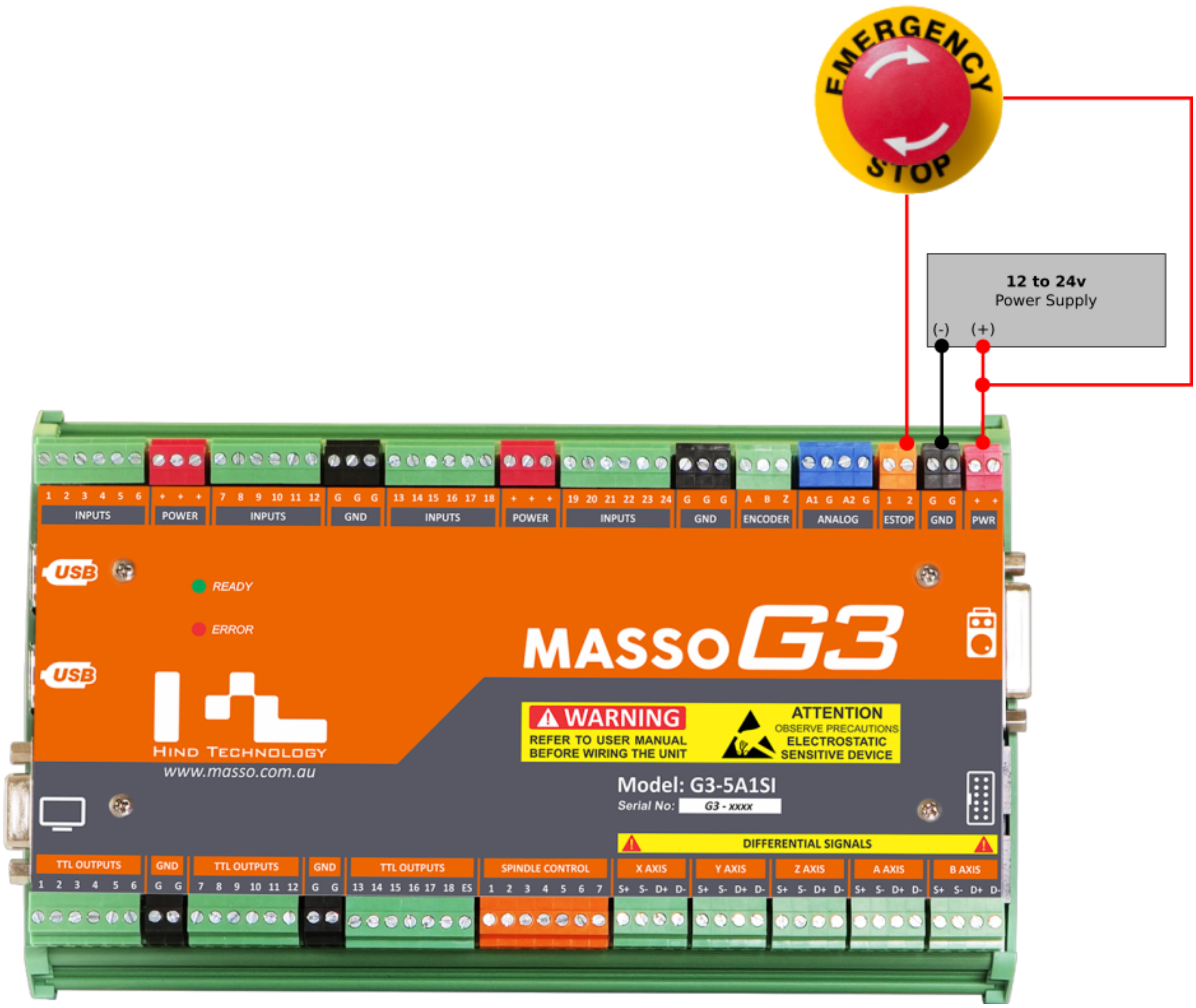
Pin No.	Description
Pin 1	E-Stop Signal - To be used when using MPG E-Stop pendant button
Pin 2	E-Stop Signal

WARNING: To avoid damage to equipment or hazard to personnel, the system installer should wire the **E-Stop** button so that pressing the **E-Stop** button disables all drives and actuators on the machine. The E-Stop relay output on the MASSO should be wired to disable the axis drives and the spindle drive circuits.

Simple one E-Stop button wiring

The below wiring example shows how to wire and use only one E-Stop button. The **E-Stop** button is wired to **ESTOP** terminal **Pin 2**.

INFORMATION: In the below example E-Stop button on the MPG will not work.

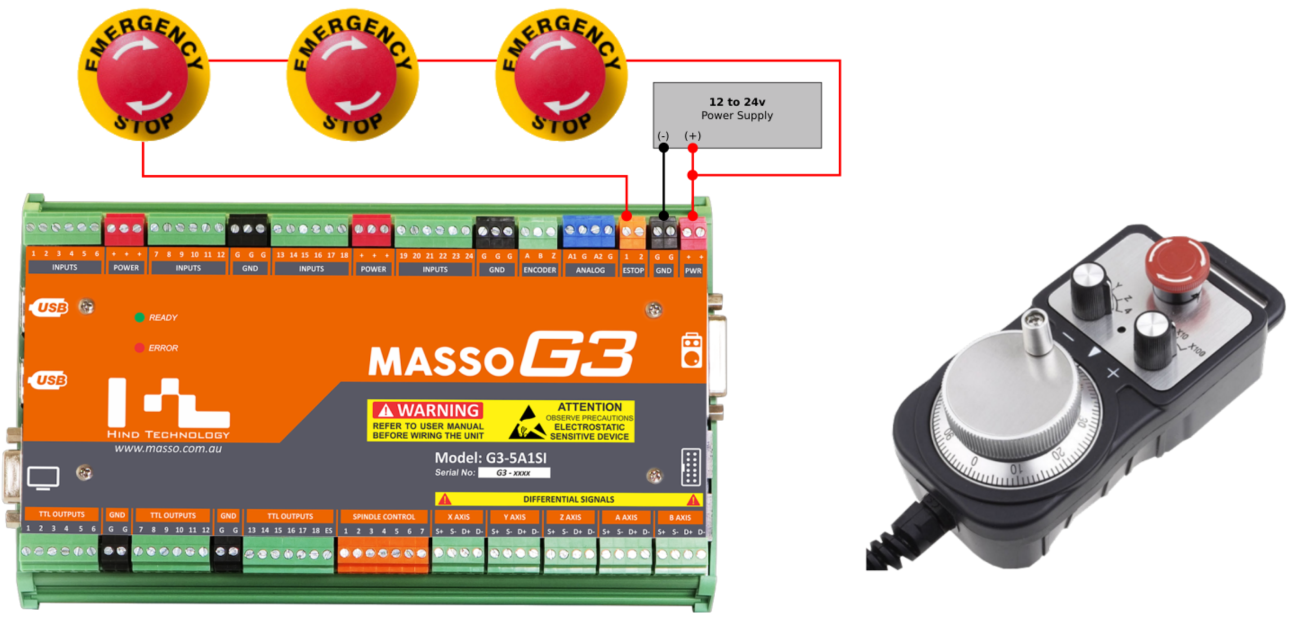


Wiring only one E-Stop on MPG pendant

The below wiring example shows how to wire and use only the E-Stop button on the MPG pendant. **Pin 1** on the **ESTOP** terminal is wired to positive of the power supply to get the MPG E-Stop button working.

Wiring multiple E-Stop buttons and MPG pendant E-Stop button

The below wiring example shows how to wire and use multipe **E-Stop** buttons and MPG pendant **E-Stop** button. All **E-Stop** buttons are wired in series to **Pin 1** on the **ESTOP** terminal through the positive of the power supply. When any of the three external **E-Stop** buttons or MPG pendant **E-Stop** button is presses, MASSO will display an E-Stop alarm on the screen and the **"ES" (E-Stop output)** singnal will go LOW.



Wiring E-Stop output signal to relay

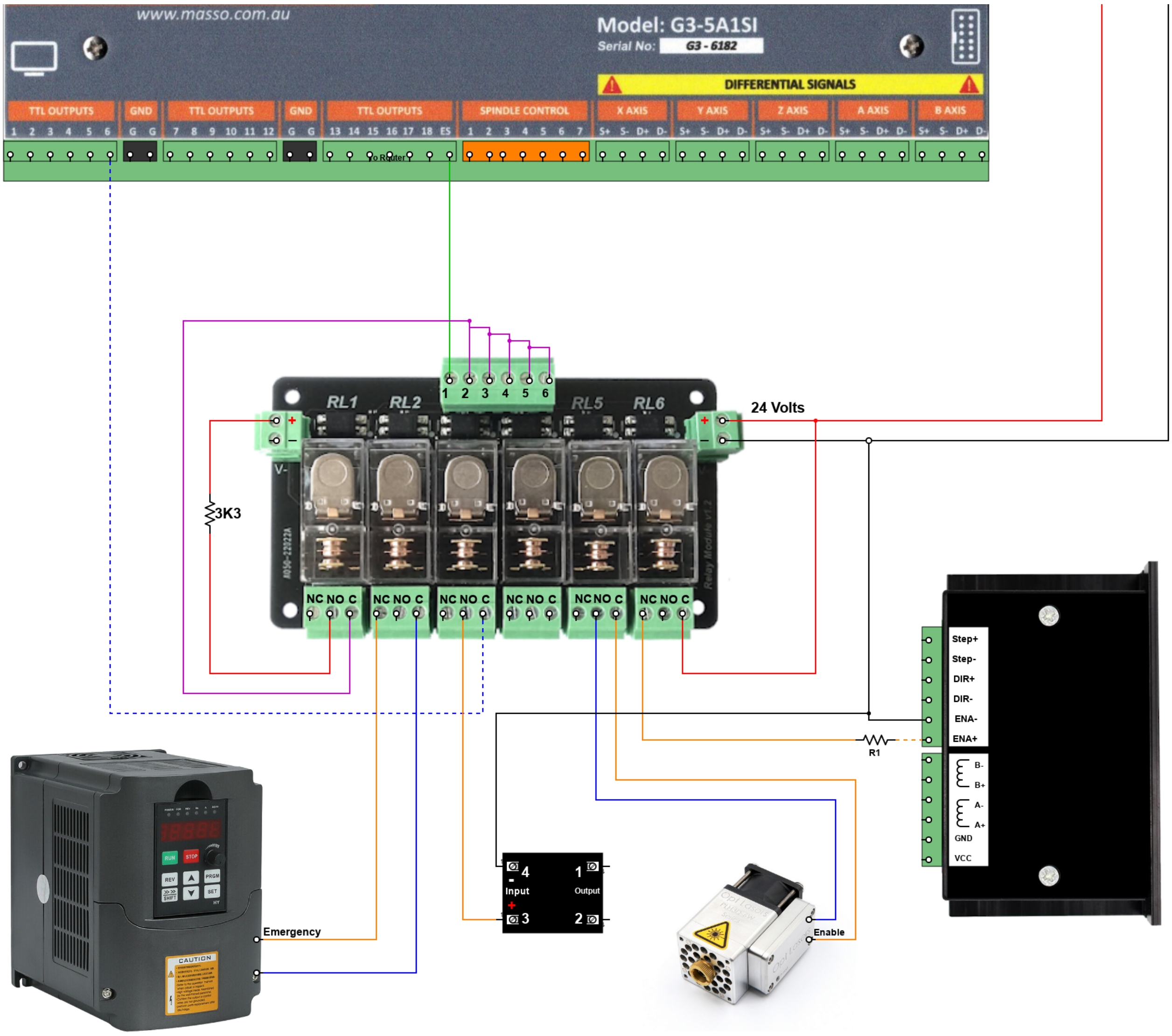
A special output signal **"ES" (E-Stop output)** is available on the outputs terminal. This output is internally hardwired to the **E-Stop** button signals and goes LOW when the **E-Stop** button is pressed.

CAUTION: This output must be used to control a relay and then the relay must be able to disable all drives and actuators on the machine. The user should not rely on the software to stop the axis, spindle or other actuators in case of an emergency and must disable all drives electrically.

- The normal state of the ES Relay is energized when the machine is not in an EStop condition.
- Multiple relays can be used if you need more than 1 set of relay contacts
- You can connect multiple MASSO Relays together as shown. Use this method of wiring if you require 2 to 5 relay outputs. Relay 1 is connected to the ES output on MASSO and the Output of Relay 1 will operate all other relays.
- A single 3.3K resistor will work to operate 2 to 5 relays on the same MASSO Relay Module.

INFORMATION: MASSO Relay Module information is available here: MASSO Relay Module

Caution: The disable methods for the devices in the diagram below are for demonstration purposes only, to show various connection methods. Please consult your user manual for the correct method to disable and enable your device.



> **WARNING:** If you are disconnecting mains power in an EStop situation it is highly recommended that you do not run the mains through the MASSO Relay. Use the relay to operate a separate relay located elsewhere in the control cabinet. This is so that you are not mixing Low voltage signal and Mains voltages on the same board as this can lead to accidents. It is best practice to keep your mains voltage circuits separate and physically protected against accidental contact by the user.

This video explains the EStop switch install process.

Scan the QR code to watch the MASSO video tutorial on YouTube

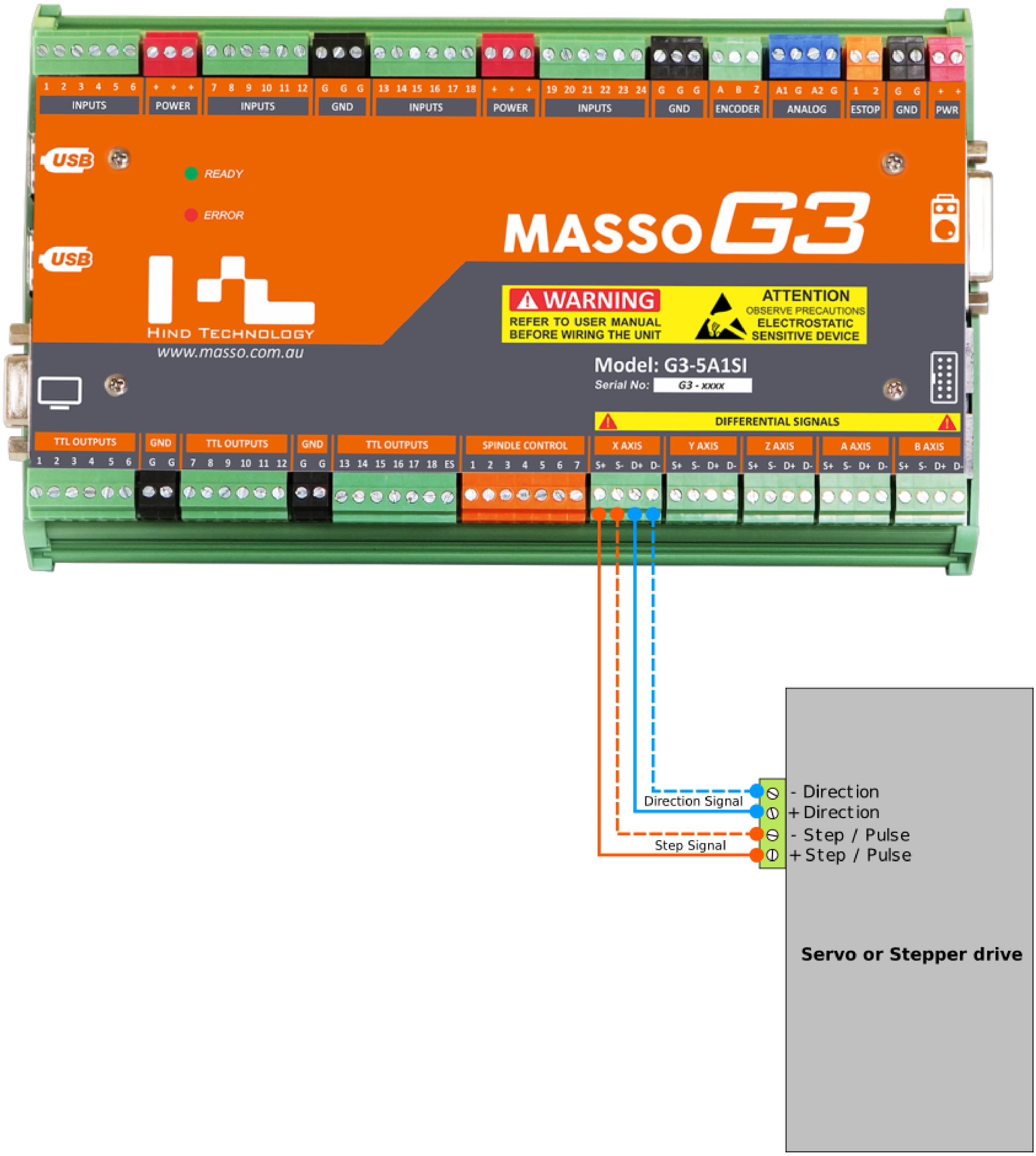
Or, Click here to view the video

11.3. Axis Servo/Stepper examples

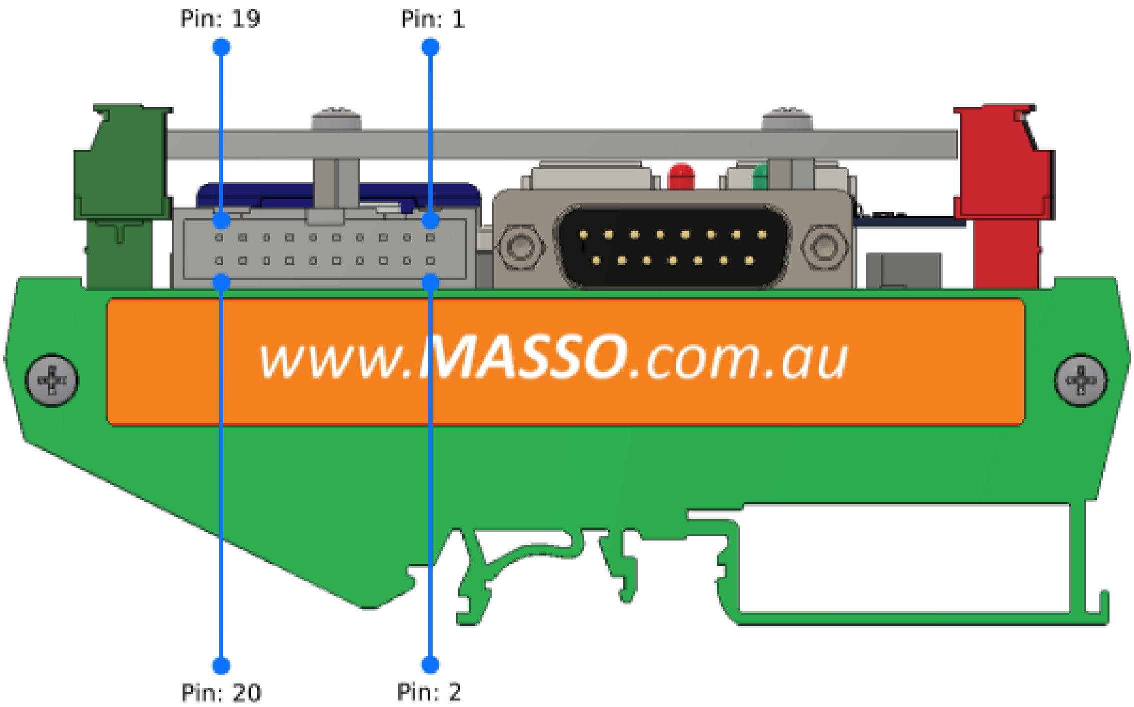
WARNING: Axis Step and Direction signals are differential type signals and the following precautions must be taken to wire the controller to avoid any electrical damage to the system:

- All axis outputs are differential signals with **-4** to **+4** voltage signals.
- Never short-circuit the signals with each other or any other voltage.
- All signals must be isolated to other signals and connected directly to the drives

Wiring example



MASSO G3 side connector information

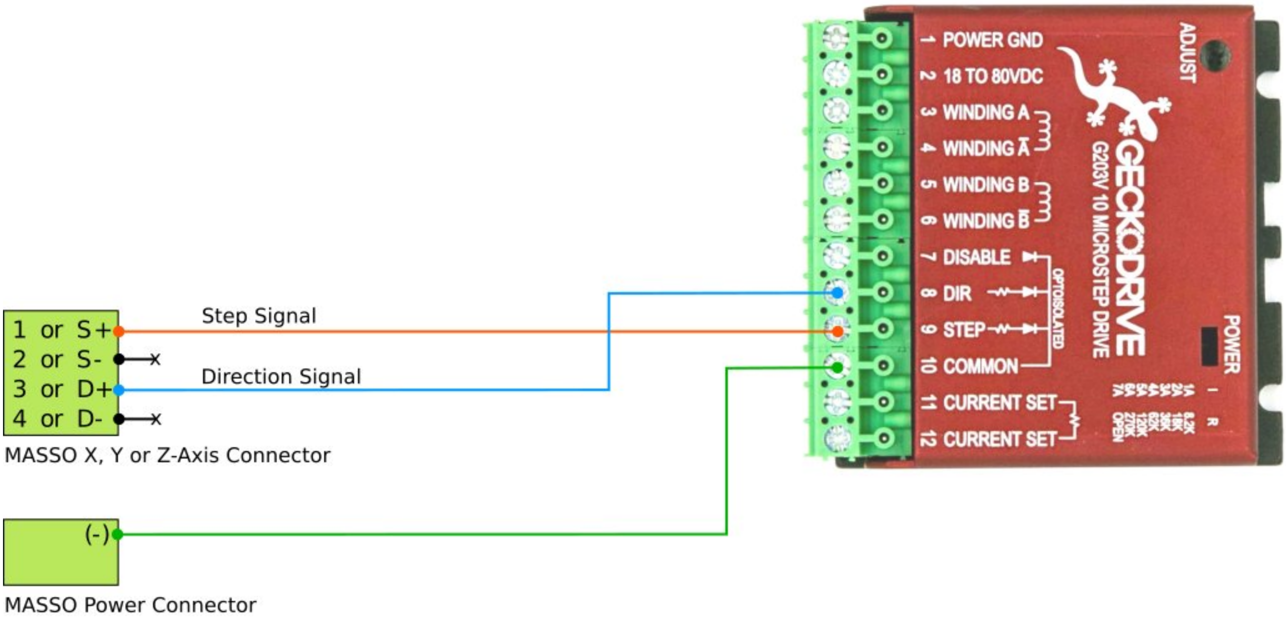


IDC Connector with TTL 5v signals:
Pin 1: GND
Pin 2: Do Not Connect
Pin 3: B-Axis Direction
Pin 4: B-Axis Step
Pin 5: A-Axis Direction
Pin 6: A-Axis Step
Pin 7: Z-Axis Direction
Pin 8: Z-Axis Step
Pin 9: Y-Axis Direction
Pin 10: Y-Axis Step
Pin 11: X-Axis Direction
Pin 12: X-Axis Step
Pin 13: Do Not Connect
Pin 14: Do Not Connect
Pin 15: Do Not Connect
Pin 16: Do Not Connect
Pin 17: Do Not Connect
Pin 18: Do Not Connect
Pin 19: Do Not Connect
Pin 20: Do Not Connect

11.3.1. Gecko 203V

Gecko Drive 203V wiring example

> **CAUTION:** The **"x"** sign means do not connect.

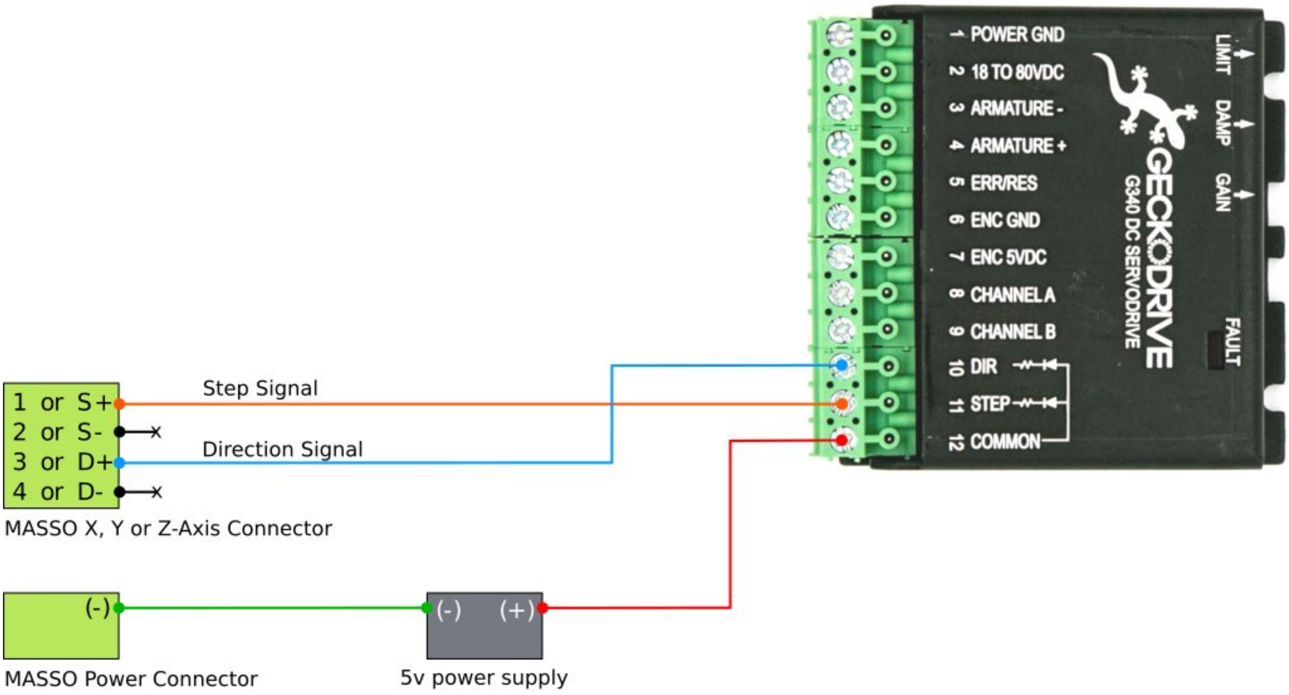


11.3.2. Gecko G340

Gecko Drive G340 wiring example

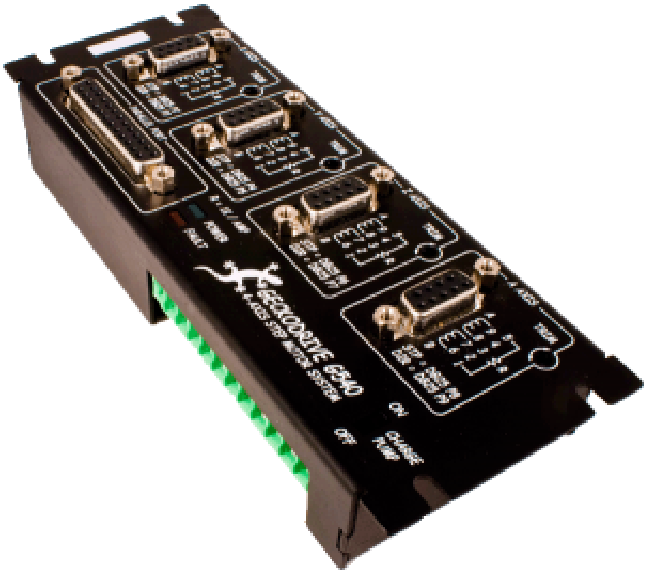
INFORMATION: As the Gecko G340 uses a common positive signal, the COMMON pin must be connected to a positive power supply and the negative of both power supplies must be connected togteher to complet the ciruit.

CAUTION: The **“x”** sign means do not connect.

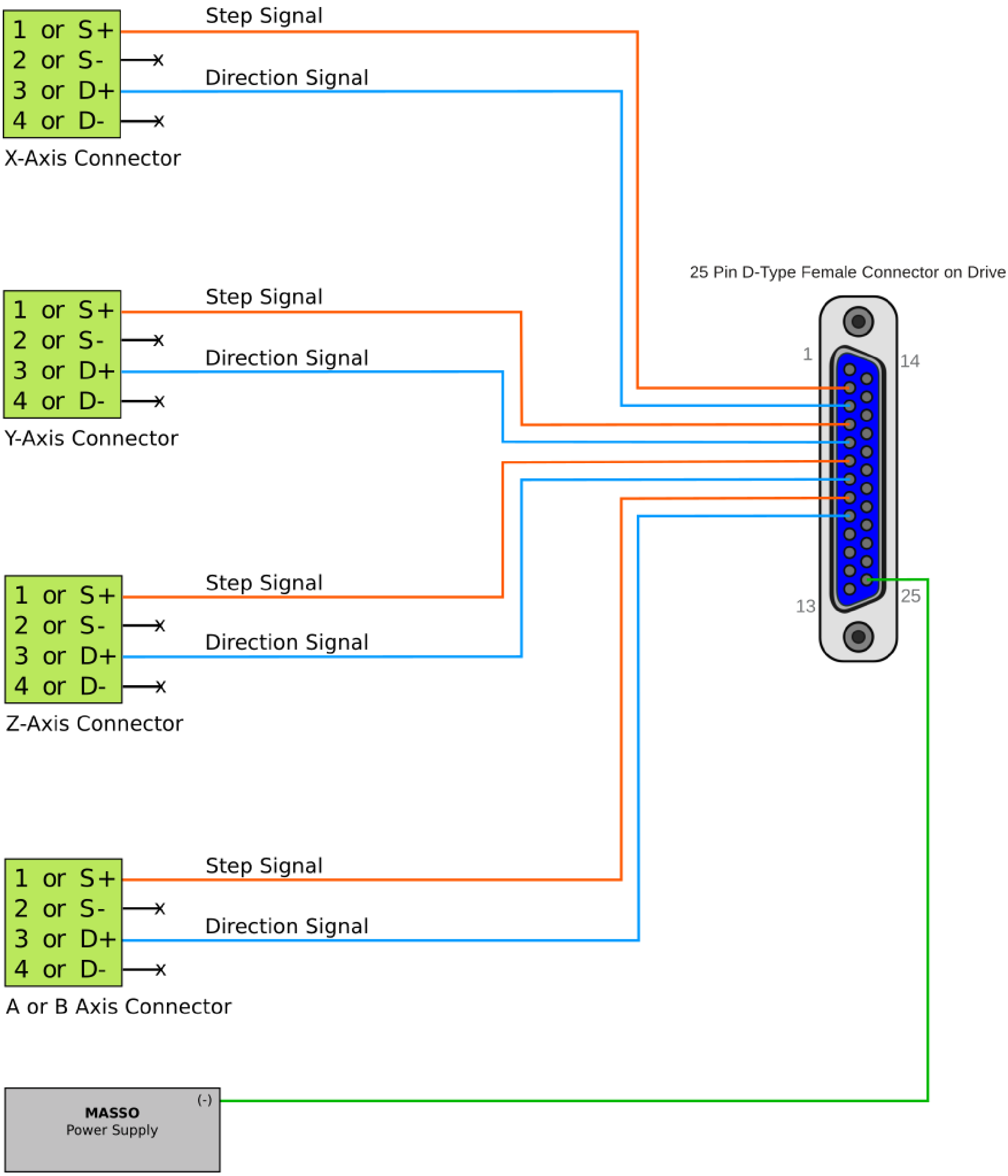


11.3.3. Gecko G540

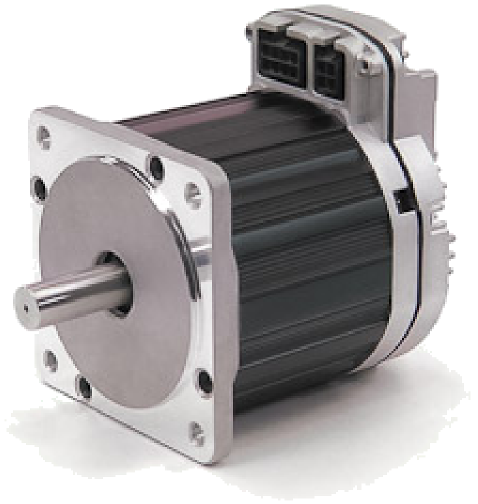
Gecko Drive G540 (4-AXIS) wiring example



CAUTION: The **“x”** sign means do not connect.

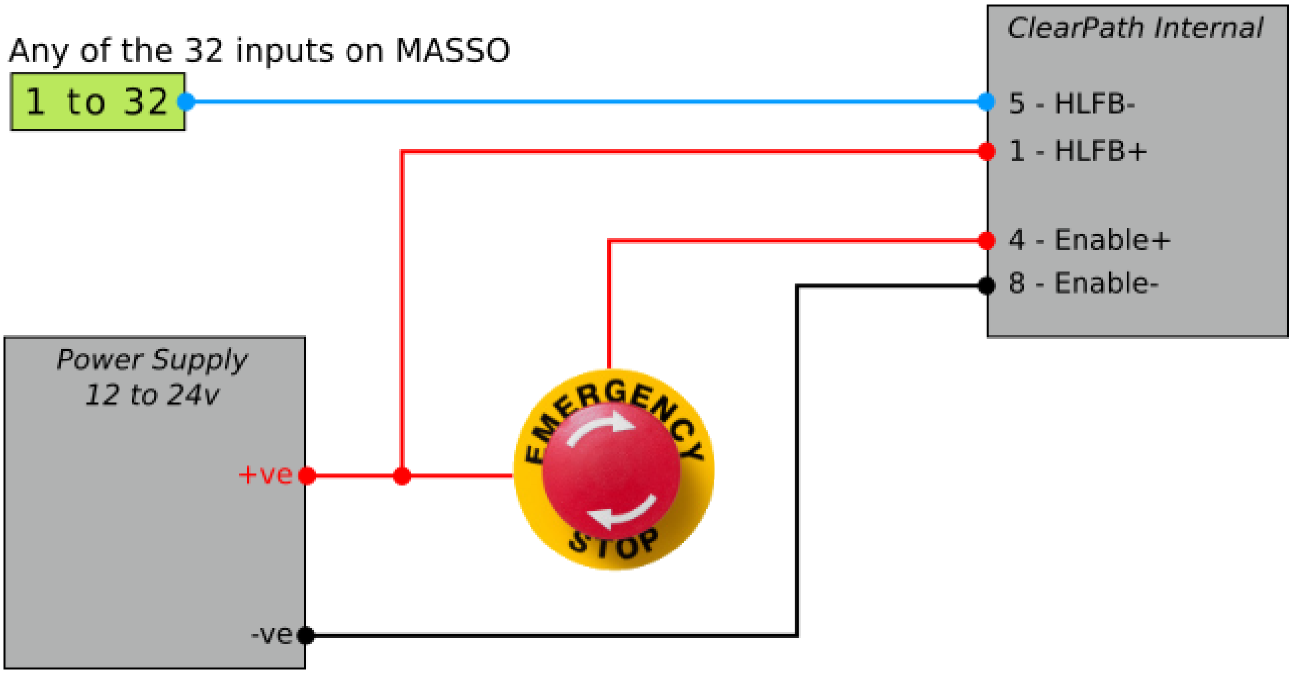

Step Signal
Direction Signal
1 or S+
2 or S-
3 or D+
4 or D-
X-Axis Connector
Step Signal
Direction Signal
1 or S+
2 or S-
3 or D+
4 or D-
Y-Axis Connector
Step Signal
Direction Signal
1 or S+
2 or S-
3 or D+
4 or D-
Z-Axis Connector
Step Signal
Direction Signal
1 or S+
2 or S-
3 or D+
4 or D-
A or B Axis Connector
25 Pin D-Type Female Connector on Drive
1
14
13
25
MASSO
Power Supply
(-)

11.3.4. Teknic - ClearPath



Please refer to Teknic's ClearPath User Manual for details

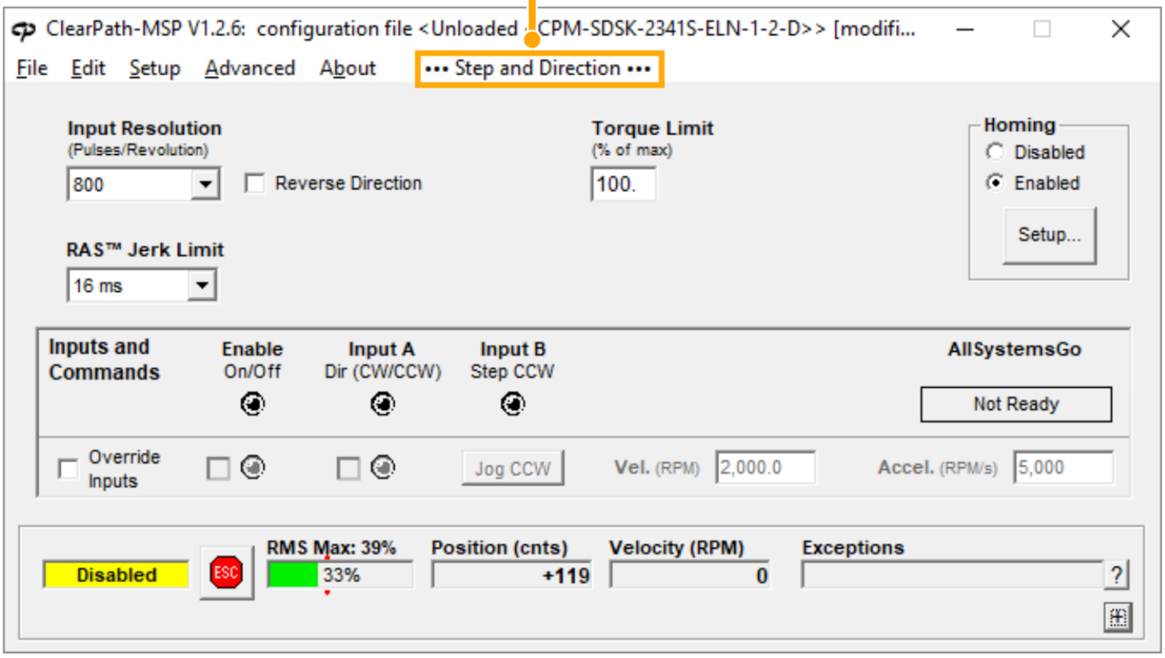
Teknic ClearPath wiring example



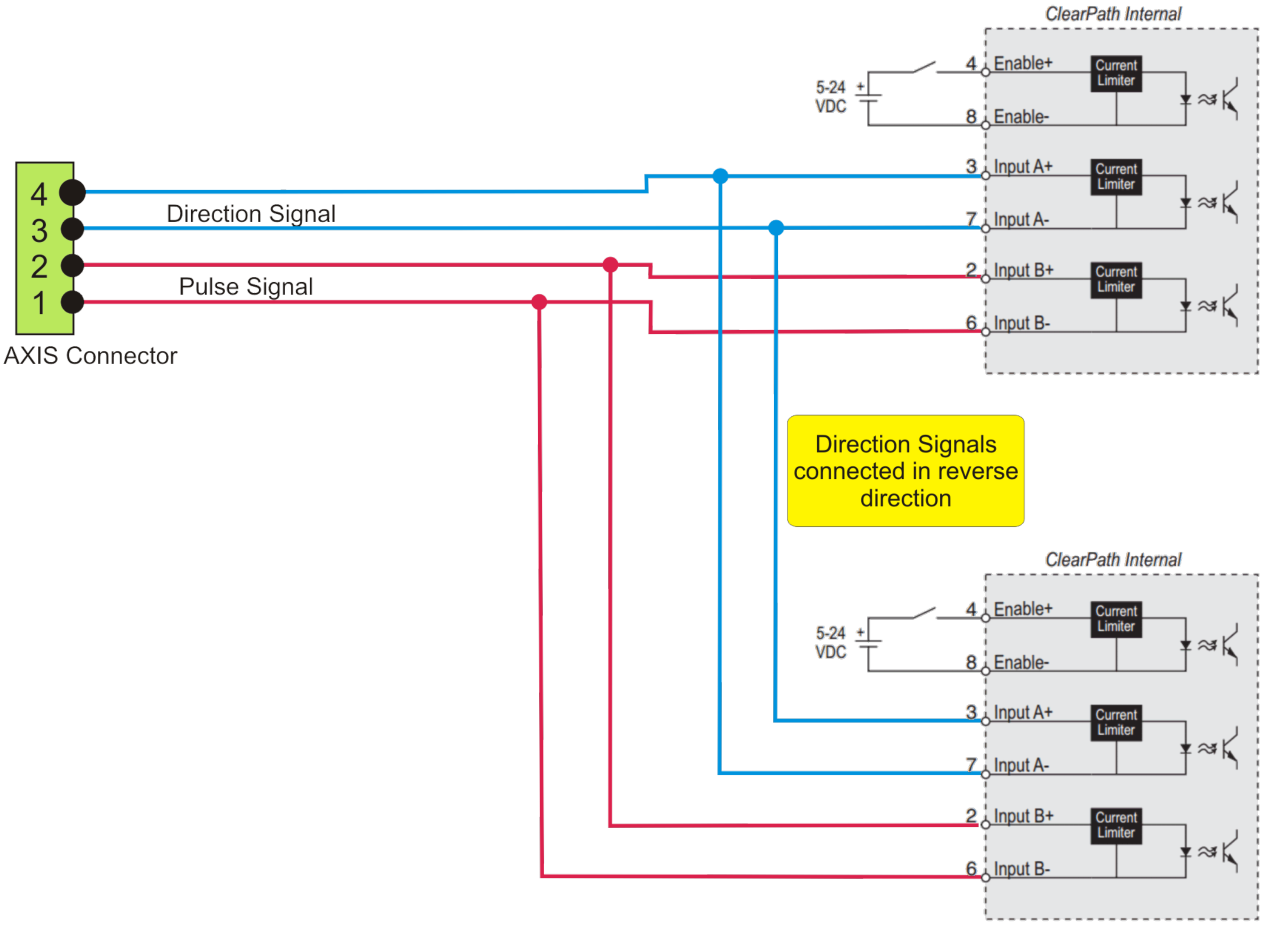
INFORMATION: Using the ClearPath software please check that the motor is configured to Step and Direction mode as shown below.

v5.25 - 25 Jul,2021

Check for ***Step and Direction*** setting



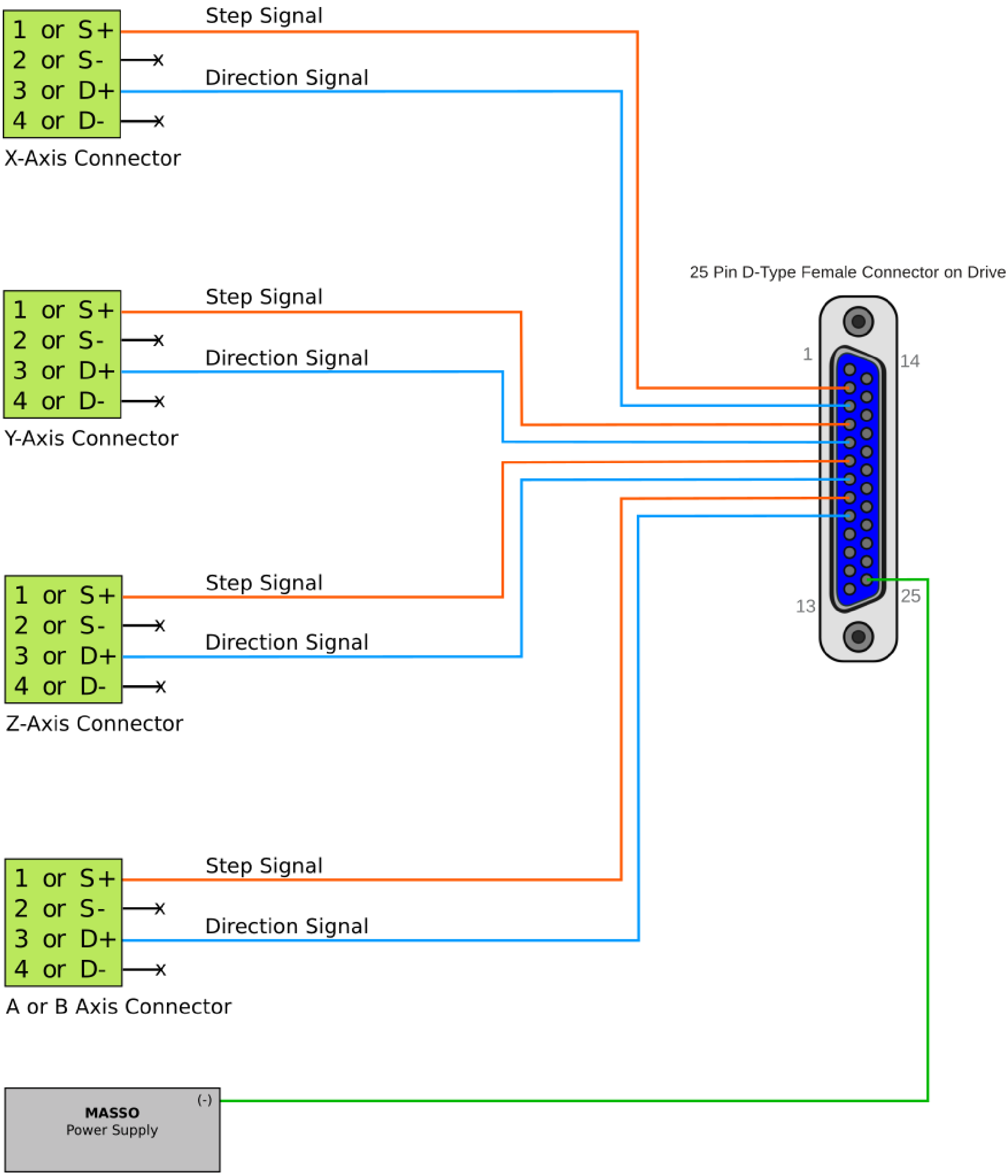
INFORMATION: Two motors on the same axis can be slaved in parallel by wiring the STEP and DIRECTION signals in parallel as shown below. As in most cases to run one of the motors in the opposite direction the DIRECTION +ve & -ve signal wires can be swapped on one of the motors.


ClearPath Internal
5-24 VDC
4 Enable+
8 Enable-
Current Limiter
3 Input A+
7 Input A-
2 Input B+
6 Input B-
4
3
2
1
Direction Signal
Pulse Signal
AXIS Connector
Direction Signals connected in reverse direction
ClearPath Internal
5-24 VDC
4 Enable+
8 Enable-
Current Limiter
3 Input A+
7 Input A-
2 Input B+
6 Input B-

11.3.5. Leadshine MX4660

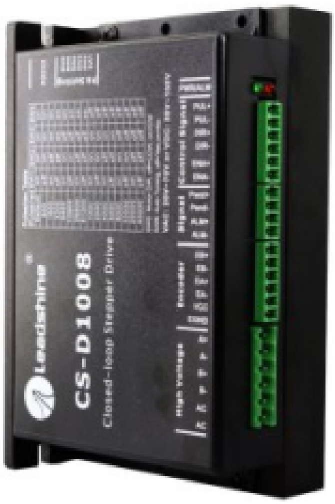
Leadshine Drive MX4660 wiring example

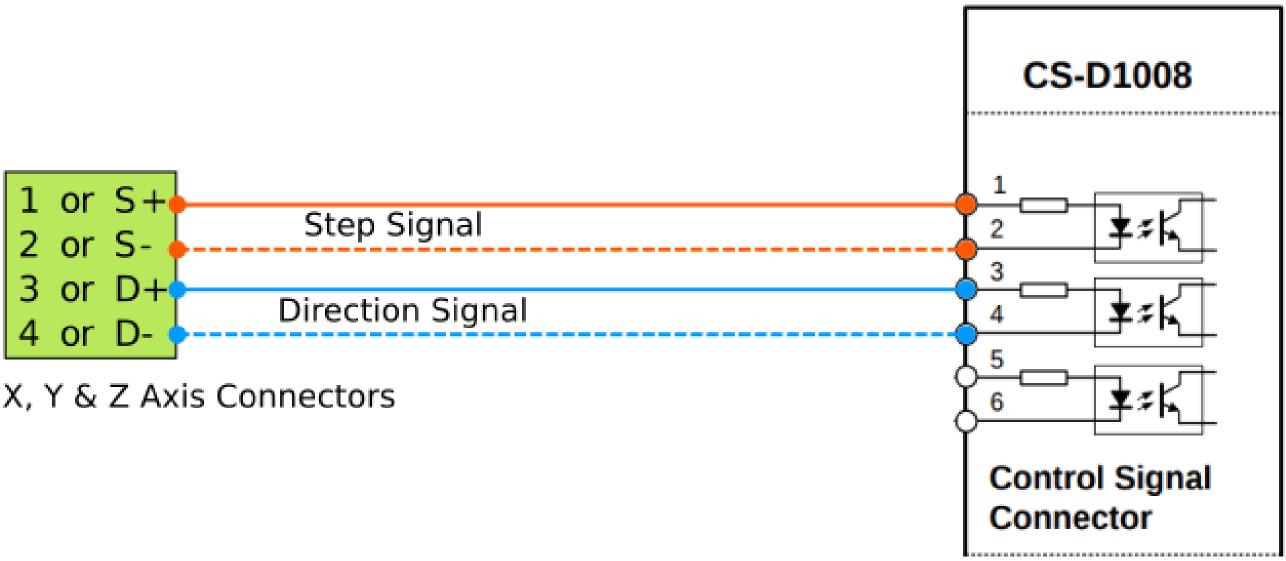
CAUTION: The “**x**” sign means do not connect.


1 or S+
2 or S-
3 or D+
4 or D-
Step Signal
Direction Signal
X-Axis Connector
1 or S+
2 or S-
3 or D+
4 or D-
Step Signal
Direction Signal
Y-Axis Connector
1 or S+
2 or S-
3 or D+
4 or D-
Step Signal
Direction Signal
Z-Axis Connector
1 or S+
2 or S-
3 or D+
4 or D-
Step Signal
Direction Signal
A or B Axis Connector
25 Pin D-Type Female Connector on Drive
1
14
13
25
MASSO
Power Supply
(-)

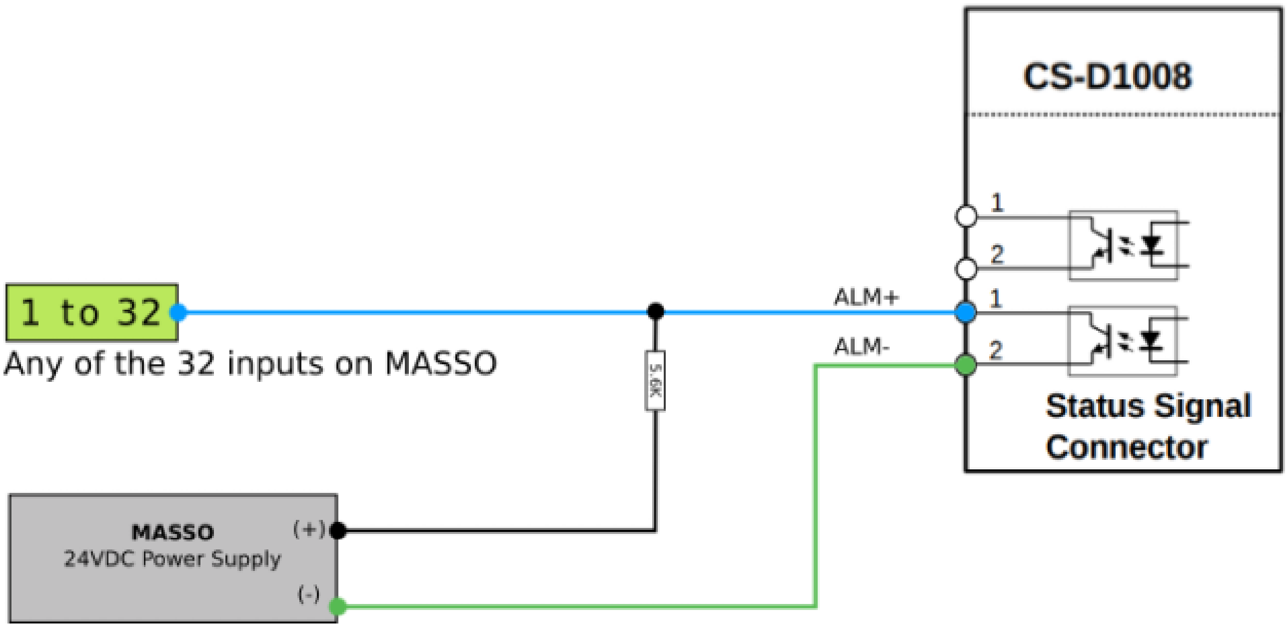
11.3.6. Leadshine CS-D1008

Leadshine Drive CS-D1008 wiring example



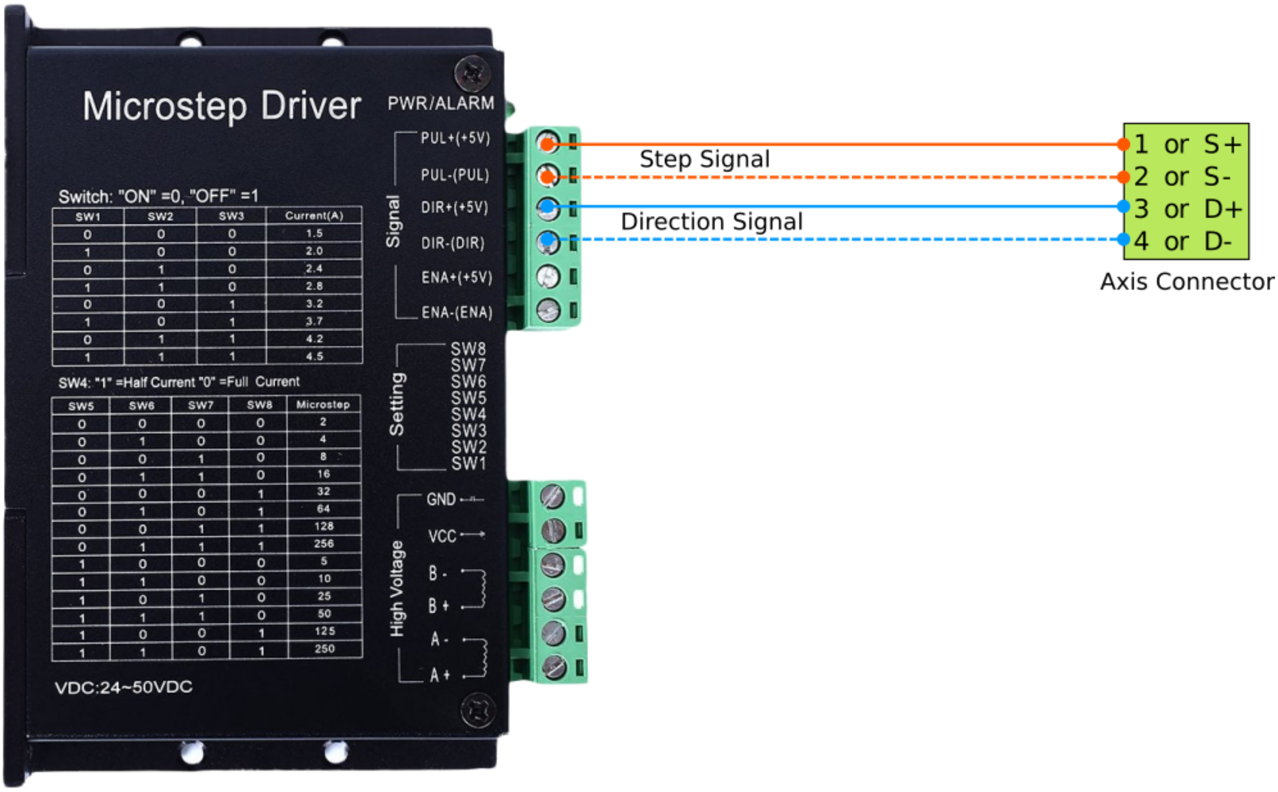


Drive alarm signal wiring


CS-D1008
1
2
1
2
Status Signal Connector
ALM+
ALM-
1 to 32
Any of the 32 inputs on MASSO
5.6K
MASSO
24VDC Power Supply
(+)
(-)

11.3.7. Longs Motors

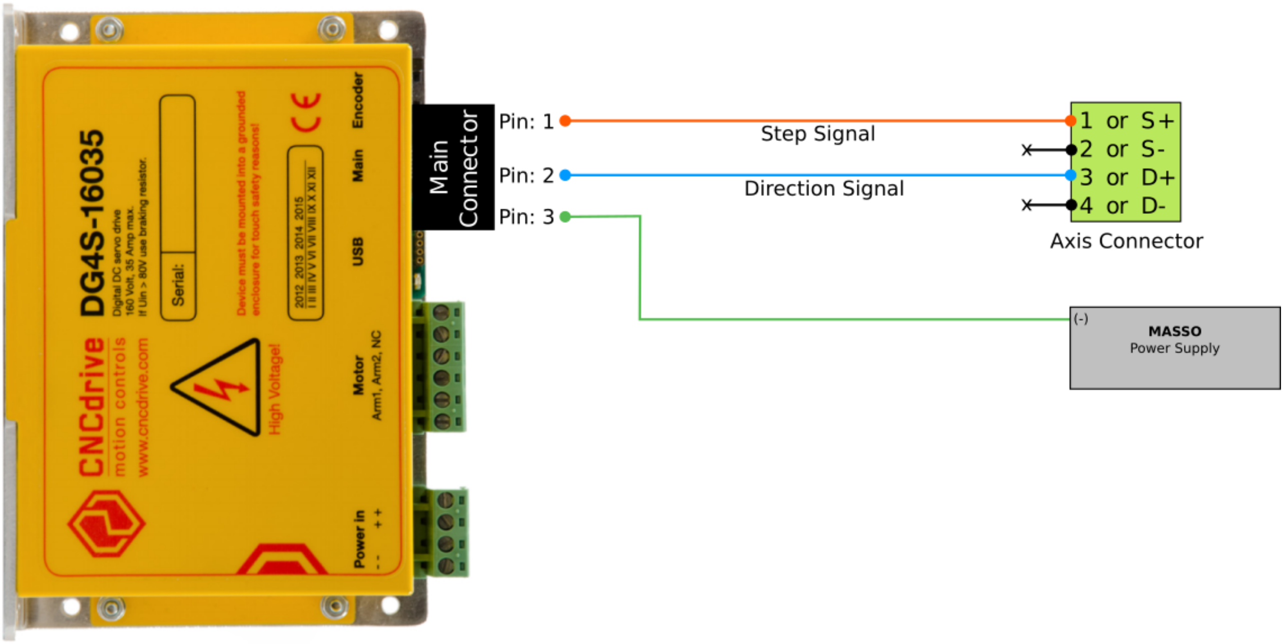
DM542A, DQ860MA wiring example



11.3.8. CNCdrive - DG4S-16035

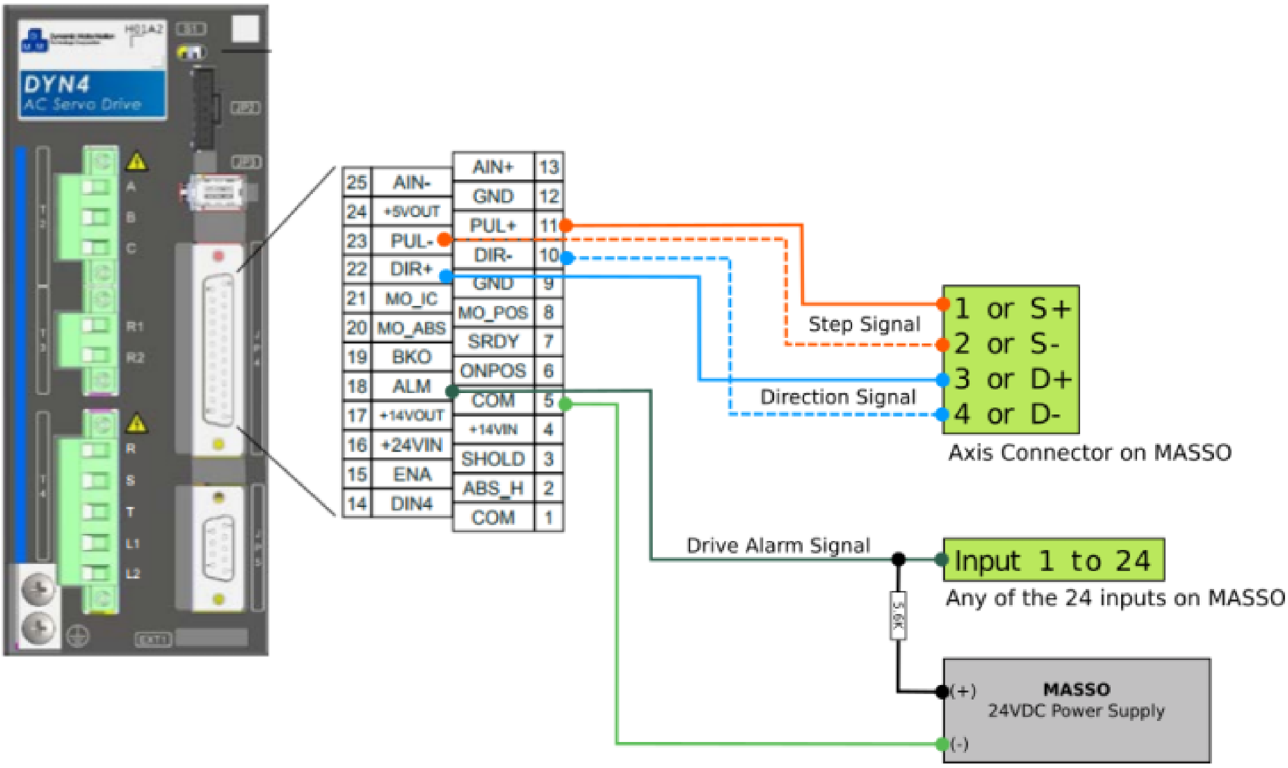
DG4S-16035 wiring example

CAUTION: The “**x**” sign means do not connect.



11.3.9. DMM - Dynamic Motor Motion

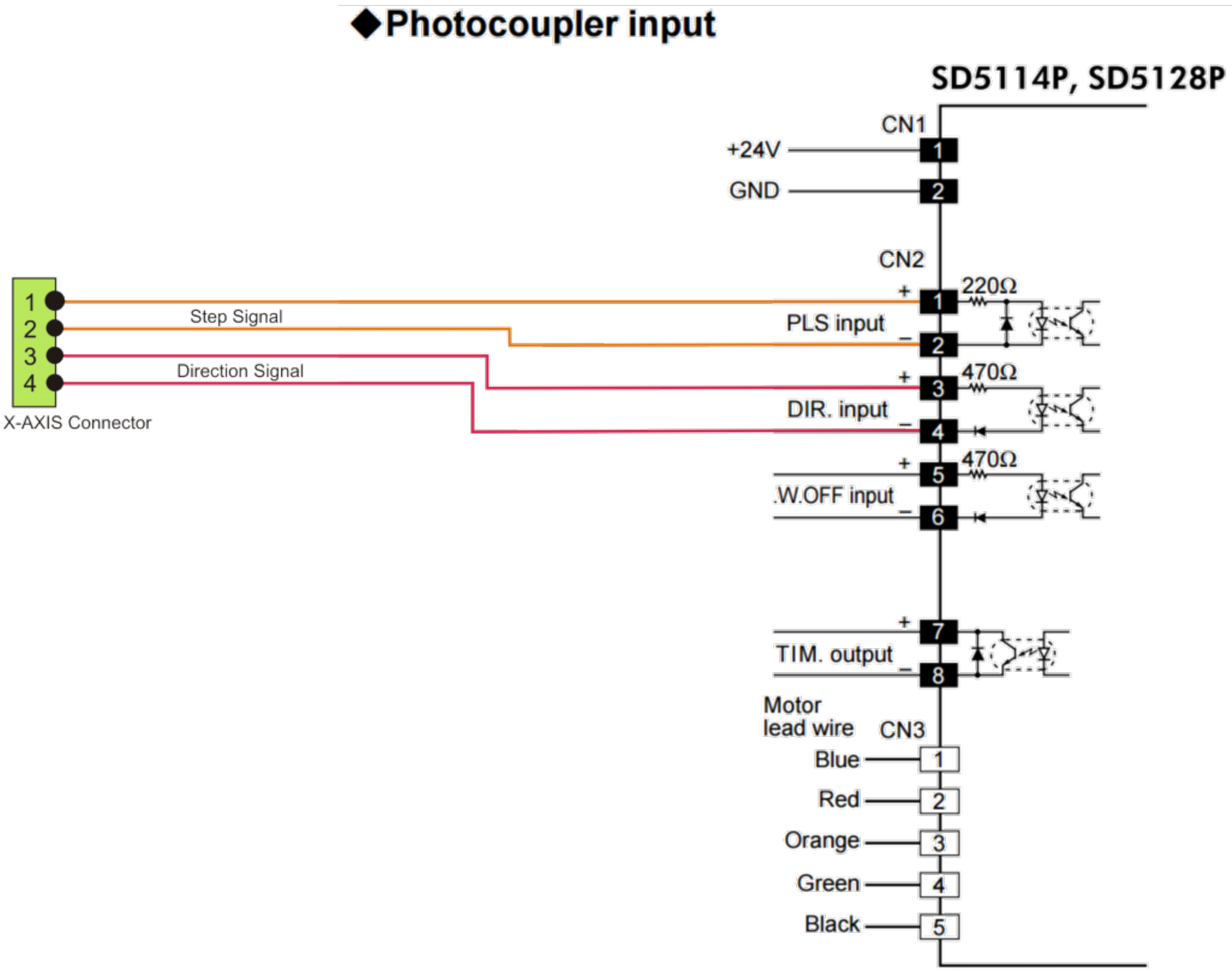
DMM DYN4 wiring example



Information: The resistor value is for a 24vDC power supply. Resistor value should be changed if using a different power supply voltage.

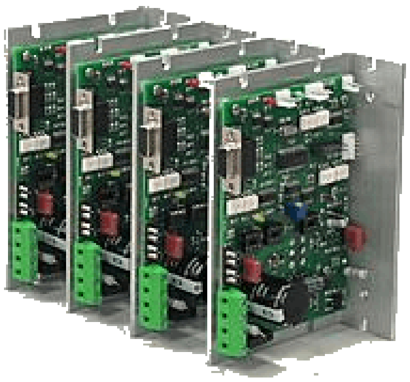
11.3.10. VEXTA

VEXTA SD51xx wiring example

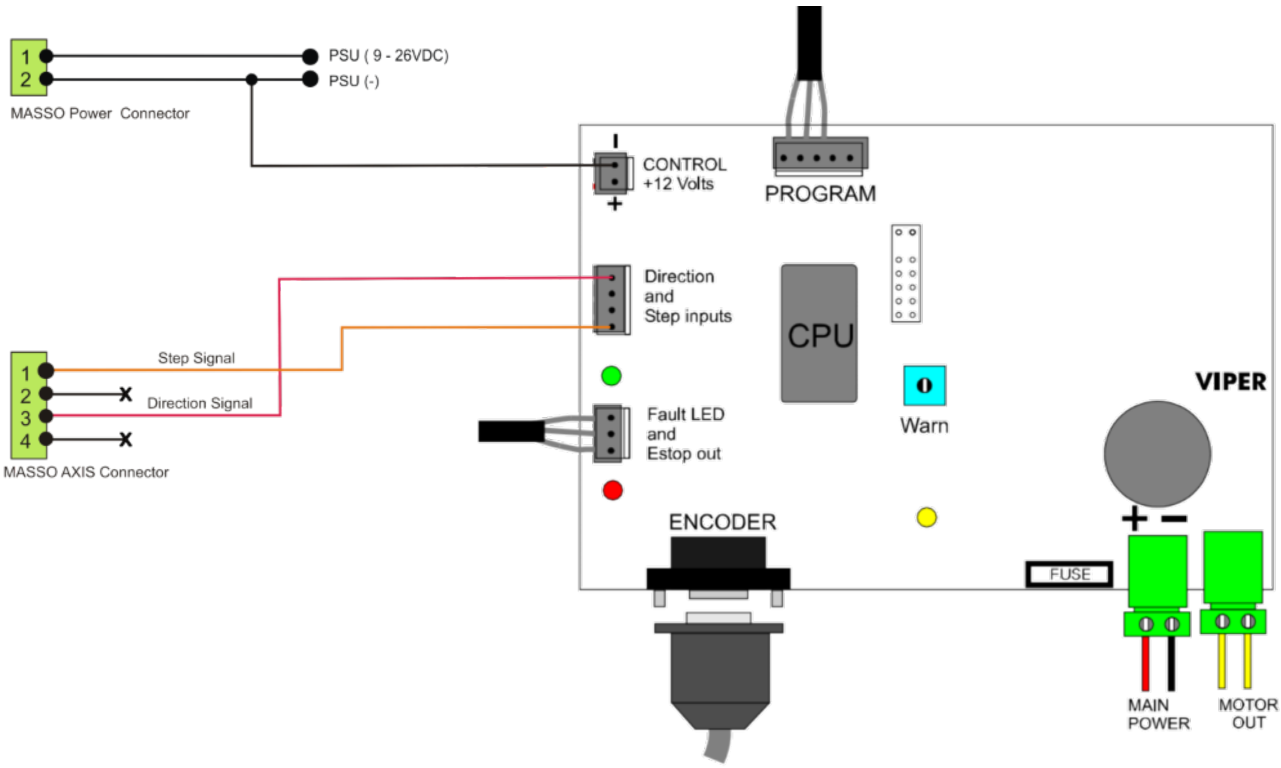


11.3.11. Viper

Viper 100F/200F wiring example

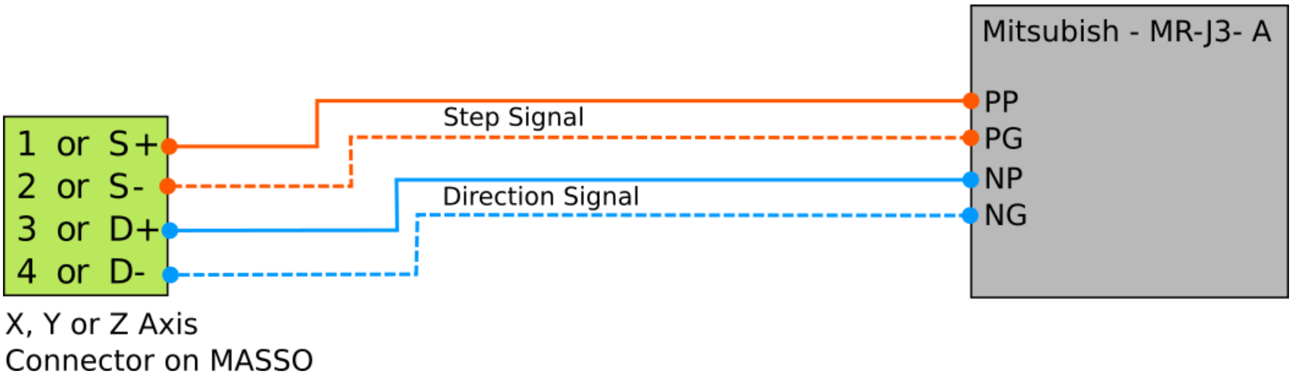


> **CAUTION:** The **“x”** sign means do not connect.

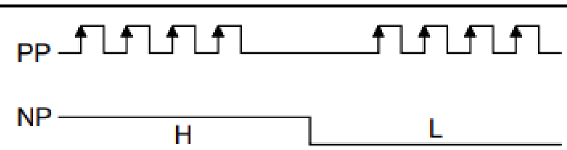


11.3.12. Mitsubishi - MR-J3

Mitsubishi - MR-J3 wiring example



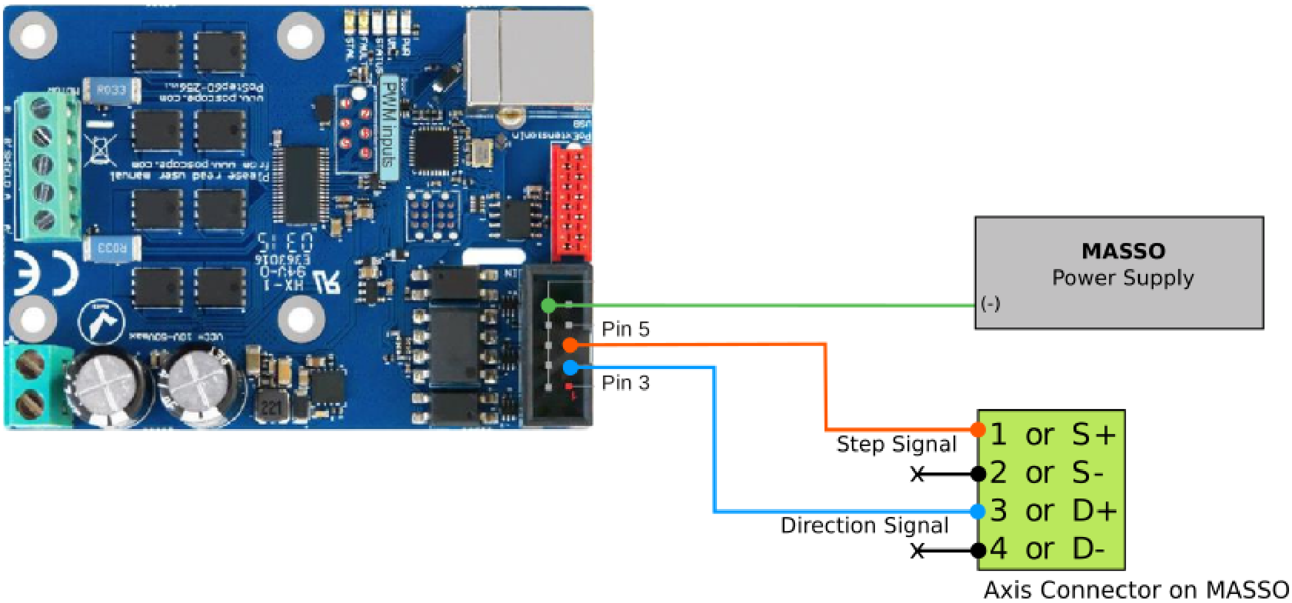
INFORMATION: As per drive user manual set the PA13 parameter to 0001h to take Step(Pulse) and Direction signals.

0001h	Positive logic	Signed pulse train	

11.3.13. PoStep60

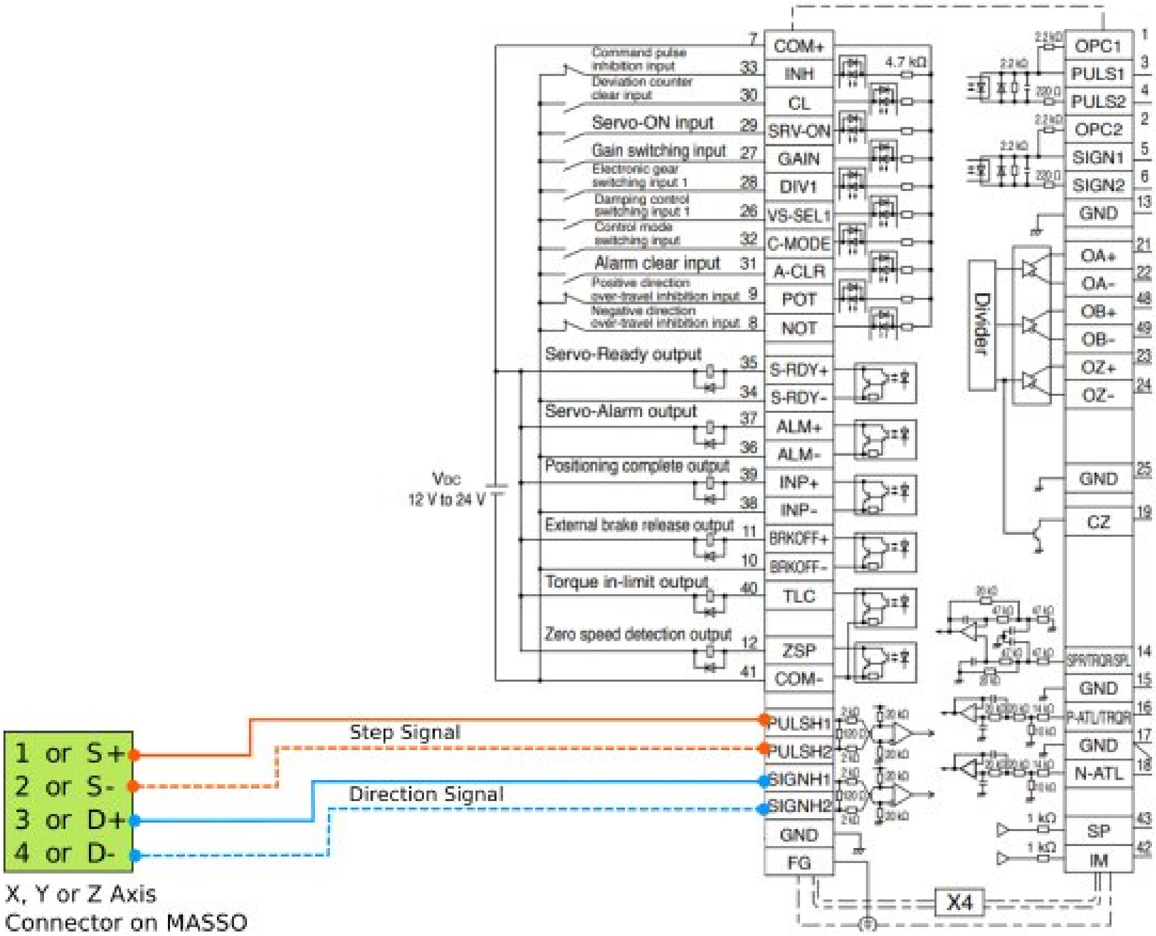
PoStep60 wiring example

> **CAUTION:** The “**x**” sign means do not connect.



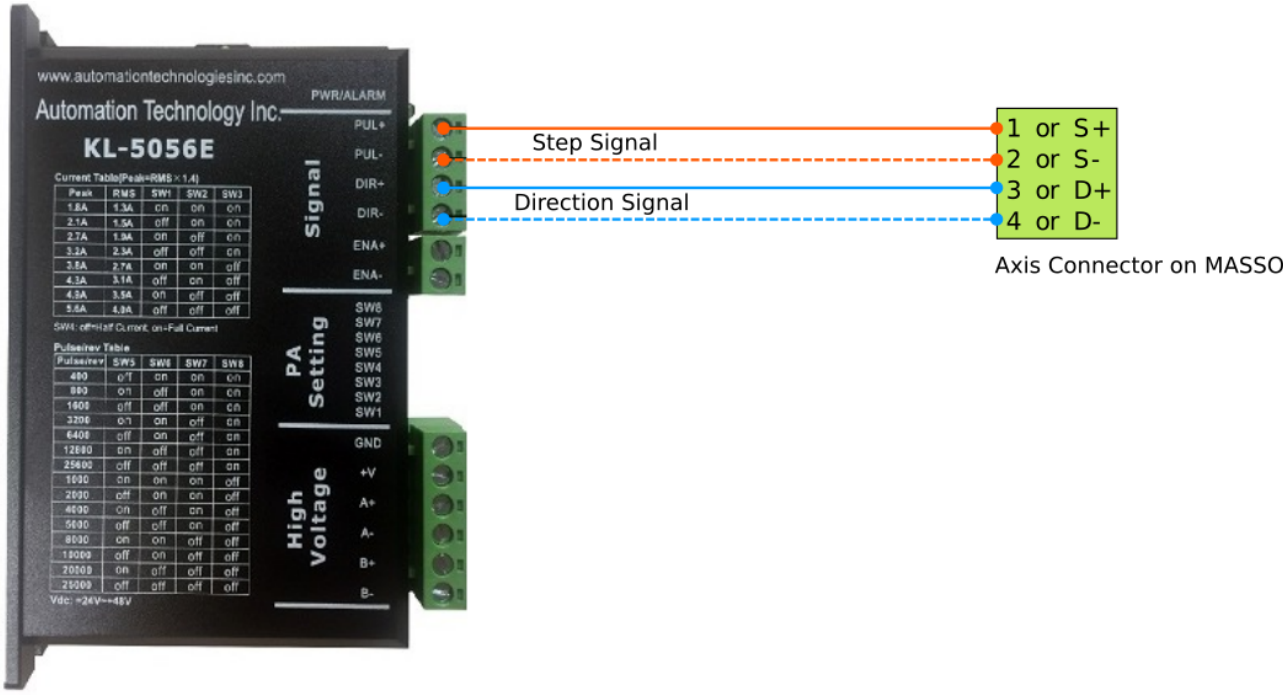
11.3.14. Panasonic

Panasonic - MCDHT3520 wiring example


1 or S+
2 or S-
3 or D+
4 or D-
X, Y or Z Axis
Connector on MASSO
Step Signal
Direction Signal
Servo-ON input
Gain switching input
Alarm clear input
Servo-Ready output
Servo-Alarm output
Positioning complete output
External brake release output
Torque in-limit output
Zero speed detection output
VDC
12 V to 24 V
COM+
INH
CL
SRV-ON
GAIN
DIV1
VS-SEL1
C-MODE
A-CLR
POT
NOT
S-RDY+
S-RDY-
ALM+
ALM-
INP+
INP-
BRKOFF+
BRKOFF-
TLC
ZSP
COM-
PULSH1
PULSH2
SIGNH1
SIGNH2
GND
FG
OPC1
PULS1
PULS2
OPC2
SIGN1
SIGN2
OA+
OA-
OB+
OB-
OZ+
OZ-
CZ
N-ATL
SP
IM
Divider
X4

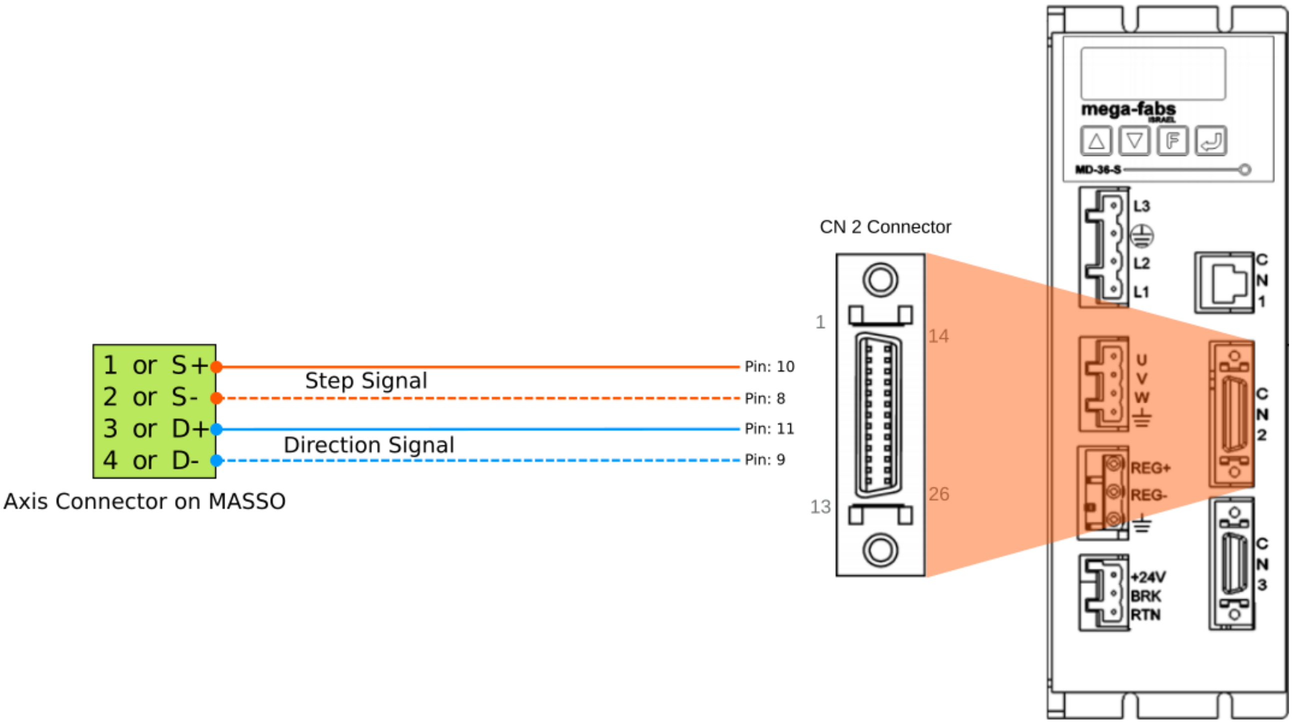
11.3.15. Automation Technology Inc.

Automation Technology Inc. - KL5056E wiring example



11.3.16. Hiwin

Hiwin mega-fabs D1 wiring example

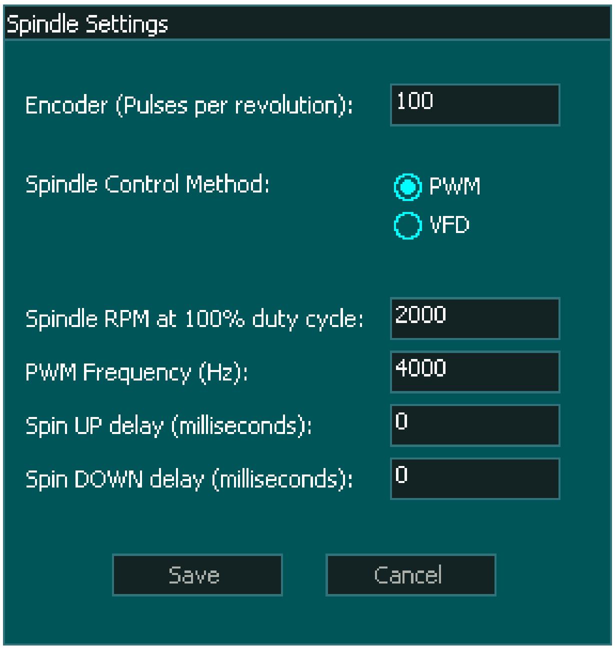


CN 2 Connector
1 or S+
2 or S-
3 or D+
4 or D-
Step Signal
Direction Signal
Pin: 10
Pin: 8
Pin: 11
Pin: 9
Axis Connector on MASSO
1
14
13
26
mega-fabs
MD-36-S
L3
L2
L1
U
V
W
REG+
REG-
+24V
BRK
RTN
CN1
CN2
CN3

11.4. Spindle Control

MASSO provides **0~10v** and **PWM** control signals to control a variety of VFD and DC spindle drives.

In the Spindle Settings window the mode of spindle control can be selected. Further, **Spin UP** and **Spin DOWN** delay values can be added. The spinde delay values pauses the machine on spindle ON and OFF commands for the spindle to get to the required RPM.



INFORMATION: PWM frequency on the MASSO can be set between **4 kHz** to **65 kHz.**

INFORMATION: When running in PWM mode MASSO outputs **Uni-polar PWM** signals.

Pin No.	Description	Type
Pin 1	0~10V DC Output	Analog
Pin 2	Motor Direction Clockwise / PWM output	TTL 5 Volt
Pin 3	Motor Direction Counter Clockwise / PWM output	TTL 5 Volt
Pin 4	**OPTO** - Motor Direction CW / PWM output	Transistor
Pin 5	**OPTO** - Motor Direction CW / PWM output	Transistor
Pin 6	**OPTO** - Motor Direction CCW / PWM output	Transistor
Pin 7	**OPTO** - Motor Direction CCW / PWM output	Transistor

For information on wiring of the spindle control to your VFD please see our Spindle VFD examples page.

11.5. Spindle VFD examples

MASSO supports 0~10v signal, clockwise and counter-clockwise signals to directly control VFD's.

INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, the below video provides detailed steps on how to setup and configure a VFD drive.

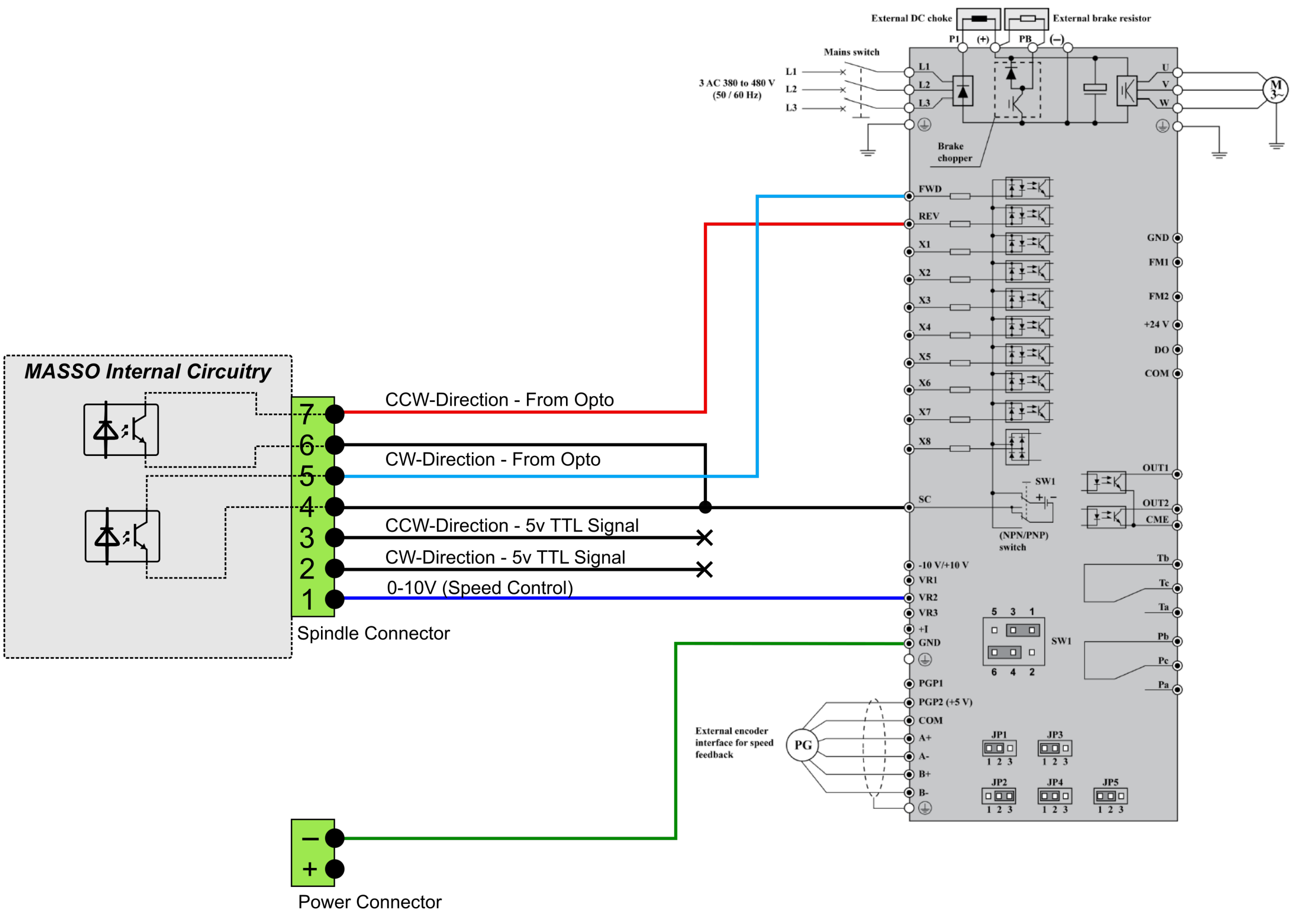
Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

11.5.1. Bosch Rexroth VFD

Bosch Rexroth VFD wiring example

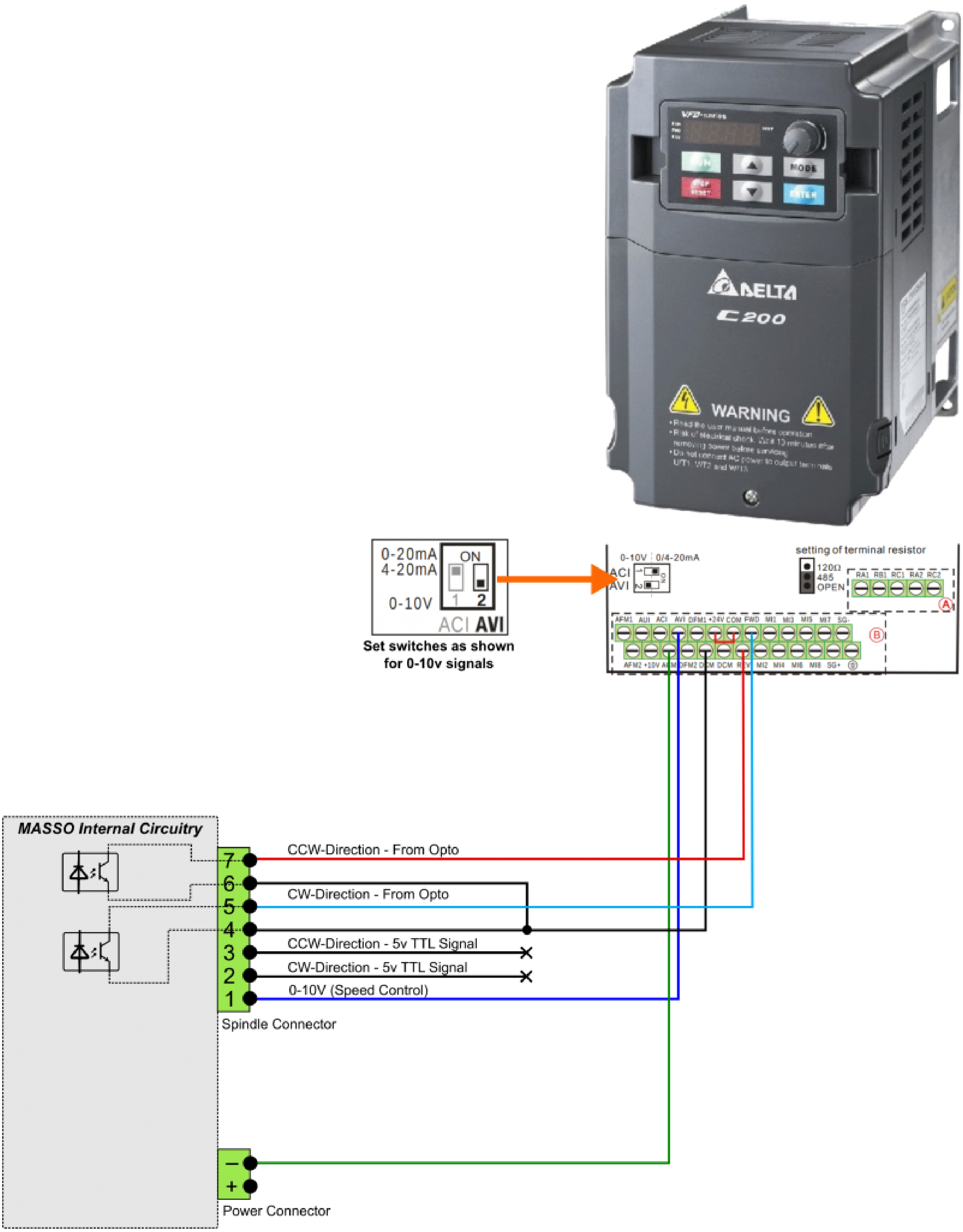
INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.



11.5.2. Delta C200 VFD

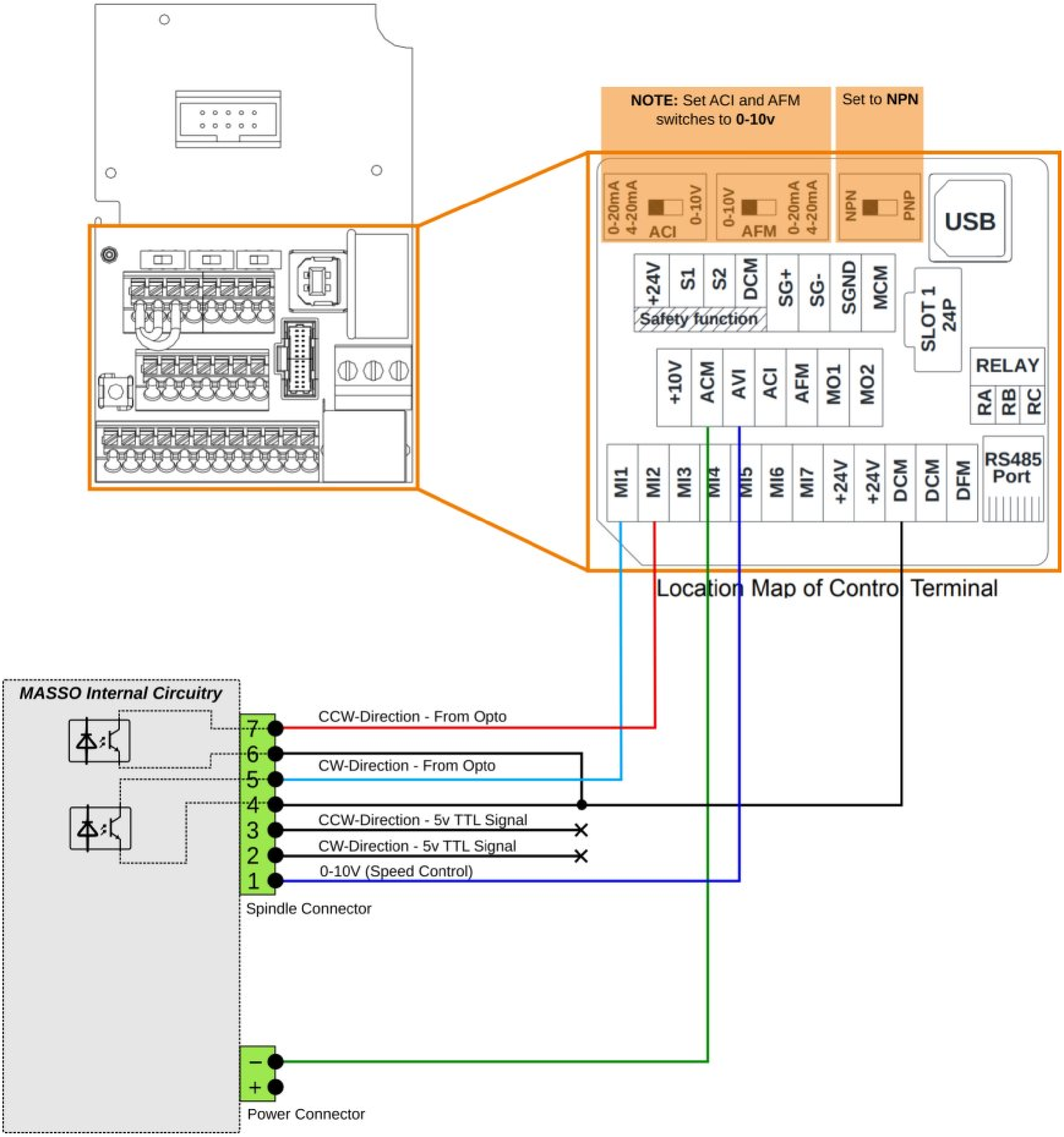
Delta - C200 series wiring example

INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.


0-20mA
4-20mA
0-10V
ON
1
2
ACI AVI
Set switches as shown
for 0-10v signals
0-10V
0/4-20mA
ACI
AVI
setting of terminal resistor
120Ω
485
OPEN
WARNING
MASSO Internal Circuitry
7
6
5
4
3
2
1
CCW-Direction - From Opto
CW-Direction - From Opto
CCW-Direction - 5v TTL Signal
CW-Direction - 5v TTL Signal
0-10V (Speed Control)
Spindle Connector
−
+
Power Connector

11.5.3. Delta MS300 VFD

Delta - MS300 series wiring example

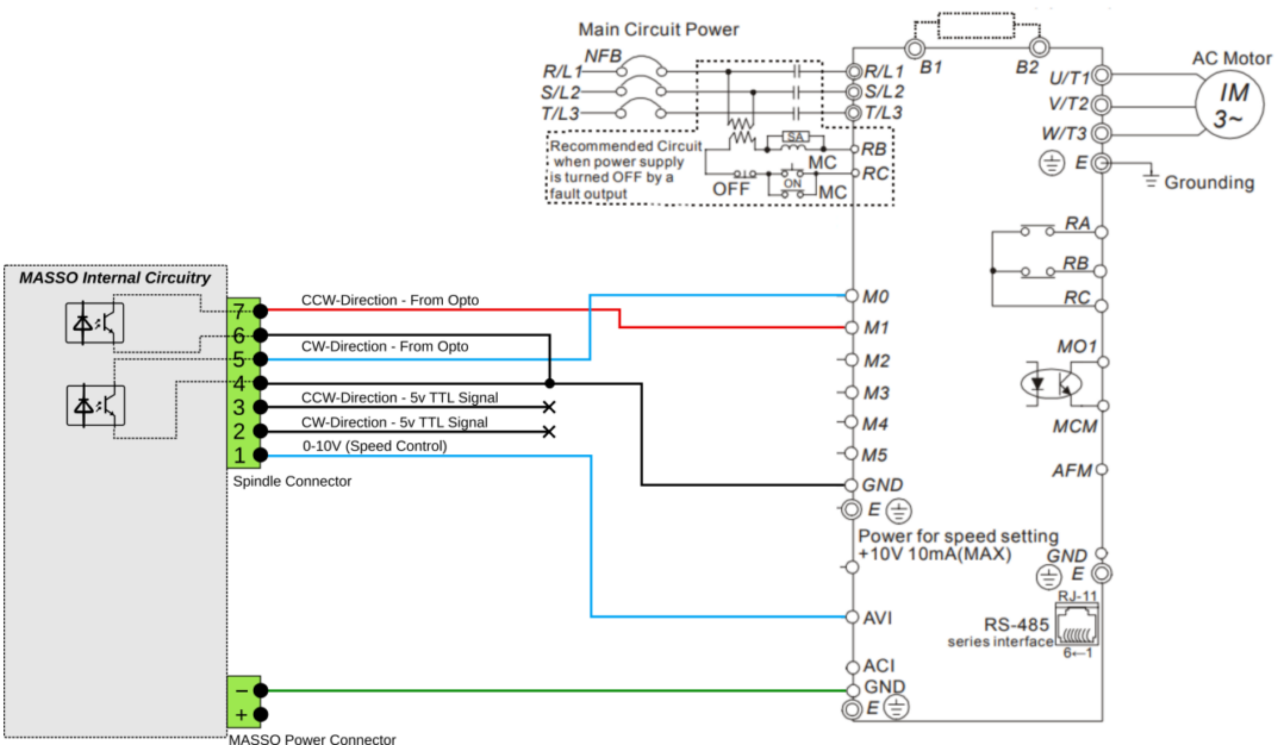


INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.

11.5.4. Delta VFD-M

Delta - VFD-M series wiring example

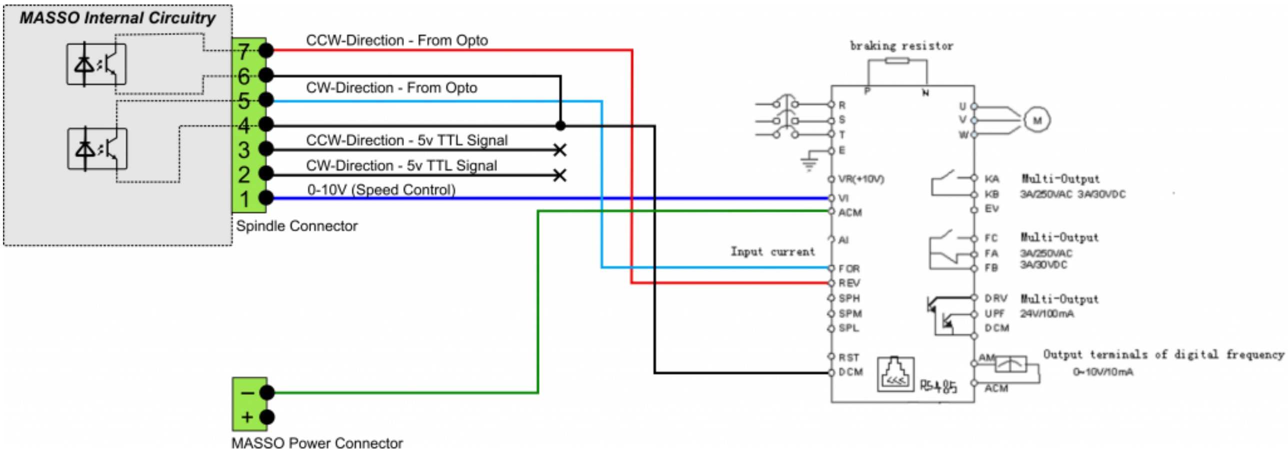
INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.


Main Circuit Power
NFB
R/L1
S/L2
T/L3
Recommended Circuit when power supply is turned OFF by a fault output
SA
MC
OFF
ON
MC
R/L1
S/L2
T/L3
RB
RC
B1
B2
U/T1
V/T2
W/T3
E
AC Motor
IM 3~
Grounding
RA
RB
RC
MASSO Internal Circuitry
CCW-Direction - From Opto
CW-Direction - From Opto
CCW-Direction - 5v TTL Signal
CW-Direction - 5v TTL Signal
0-10V (Speed Control)
7
6
5
4
3
2
1
Spindle Connector
M0
M1
M2
M3
M4
M5
GND
E
MO1
MCM
AFM
Power for speed setting +10V 10mA(MAX)
GND
E
RJ-11
RS-485 series interface
6←1
AVI
ACI
GND
E
−
+
MASSO Power Connector

11.5.5. Yuhuan Huanyang

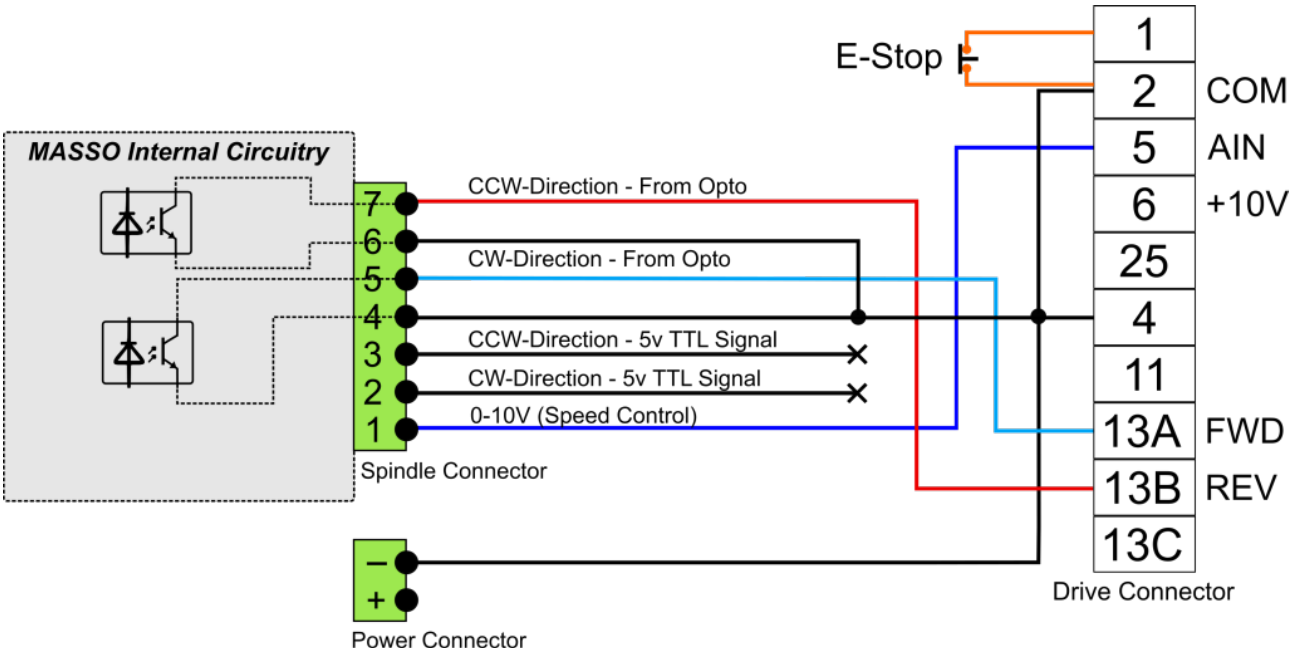
Yuhuan Huanyang HY02D211B-T wiring example

INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.


MASSO Internal Circuitry
7
6
5
4
3
2
1
Spindle Connector
CCW-Direction - From Opto
CW-Direction - From Opto
CCW-Direction - 5v TTL Signal
CW-Direction - 5v TTL Signal
0-10V (Speed Control)
–
+
MASSO Power Connector
braking resistor
P
N
R
S
T
E
VR(+10V)
VI
ACM
AI
Input current
FOR
REV
SPH
SPM
SPL
RST
DCM
RS485
U
V
W
M
KA
KB
EV
Multi-Output
3A/250VAC 3A/30VDC
FC
FA
FB
Multi-Output
3A/250VAC
3A/30VDC
DRV
UPF
DCM
Multi-Output
24V/100mA
AM
ACM
Output terminals of digital frequency
0~10V/10mA

11.5.6. Lenze VFD

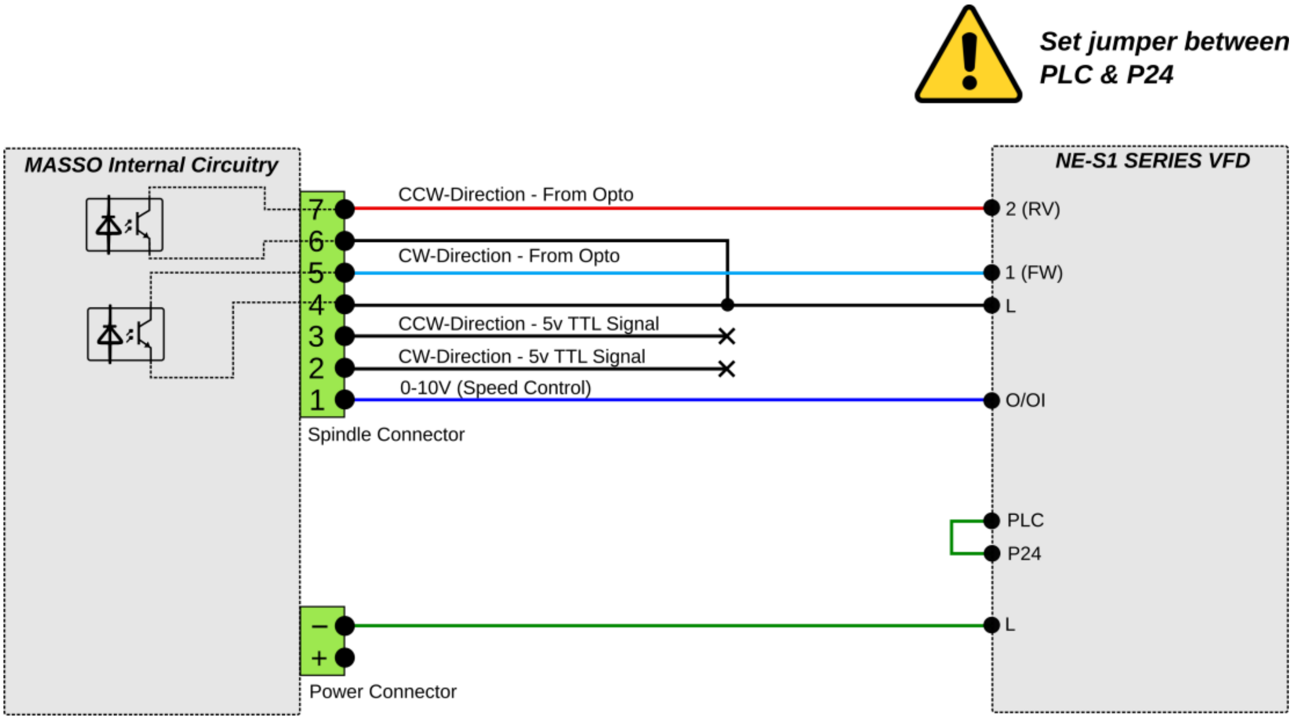
INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.



11.5.7. Hitachi VFD

NE-S1 SERIES wiring example

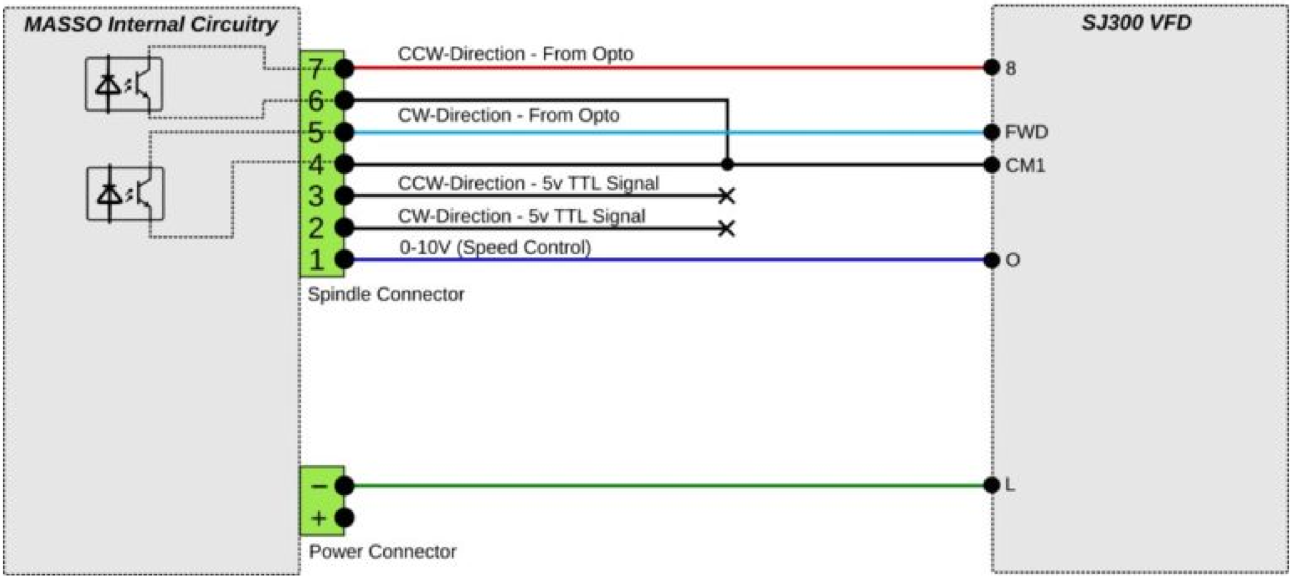
INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.



SJ300 SERIES wiring example

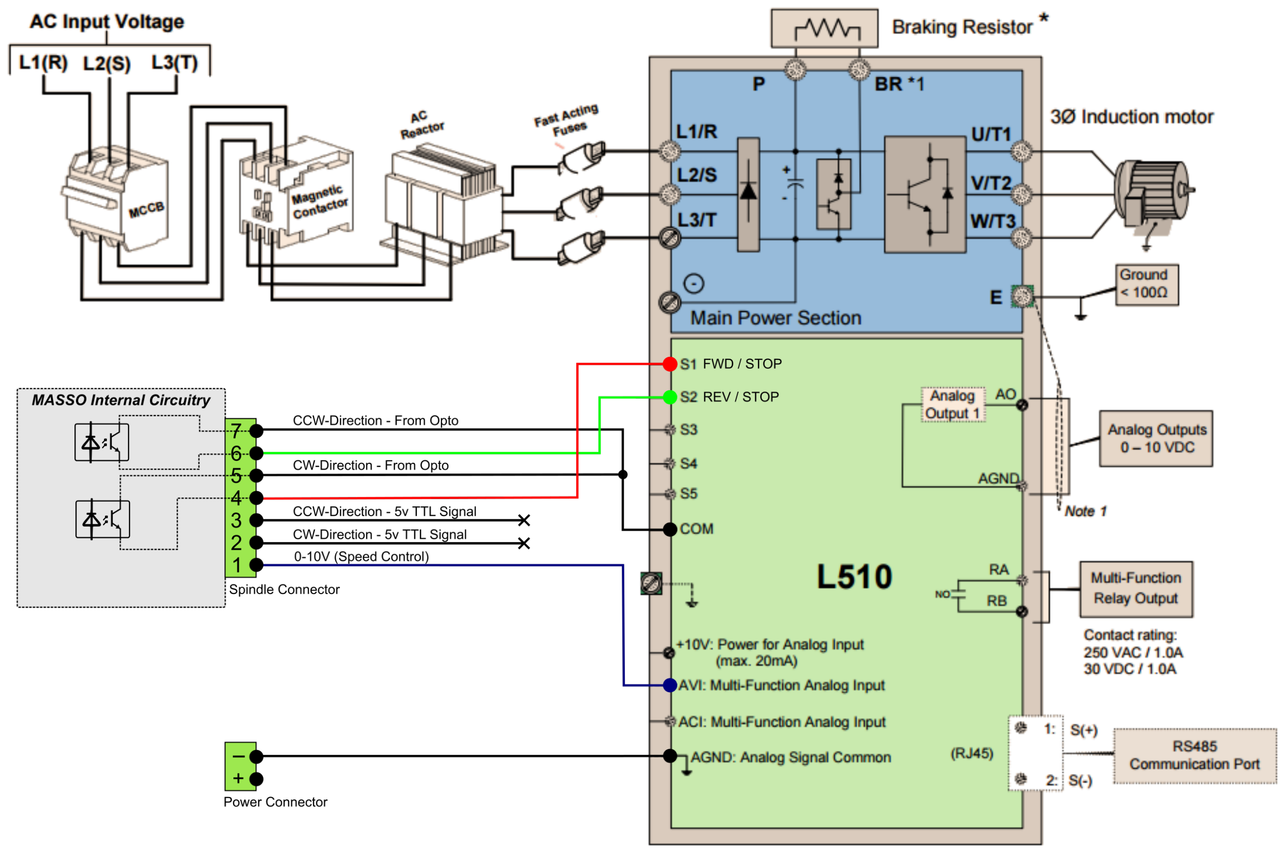
INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.

Set jumper between PLC & CM1



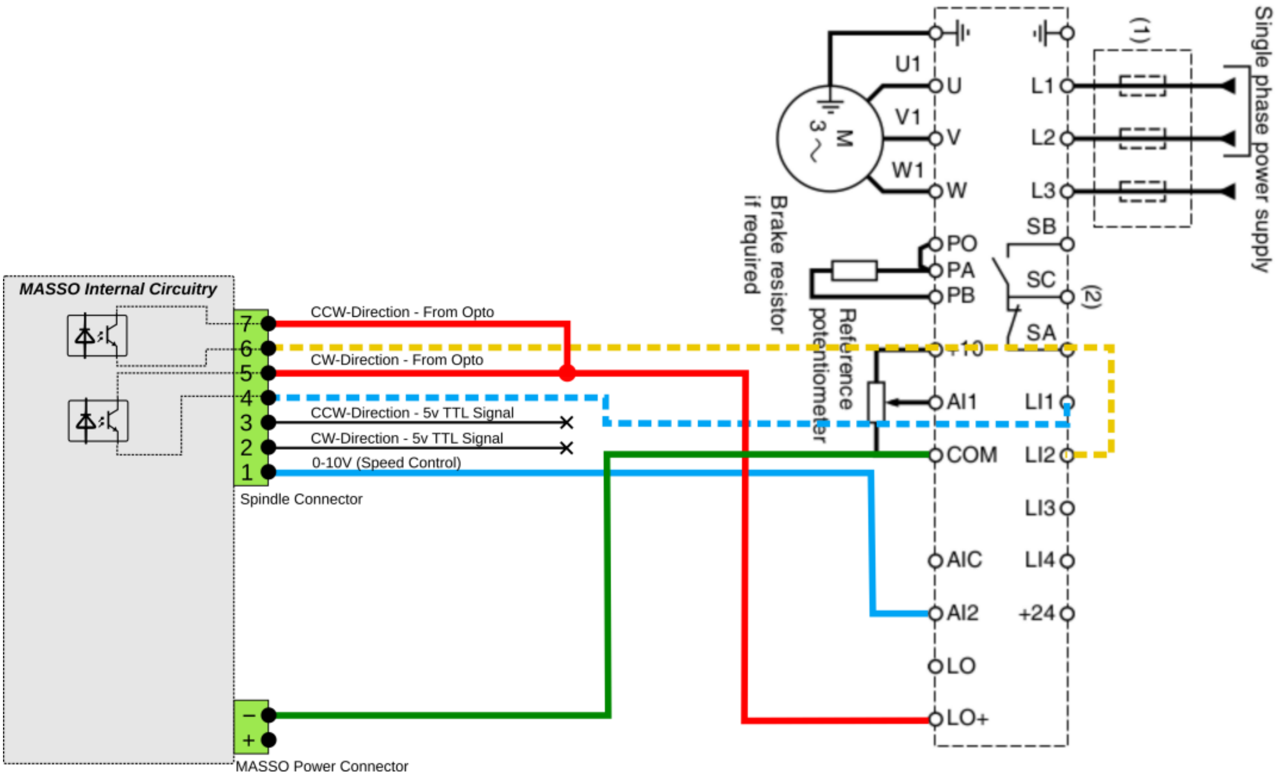
11.5.8. TECO Westinghouse VFD

INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.


AC Input Voltage
L1(R) L2(S) L3(T)
MCCB
Magnetic Contactor
AC Reactor
Fast Acting Fuses
Braking Resistor *
P
BR *1
L1/R
L2/S
L3/T
U/T1
V/T2
W/T3
3Ø Induction motor
Ground < 100Ω
E
Main Power Section
MASSO Internal Circuitry
S1 FWD / STOP
S2 REV / STOP
S3
S4
S5
COM
CCW-Direction - From Opto
CW-Direction - From Opto
CCW-Direction - 5v TTL Signal
CW-Direction - 5v TTL Signal
0-10V (Speed Control)
Spindle Connector
Analog Output 1
AO
AGND
Analog Outputs 0 – 10 VDC
Note 1
L510
RA
NO
RB
Multi-Function Relay Output
Contact rating:
250 VAC / 1.0A
30 VDC / 1.0A
+10V: Power for Analog Input (max. 20mA)
AVI: Multi-Function Analog Input
ACI: Multi-Function Analog Input
AGND: Analog Signal Common
(RJ45)
1: S(+)
2: S(-)
RS485 Communication Port
Power Connector

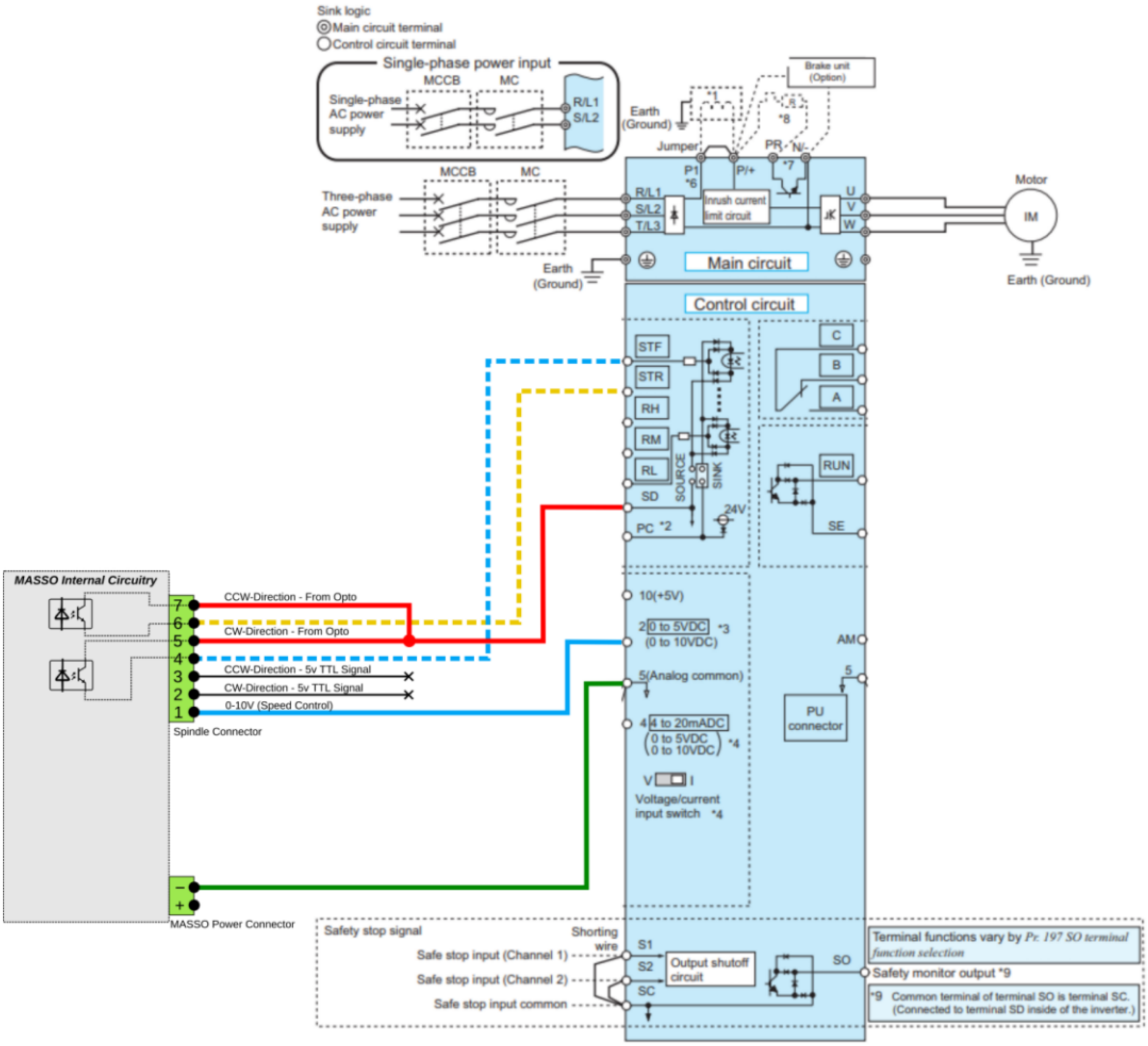
11.5.9. Schneider Altivar 18

INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.



11.5.10. Mitsubishi FR-D720S-100

INFORMATION: As VFD's have different control parameters, the VFD must be first properly configured to take 0~10v control signals, wiring the VFD alone will not make it work with the controller.


Sink logic
Main circuit terminal
Control circuit terminal
Single-phase power input
MCCB
MC
Single-phase AC power supply
R/L1
S/L2
Brake unit (Option)
Earth (Ground)
Jumper
P1
P/+
PR
N/-
Three-phase AC power supply
Inrush current limit circuit
Main circuit
Motor
IM
Earth (Ground)
Control circuit
STF
STR
RH
RM
RL
SD
PC
SOURCE
SINK
24V
C
B
A
RUN
SE
MASSO Internal Circuitry
CCW-Direction - From Opto
CW-Direction - From Opto
CCW-Direction - 5v TTL Signal
CW-Direction - 5v TTL Signal
0-10V (Speed Control)
Spindle Connector
10(+5V)
0 to 5VDC
(0 to 10VDC)
5(Analog common)
AM
4 to 20mADC
0 to 5VDC
0 to 10VDC
Voltage/current input switch
PU connector
MASSO Power Connector
Safety stop signal
Shorting wire
Safe stop input (Channel 1)
Safe stop input (Channel 2)
Safe stop input common
S1
S2
SC
Output shutoff circuit
SO
Terminal functions vary by Pr. 197 SO terminal function selection
Safety monitor output *9
*9 Common terminal of terminal SO is terminal SC. (Connected to terminal SD inside of the inverter.)

11.6. Door Input

INFORMATION: Door input must be wired through a door sensor/switch for safety, further the sensor/switch should be wired to spindle enable signal so that the spindle is disabled when the door is opened.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

On the Masso G2 a Door sensor input must be assigned even if there is no door on your machine. If you do not have a door then assign a spare input as a Door sensor input and set the logic to show low. This will effectively disable the door alarm.

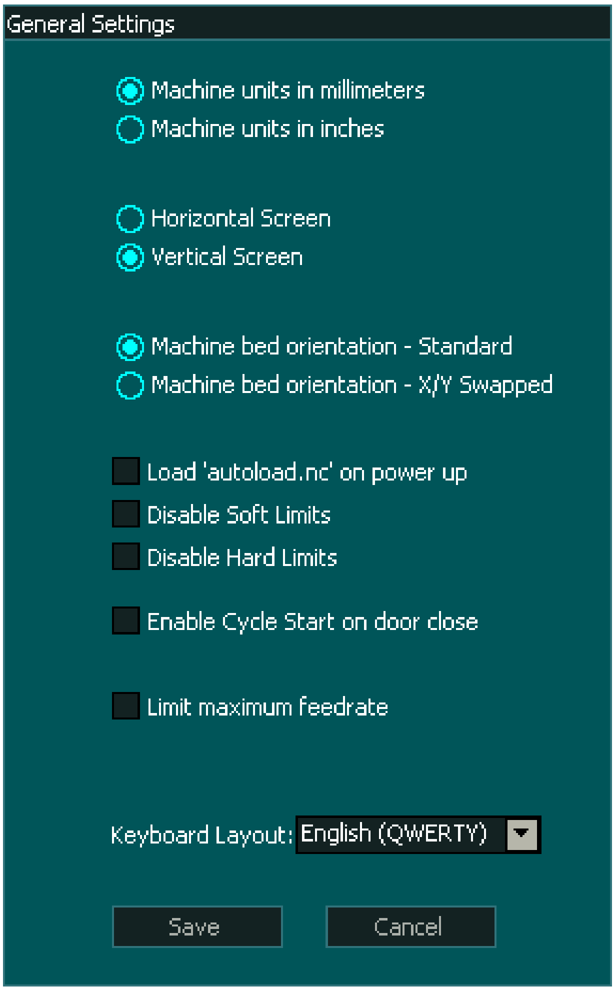
11.7. Setting default units to mm or inches

Setting default units of the controller

As per the user requirements the default machine units can be set between millimeters or inches in the controller settings. All controller calibration values and screen units are displayed as per the selected unit.

The machine units settings is available in the **F1-Setup** screen under **General Setting** window.

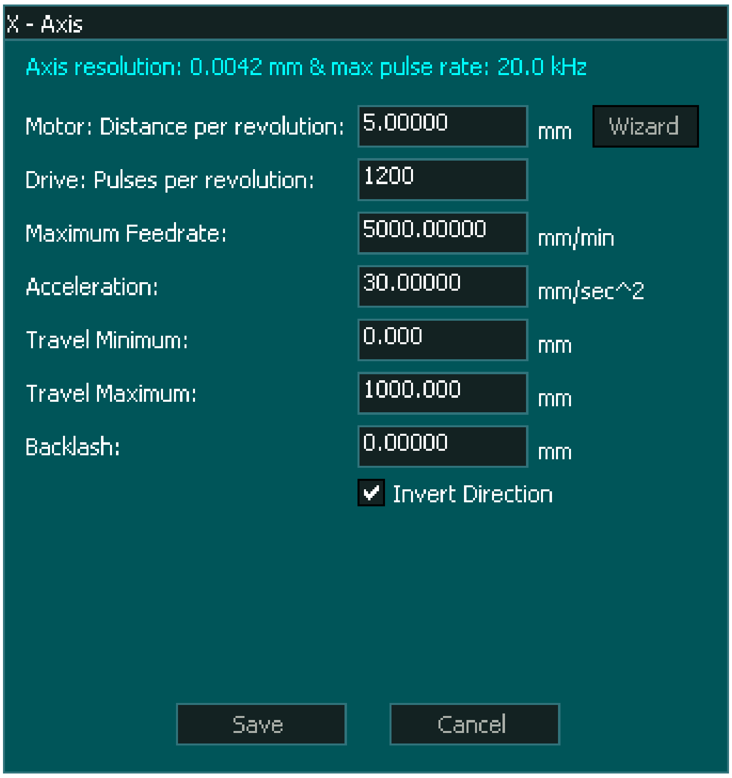
INFORMATION: The controller units can also be temporarily changed between millimeters or inches using G20 and G21 gcodes.



11.8. Axis Calibration

Once all the electrical connections have been done, the system can be calibrated. Axis calibration can be done in the following simple steps:

Motor: Distance per revolution



- First note down the pitch of your ball screw. Pitch defines how much the ball nut moves when the ball screw is turned exactly one full rotation.
- In the **F1-Setup** screen, open the axis setup window and enter the ball screw pith in the **Motor: Distance per revolution** box.
- If the machine axis moves are controlled using timing belts or has a rack and pinion type setup then enter the amount of axis movement when the motor shaft is turned exactly in one full rotation. If this value is unknown or hard to calculate then the **calibration wizard** can be used which is explained on the bottom of this page.

Drive: Pulses per revolution

Servo and stepper motor drives have either switches or software tools to setup the drives **Pulses Per Revolution (PPR)** settings. These settings define how many pulses the drive will take to turn the motor shaft one complete revolution.

INFORMATION: Please refer to your motor drives documentation on how to setup PPR.

Maximum Feed Rate

Each machine axis have limitation of maximum allowable speed depending on the hardware and safety limitations. The maximum feed rate value is used to check and make sure that the system does not exceed this value during operation. This value might be different for each axis depending on the design of that axis.

Acceleration

Depending on the moving mass and motor torque the acceleration value can be set for each axis.

Minimum & Maximum Travel

These values define the travel as well as minimum and maximum values of the axis. In most setups this values is between 0.00 and some positive number, but in some cases such as Z axis of a milling machine this value can be negative as the axis homes towards the top which is 0.00 but the actual machining happens in the negative direction that is towards the machine bed.

NOTE: The minimum and maximum travel also sets the soft limit of the axis and its very important to set this value with the exact travel of the axis.

INFORMATION: If minimum, maximum or homing position (in homing settings window) values are not correctly entered then the axis might not home properly.

Axis Calibration Wizard

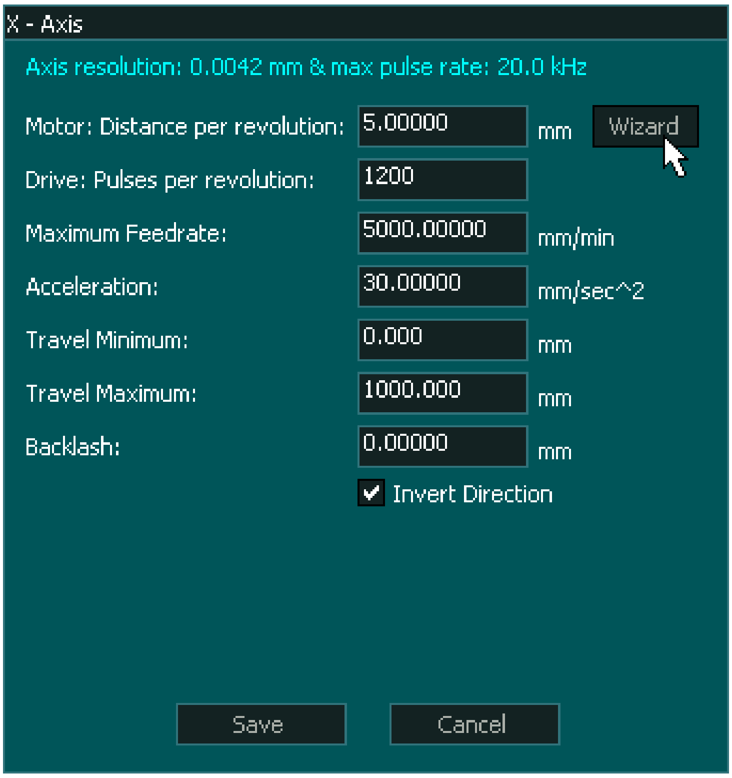
If this axis **distance per revolution** value is unknown or hard to calculate then the **Axis Calibration Wizard** can be used, please **CLICK HERE** for details.

11.9. Axis Calibration Wizard

Axis calibration wizard can be used to calibrate axis where the calibration values of the mechanical setup are unknown or hard to calculate axis. This may be due to multiple ratios on the axis such as timing belts and rack & pinion designs.

INFORMATION: If your Axis maximum and minimum travel is not set correctly you may not be able to travel the required distance for calibration. In this case change your maximum and minimum travel distances while doing your calibration to ensure you do not reach the limits.

Open the wizard by clicking the "Wizard" button



Calibration steps

INFORMATION: For best results, move the axis from one extreme of the axis to the other extreme during calibration, the longer the distance measured during calibration the more accurate the calibration will be.

INFORMATION: Before starting axis calibration ensure that backlash is turned off.

Step 1 Mark the starting point

Ensure that Backlash is turned off.

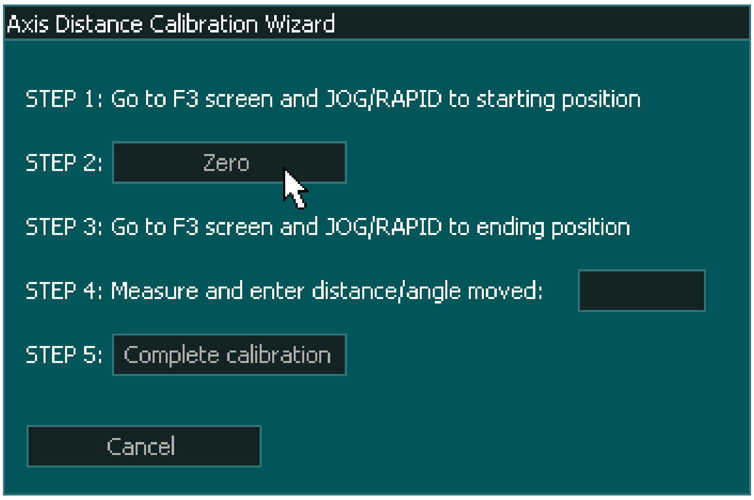
Go into the F3 Screen and Jog the axis that you wish to calibrate to one end of the axis travel and mark the starting point. This could be as simple as putting a sharp Vbit into your spindle and marking an **X** under the cutter to show the starting point. Ensure that when you move to the starting point you jog in the same direction of travel that you will be moving in to the end point. This will remove backlash from the axis under test..

INFORMATION: The easiest way to do this is to use a piece on masking tape with an **X** already marked on it and slide it under the cutter point.

Step 2 Zero the Axis

Return to the F1 Screen and click the "Zero" button on the calibration Wizard screen.

The button will change to read "Zero Set"



Step 3 Move to the end point

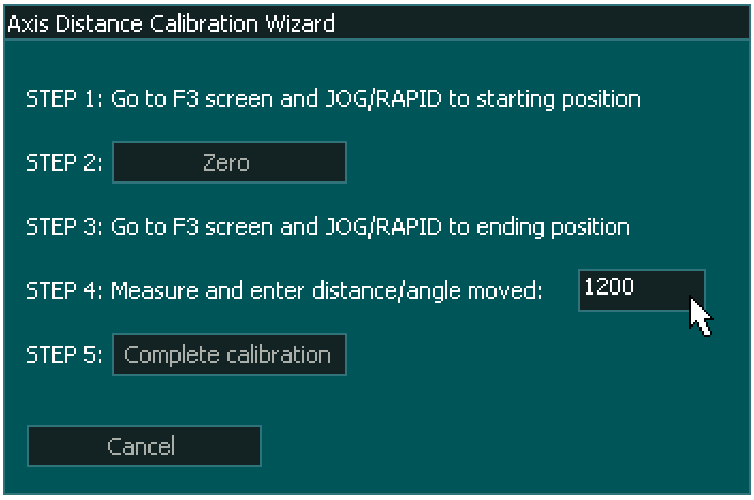
Go to the F3 screen and jog to the the other end of the chosen axis. Mark the endpoint with another **X**

The longer the distance moved for your calibration the more accurate the final result will be.

Step 4 Measure

Using a ruler measure the distance between the starting **X** and the end **X**.

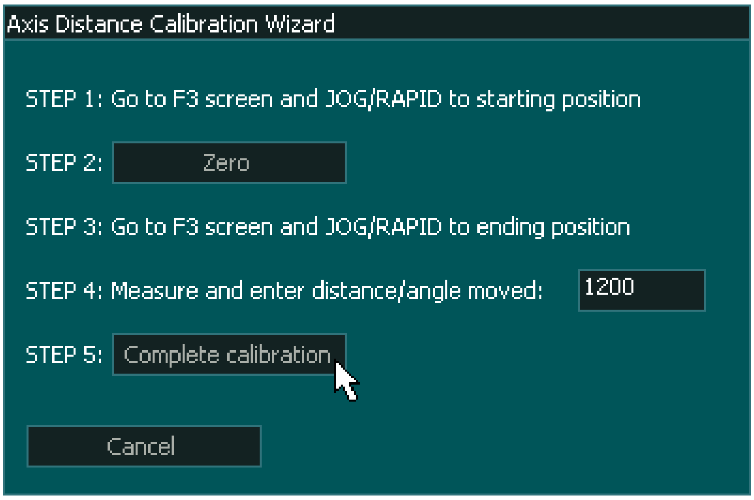
Enter the measured distance the axis moved into box on the calibration wizard.



Step 5 Complete Calibration

Press the "Complete Calibration" button on the calibration wizard and the new distance per revolution value will be written into Axis settings page.

Press the Save on the Axis settings page to complete the axis calibration.



While a ruler will give good results with the X & Y axis the use of a dial indicator is recommended for axis such as the Z axis where the amount of axis movement is small.

Do not use the calibration wizard on a rotary axis. The most accurate setting for a rotary axis is obtained through calculation.

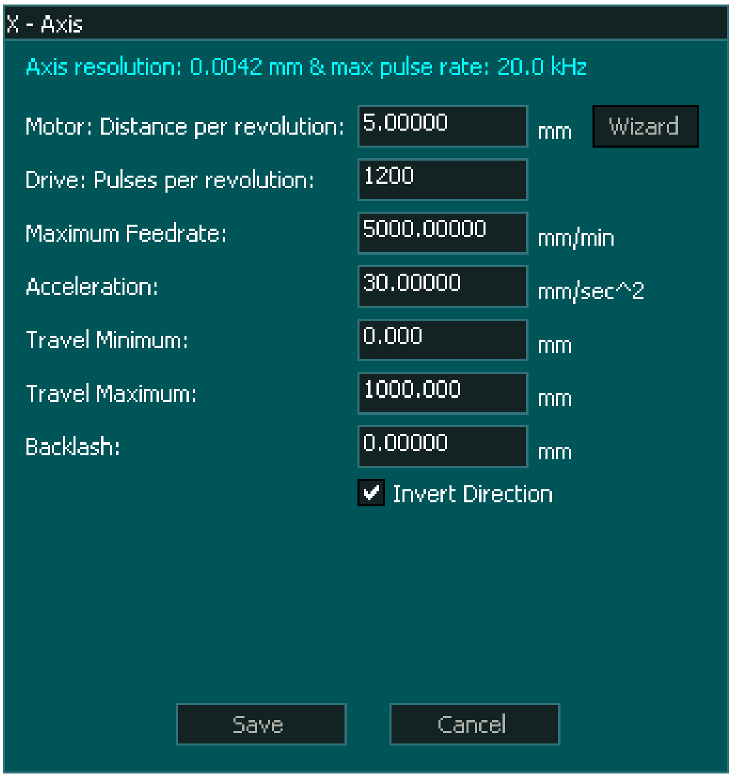
11.10. Backlash Compensation

When to use backlash compensation

Axis backlash should first be adjust mechanically as its best to first find the source of backlash and if needed replacing parts. As with any mechanical system there will always be some minor backlash and only very small backlash should be managed by MASSO's backlash compensation feature.

Information: Maximum backlash value is 10mm or 0.3937", If the value exceeds this, the backlash value setting will reset.

Enter the measured axis backlash value in the **Backlash** box. If not using set this value to 0.00



11.11. Slave Axis

Software axis slaving option can be used to slave **X axis** with **A axis** or **Y axis** with **B axis**. This option allows the user to have two separate homing switches or sensors on axis to be able to align the axis.

INFORMATION: When using slaving option, separate homing sensors/switches need to be installed on the slave side.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

11.12. Homing / Home Inputs

INFORMATION: Homing the machine is one of the most important parts of a CNC. Without homing the machine no CNC machine can be used to its full potential and can result in the crashing of the machine as the controller does not know the position of the axis on power-up.

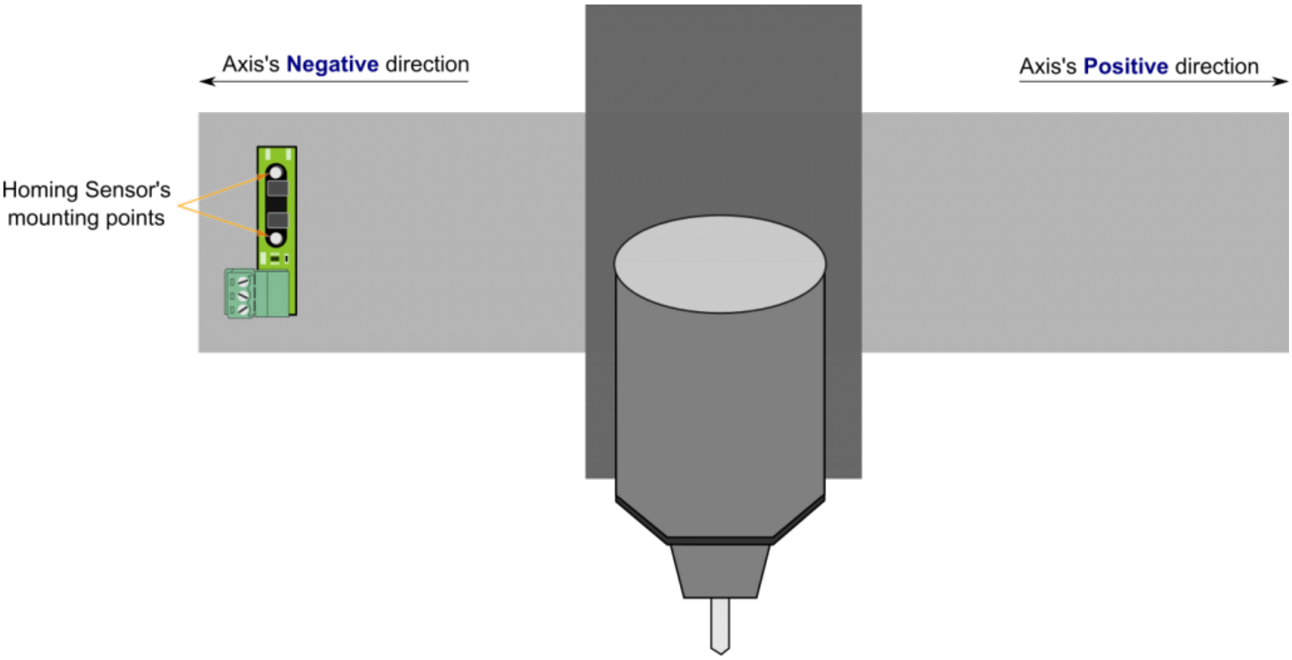
PLEASE NOTE: The sensors shown in the video below show a separate 5-volt power supply. New version sensors such as the Masso Homing Sensor can run on a wide range of voltages and may be powered directly from the Masso power supply without the need for a separate power supply. Please consult the datasheet for your homing sensor to determine its required operating voltage.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

Step 1: Mounting sensors

Mount homing sensors/switches on each axis of your machine as shown in the below image. It's preferred the sensors/switches are mounted on the 0.00 location of the axis but can be mounted at any location.



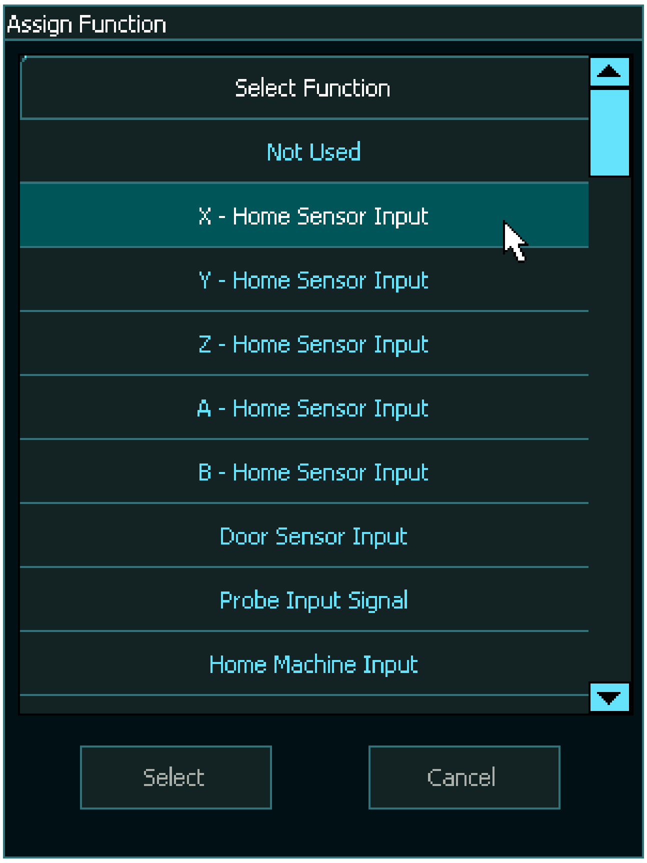
Step 2: Assign inputs

After wiring the sensor/switches the system must be configured for proper operation as described below:

- Go to the **F1-Setup** screen.
- From the **INPUTS** list select any free input and assign them as X, Y, Z... **Home sensor Input**.
- You can also see the status of the sensors change from **L** to **H** when a signal is received on that input from homing sensor/switch.

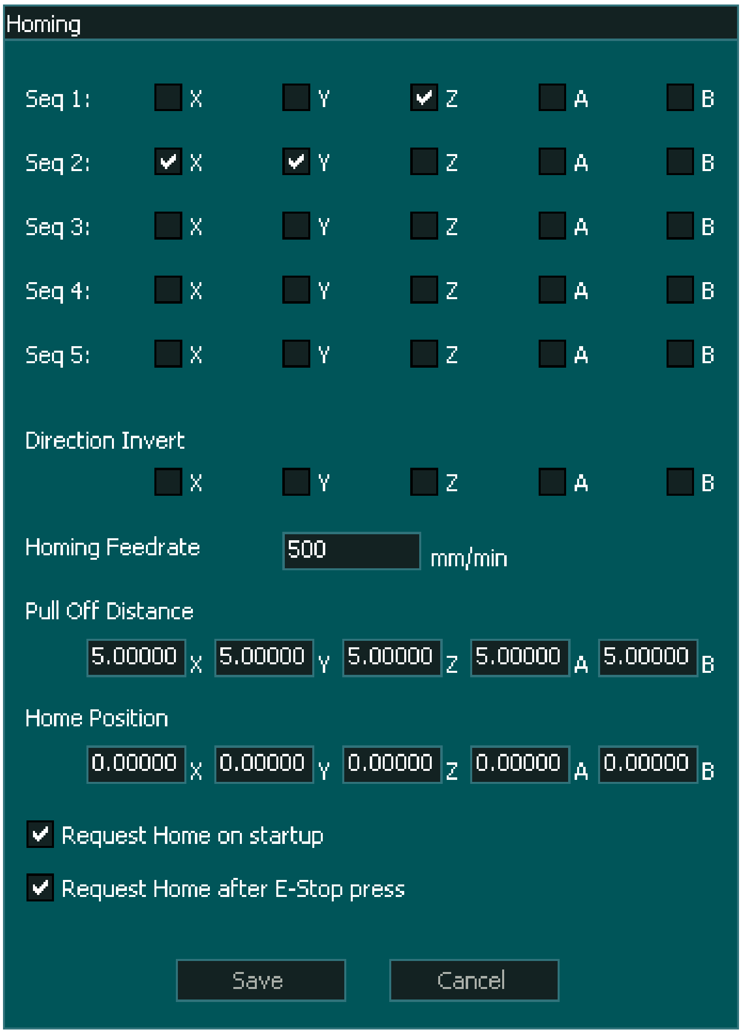
INFORMATION: All input signals can be easily inverted by selecting the input in the **INPUTS** list and pressing the space-bar key on the keyboard to invert the input signal. These settings are automatically saved.

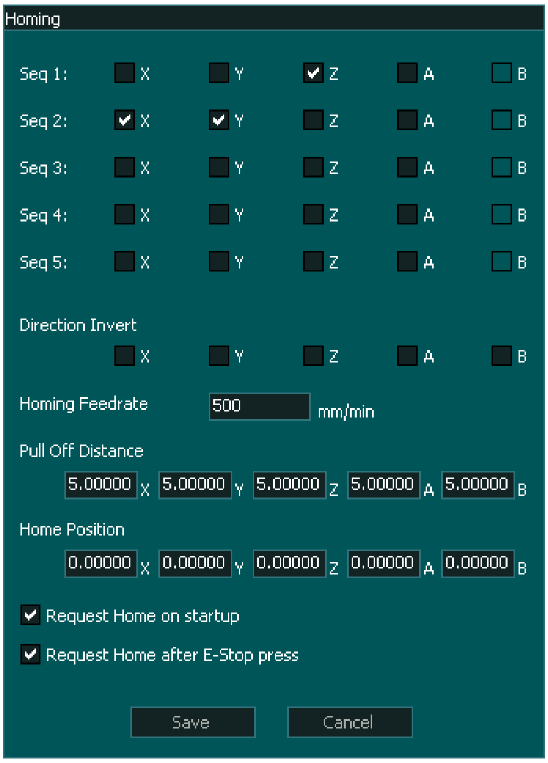
CAUTION: The homing inputs must show a **LOW** signal when the sensor/switch is not engaged or the homing will fail.



Step 3: Setting up the homing sequence

- Open the **Homing** window.
- Now in the homing sequence tick the appropriate boxes for the axis as you would like to home.
- In the below example we set the homing sequence for a milling machine/router. As you would first need to move the tool away from the job by moving the Z-axis up, set **Seq 1** by only selecting the Z axis, this way MASSO only homes Z axis first.
- Next in **Seq 2** select the X and Y-axis to start homing the X and Y axis together.
- When an axis is slaved it will appear grayed out in the homing screen.


Homing
Seq 1: X Y Z A B
Seq 2: X Y Z A B
Seq 3: X Y Z A B
Seq 4: X Y Z A B
Seq 5: X Y Z A B
Direction Invert
X Y Z A B
Homing Feedrate
500
mm/min
Pull Off Distance
5.00000 X 5.00000 Y 5.00000 Z 5.00000 A 5.00000 B
Home Position
0.00000 X 0.00000 Y 0.00000 Z 0.00000 A 0.00000 B
Request Home on startup
Request Home after E-Stop press
Save
Cancel

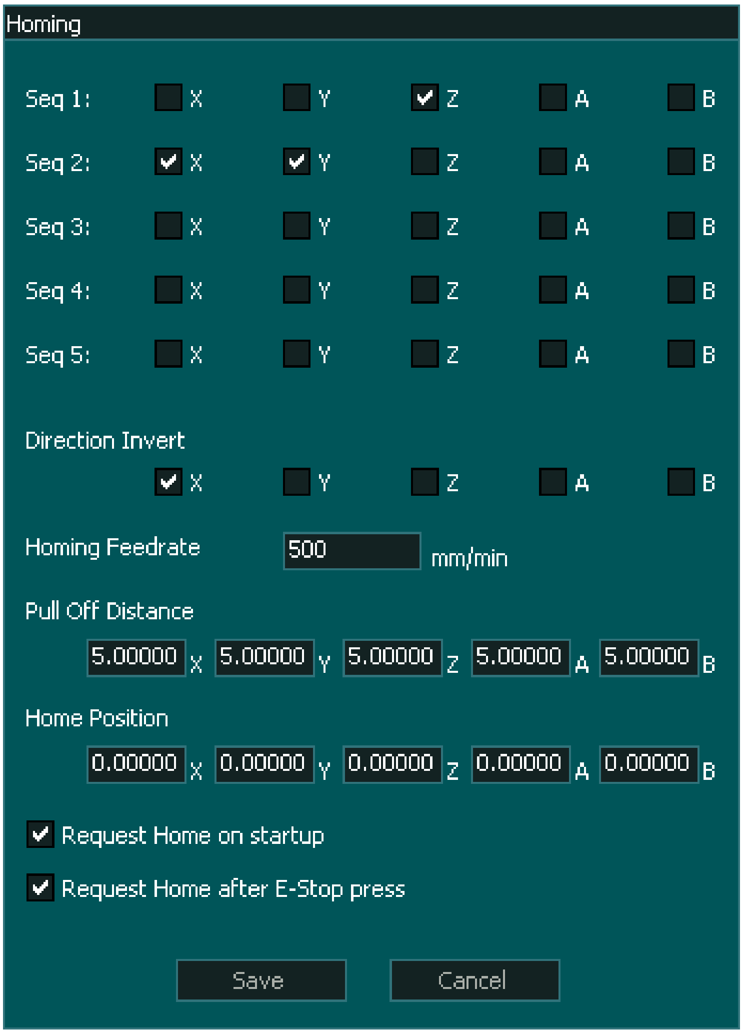


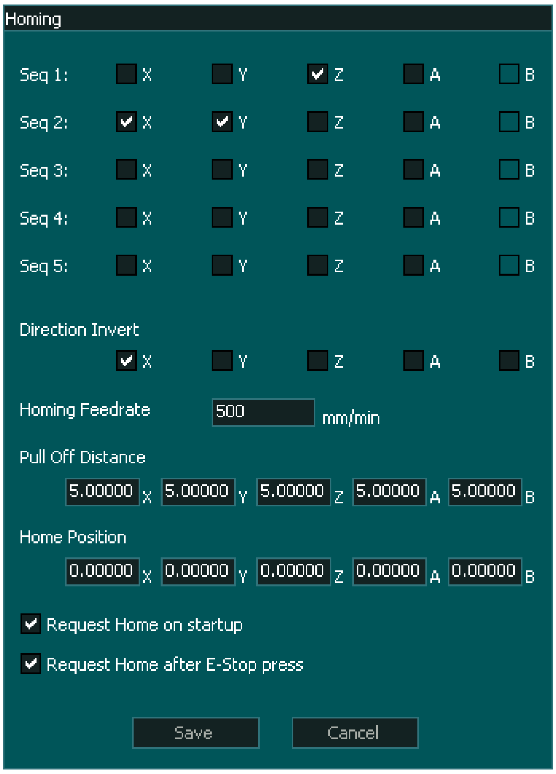
Step 4: Setting homing direction

During homing if any of the axis starts moving away from the homing sensor/switch, press **ESCAPE** or feed hold button to stop homing cycle and invert the direction in the homing setting as shown below.

In the Examples below the X-axis homing direction has been inverted.

- When inverting the homing direction of a slaved axis please make sure that both axis have the same setting for the axis that make up a slaved pair or they will travel in opposite directions.


Homing
Seq 1: X Y Z A B
Seq 2: X Y Z A B
Seq 3: X Y Z A B
Seq 4: X Y Z A B
Seq 5: X Y Z A B
Direction Invert
X Y Z A B
Homing Feedrate 500 mm/min
Pull Off Distance
5.00000 X 5.00000 Y 5.00000 Z 5.00000 A 5.00000 B
Home Position
0.00000 X 0.00000 Y 0.00000 Z 0.00000 A 0.00000 B
Request Home on startup
Request Home after E-Stop press
Save
Cancel



Step 5: Pull off Distance

Once Masso finds the homing sensor it will stop and back off the sensor until the sensor logic returns to Low. It will them back off the sensor by the distance specified in the pull-off distance setting on the homing screen. The new position will be assigned the Home position value

- On the Masso G3 (above left) separate pull-off distances can be specified for each axis. Please ensure that you enter the same distance values for the axis that make up a slaved pair or the axis will skew.
- On the Masso G2 (above right) a single pull-off distance is specified which is applied to all axis.

Step 6: Specifying the homing location

As the homing sensors/switches can be mounted on either side of the axis, the position of the homing sensor/switch needs to be entered. If the sensor/switch is mounted on the 0.00 location as per the above example then enter **Home Position as 0.00**. If the sensor/switch is mounted on the other side, for example, the axis travel is 400mm and the sensor/switch is mounted at 400mm location then set **Home Position as 400.0**

INFORMATION: It's a good idea to set to enable ***"Request Home on startup"*** and ***"Request Home after E-Stop press"*** option in the "***Homing settings"*** window. This will blink a homing request alarm on the screen to tell the user to home the machine before use and won't let the user run and gcode without homing the machine.

Wiring the Masso Homing sensor

Information on wiring the Masso Homing sensor

11.13. Soft & Hard Limits

Soft Limits

For each axis minimum and maximum travel are required as part of the axis calibration process. These values are used by the system to check if the requested motion command is within the travel limits of the axis. If the requested motion is outside the travel limits then the motion is not executed and a soft limit alarm is flashed on the screen.

INFORMATION: Soft limits can be disabled in the F1-Setup screen under general settings, once disabled the gcode motion from a file or MDI command is not checked for soft limits. To jog the machine, minimum and maximum travel values are required and even if soft limits are disabled, still the system will only jog within the minimum and maximum travel only.

INFORMATION: From MASSO G3 software version 3.47, tool changer and tool holders can be outside the soft limit travel. This way the user can have a work area within the soft limits and the tools outside the soft limits and avoid crashing into tools when machining.

Hard Limits

All homing inputs on MASSO are automatically used as hard limit input. During the homing of the machine these inputs are used to home each axis and once homing is complete, these inputs are used to trigger a hard limit alarm that stops all motion and spindle. A hard limit alarm is flashed on the screen.

11.14. List of Configurable Inputs

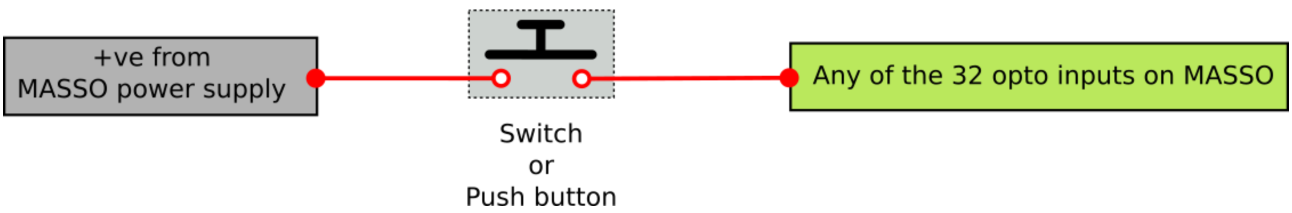
Different functions can be assigned to inputs in the **F1-Settings** screen. These can be used to set up things such as:

- Homing sensors.
- Input buttons for cycle start.
- Input buttons to automatically load gcode files from USB Flash drive.
- Tool changer sensor inputs.

INFORMATION: All input signals can be easily inverted by selecting the input in the **INPUTS** list and pressing the space-bar key on the keyboard to invert the input signal. These settings are automatically saved.

INFORMATION: All Masso inputs are optically isolated and trigger with inputs from +5v to +24v

INFORMATION: Some inputs used for external buttons require the button to remained pressed for 1 second before the input is accepted. This is to safe guard against accidental operation.



List of Configurable Inputs

- X, Y, Z, A, B - Home Sensor Input.
- Door Sensor Input.
- Probe Input Signal.
- Home Machine Input.
- Go to Home Machine Input
- Go to Parking Position
- Cycle Start Button Input.
- Cycle Stop Button Input.
- Chuck Clamp/Unclamp Input. **Note:** *Input must be set high for 1 second to toggle the output*
- Coolant Mist On Input.
- Coolant Flood On Input.
- Coolant Mist & Flood Off Input.
- Plasma - Torch Touch Signal Input.

- Plasma - Plasma Arc OK Signal.
- Plasma - Torch Breakaway Signal.
- Jog/Rapid X+ & X- Inputs.
- Jog/Rapid Y+ & Y- Inputs.
- Jog/Rapid Z+ & Z- Inputs.
- Jog/Rapid A+ & A- Inputs.
- Jog/Rapid B+ & B- Inputs.
- Jog/Rapid Mode Input.
- Autoload G-Code (1, 2, 3, 4, 5, 6) Inputs.
- Tool Changer - Inputs.
- Auxiliary Input 1-6 (Toggle) **Note:** *Input must be set high for 1 second to toggle the output*
- X, Y, Z, A, B Motor Alarm Input.
- Lubricant Alarm Input.
- Spindle Drive Alarm Input.
- Tool Setter Input.
- Air Pressure Low Alarm Input.
- Spindle Coolant Pulses Alarm
- Spindle Coolant Flow Alarm Input.
- Gcode Rewind Button Input.

11.15. List of Configurable Outputs

Different functions can be assigned to outputs in the **F1-Settings** screen. These can be used to set up things such as:

- Tower lights.
- Coolant control.
- Tool changer control signals.

INFORMATION: All output signals can be easily inverted by selecting the output in the **OUTPUTS** list and pressing the space-bar key on the keyboard to invert the output signal. These settings are automatically saved.

List of Configurable Outputs

- Tower Light Red, Yellow or Green.
- Lubrication.
- Coolant Flood.
- Coolant Mist.
- Chuck Clamp.
- Tool Changer - Outputs.
- Auxiliary Output (1 to 16) Output.
- Laser Crosshair +
- Touch Screen Beep Output.
- Tool Air Blast Cleaning
- Plasma On/Off Signal

INFORMATION: When an output shows HIGH it will output 5 volts on the output pin and when the output is low it will output 0 volts.

CAUTION: When Masso turns on it will set the outputs to the logic levels shown on the F1 page. Please ensure that you take this into account when setting up the initial logic level of your output as it will determine if the output will turn on or off when Masso is powered up.

11.16. TTL Outputs

16 Transistor–transistor logic (TTL) outputs are available on MASSO controller, these outputs can be assigned different functions in the MASSO setup screen, please see this link **CLICK HERE**

- These outputs are designed to be interfaced to other electronics for low current signals. The maximum allowed current load on each output is **5 (mA)**.
- For controlling things such as actuators, motors or relays please use a driver/amplifier board or the MASSO Relay module which is designed to work with these outputs.
- MASSO G3 outputs will provide a 5 volt signal when the output goes high and 0 volts when the output goes low. The output is reversed if you invert the output in the F1 screen.
- MASSO G3 outputs have built in protection that prevent the output from sinking current.
- MASSO G2 outputs do not include and protection on the output can can both source and sink current.

To control high load electronics use the MASSO relay module **CLICK HERE**

CAUTION: Connecting high current devices such as motors or relays to these outputs will damage the controller.

CAUTION: Do not use cheap relay modules as they are known to feed back voltages into MASSO and completely destroying the controller.

INFORMATION: All output signals can be easily inverted by selecting the input in the **OUTPUTS** list and pressing the space-bar key on the keyboard to invert the input signal. These settings are automatically saved.

11.17. Controlling Relays

MASSO Relay module can be used to control up to 6 relays per module and multiple modules can be connected to control more relays.

These relays can be used to control high load devices such as actuators and motors.

CAUTION: Connecting the power polarity in reverse will damage the relay module.

INFORMATION: For more details about MASSO relay module, **CLICK HERE**

11.18. MPG Pendant

Information: Jogging with the MPG can only be done in the F3 JOG screen.

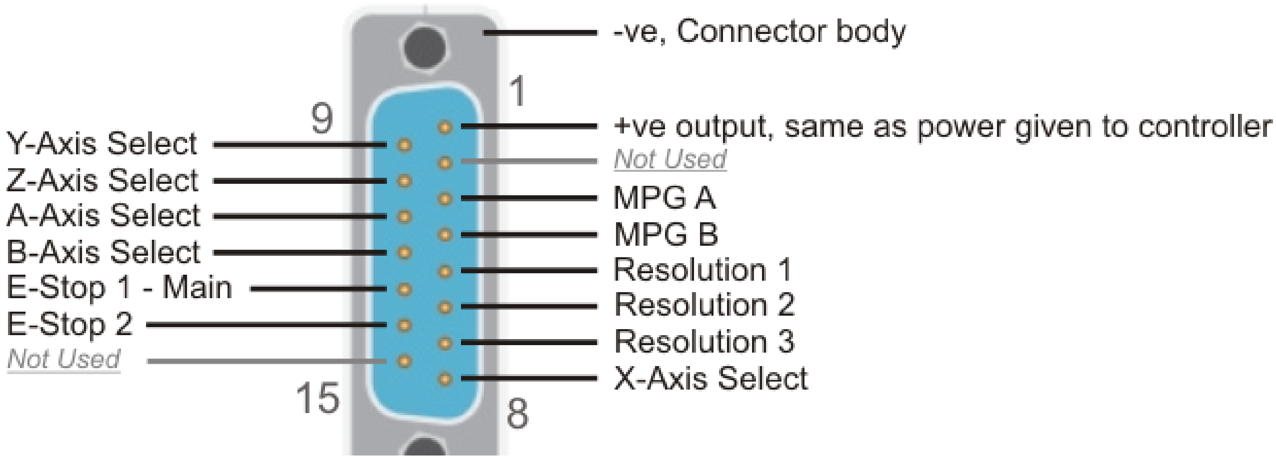
Information: The MPG can be used on the F2 screen in combination with the F11 (Feed Rate Override) and F12 (Spindle Speed Override).

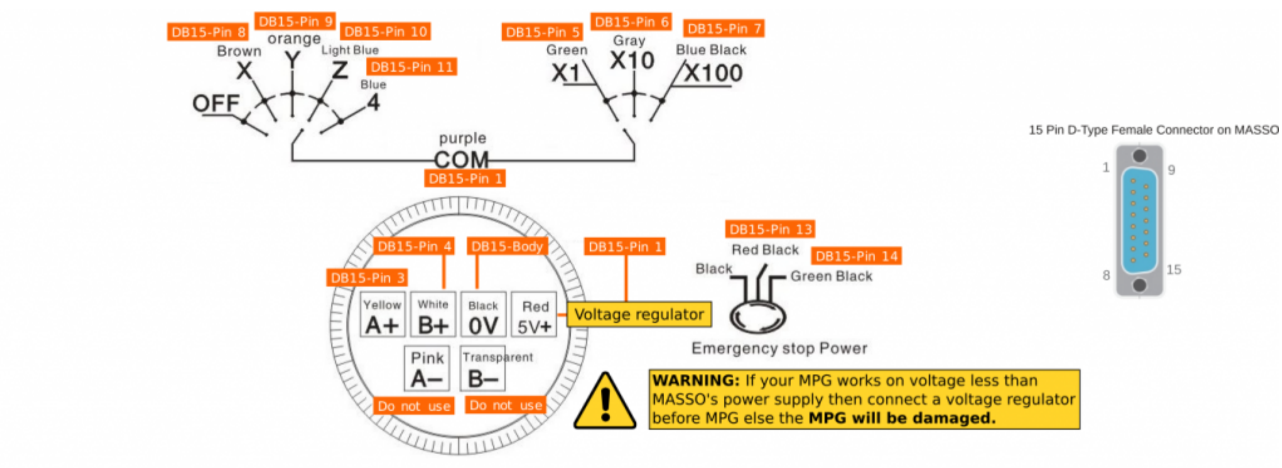
A wired MPG (Manual pulse generator) can be connected to MASSO to jog machine axis and to control things such as feed and spindle overrides.

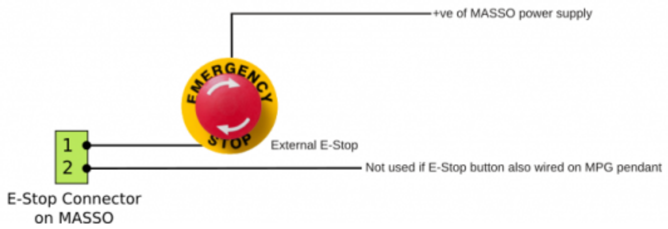
A ready to plug in MASSO MPG pendant can be purchased from this link **CLICK HERE**

MPG Pendant Wiring

To wire a different MPG pendant or a MPG handwheel on you machine, please see the below instructions.


-ve, Connector body
1
9
+ve output, same as power given to controller
Not Used
Y-Axis Select
Z-Axis Select
A-Axis Select
B-Axis Select
E-Stop 1 - Main
E-Stop 2
Not Used
MPG A
MPG B
Resolution 1
Resolution 2
Resolution 3
X-Axis Select
15
8





Extension Cable

If you wish to use an DB15 extension cable between Masso and your Pendant please check with your supplier that it connects not only the 15 pins of the plug, but the shield of the plug also connects end to end or the pendant will not work.

11.19. Tower Lights

Tower lights can be wired to MASSO outputs to provide visual indication of machine status.

Name	Description
Red Light	Flashes on alarms such as E-Stop
Yellow Light	Flashes on alarms such as Door open
Green Light	Lights up when running program

INFORMATION: All output signals can be easily inverted by selecting the input in the **OUTPUTS** list and pressing the space-bar key on the keyboard to invert the input signal. These settings are automatically saved.

11.20. Installing or Replacing Backup Battery

An internal backup battery is required for the controller to work properly.

If the controller's battery is not installed or the battery fails and needs to be reinstalled then the below message will be displayed when the controller is powered up.

After installing a new battery, power on the unit and you will still see the same error message, next power off the controller and power back on after 5-10 seconds and the message will be automatically removed once the battery is detected by the controller.

INFORMATION: Backup battery **(model CR2032)** is required for the controller to function properly and **MUST** be installed in the unit before use.

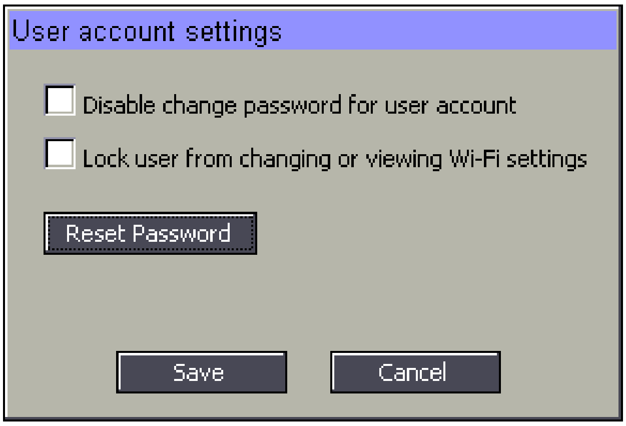
WARNING: After changing the battery make sure the controller is showing the correct loaded tool number as the loaded tool number will be reset to 0 after replacing the battery.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

11.21. User Account Settings

INFORMATION: These settings are available on MASSO G3 software version 3.47 and above.



Disable change password for user account

If this option is ticked, the user can only enter password to start using the machine but is unable to change the password. This option can be useful if multiple users are using the machine and one user might change the password locking access to other users.

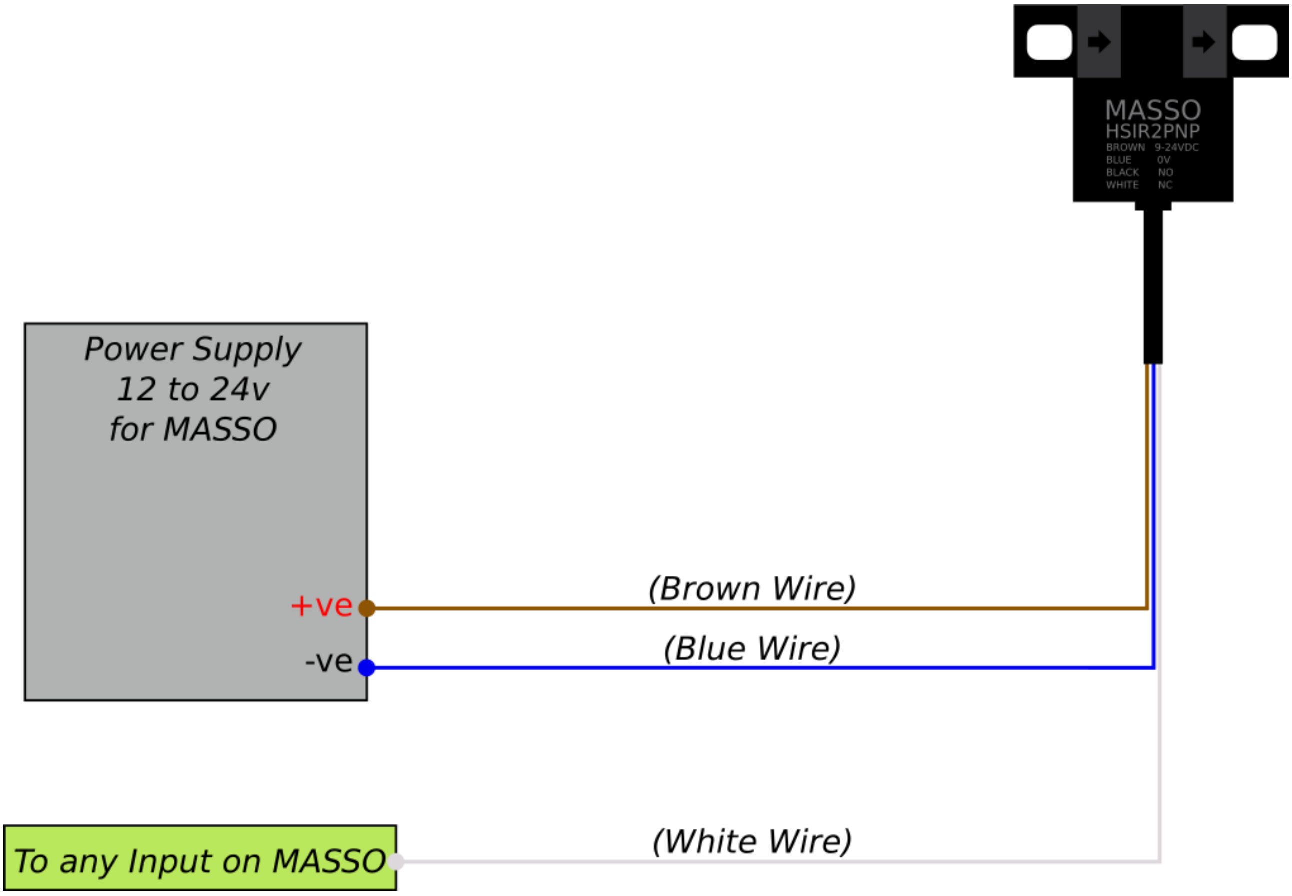
Lock user from changing or viewing Wi-Fi settings

If this option is ticked, the user can only view Wi-Fi status and IP address but can't change any of the settings including disconnecting or connecting the Wi-Fi network. The admin user should setup and click the connect button so that MASSO is connected to Wi-Fi network and then tick *"Lock user from changing or viewing Wi-Fi settings"* in F1-Setup screen. Next, if the controller is powered up or a user logs in then MASSO will automatically connect to the Wi-Fi network but will not allow the user to change any settings or disconnect from the network.

Reset Password

If the user has changed or forgot the password then admin can log in and click the *"Reset Password"* button to reset user password to "HTG".

11.22. MASSO Homing Sensor



High precision water resistant homing sensor

- High accuracy with no moving parts.
- Homing repeatability better than 10 microns.
- Water resistant with IP65 rating.
- Wide working voltage range 9 to 24VDC.
- 5 metre (16 ft) long high quality flex cable.
- Easy mounting using M3 screws.

> **CAUTION:** Connecting the power polarity in reverse will damage the sensor.

Connections

- **BROWN** – (9~24VDC)
- **BLUE** – (0V)

- **BLACK** – (NO – Normally Open)
- **WHITE** – (NC – Normally Connected)

Mounting

Mount the sensor so that it can't get damaged by the operation of the machine.

It needs to be situated so that when the homing position is reached it is triggered by a metal trigger plate attached to the machine.

The trigger plate needs to pass between the forks of the sensor.

Powering your Homing sensors

Power for the homing sensors on **MASSO G2** can be provided from:

- Directly from the MASSO power supply distribution point.
- A separate power supply which shares a common ground, (-ve rail), with your MASSO power supply.

Power for the homing sensors on **MASSO G3** or **MASSO G3 Touch** can be provided from:

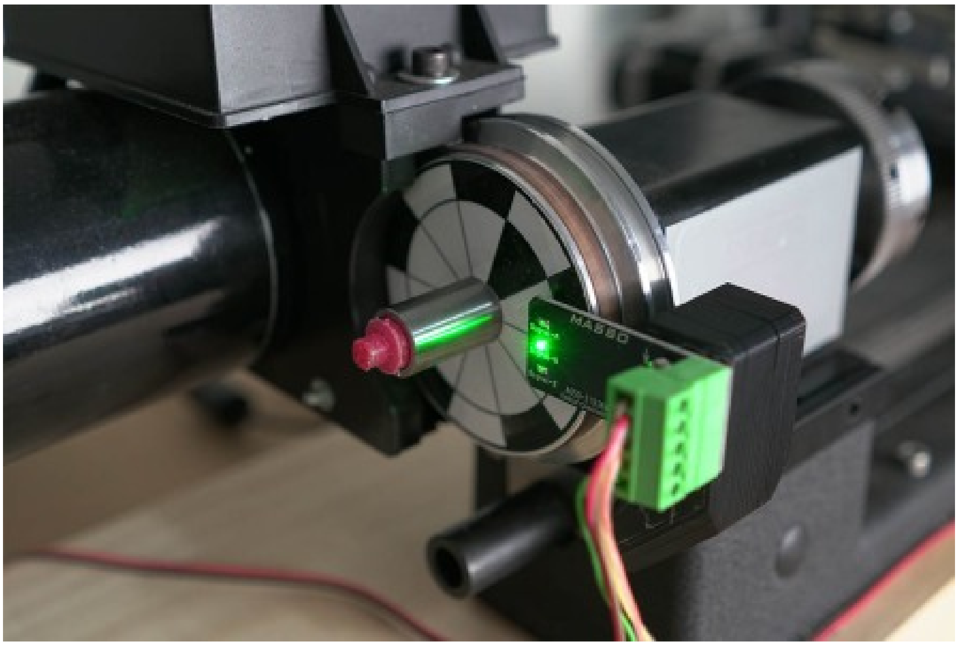
- Directly from the MASSO power supply distribution point.
- A separate power supply which shares a common ground, (-ve rail), with your MASSO power supply
- The Auxiliary power terminals built into MASSO. These are the Red and Black terminals found between the input and output terminals.

WARNING: The installation of a 1 amp fuse between your Power Supply and MASSO is required to protect against an accidental short circuit of the auxiliary power connectors on MASSO, such an event can damage the controller beyond repair.

CAUTION: Auxiliary Power and **Ground** terminals provided on the controller are only to be used for very low current devices and signals. Connecting high current loads can damage the controller beyond repair.

Homing setup instructions

11.23. MASSO Optical Encoder



MASSO contactless **optical quadrature encoders** are based on a non-mechanical design. By not having any moving parts, the sensors have very high accuracy and very low failure rate. The encoders can be easily mounted in front of your Lathe's spindle pulley to provide full quadrature encoder signals for multi pass threading.

- High accuracy with no moving parts.
- Easy to mount with no pulley or timing belts required.
- Wide working voltage range 12 to 24VDC.
- Easy mounting using M3 screws.

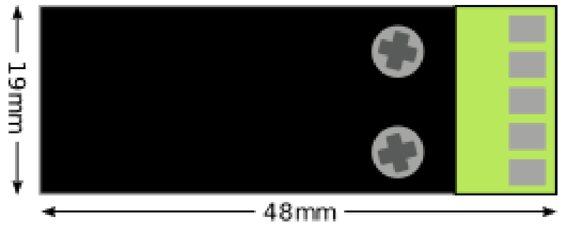
CAUTION: Output signals are 0v for **LOW** signal and 10v for **HIGH** signal.

Generate Encoder Disk Label

Simply click the below **"Generate Encoder Disk"** link to quickly generate the encoder disk label by entering the pulley **Outer Diameter (OD)** and **Inner Diameter (ID).**

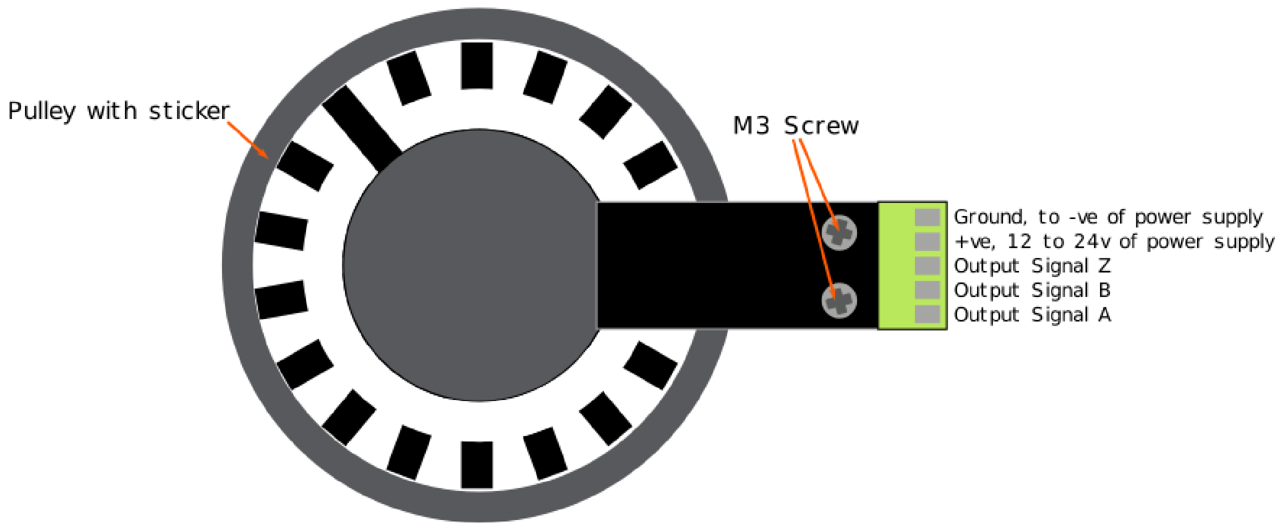
[Generate Encoder Disk]

Mechanical Dimensions



Installing and Wiring

CAUTION: Connecting the power polarity in reverse will damage the sensor.



Top View

11.24. MASSO Relay Module

MASSO 6 relay module provides optical isolation to high voltage/current signals from MASSO controller.

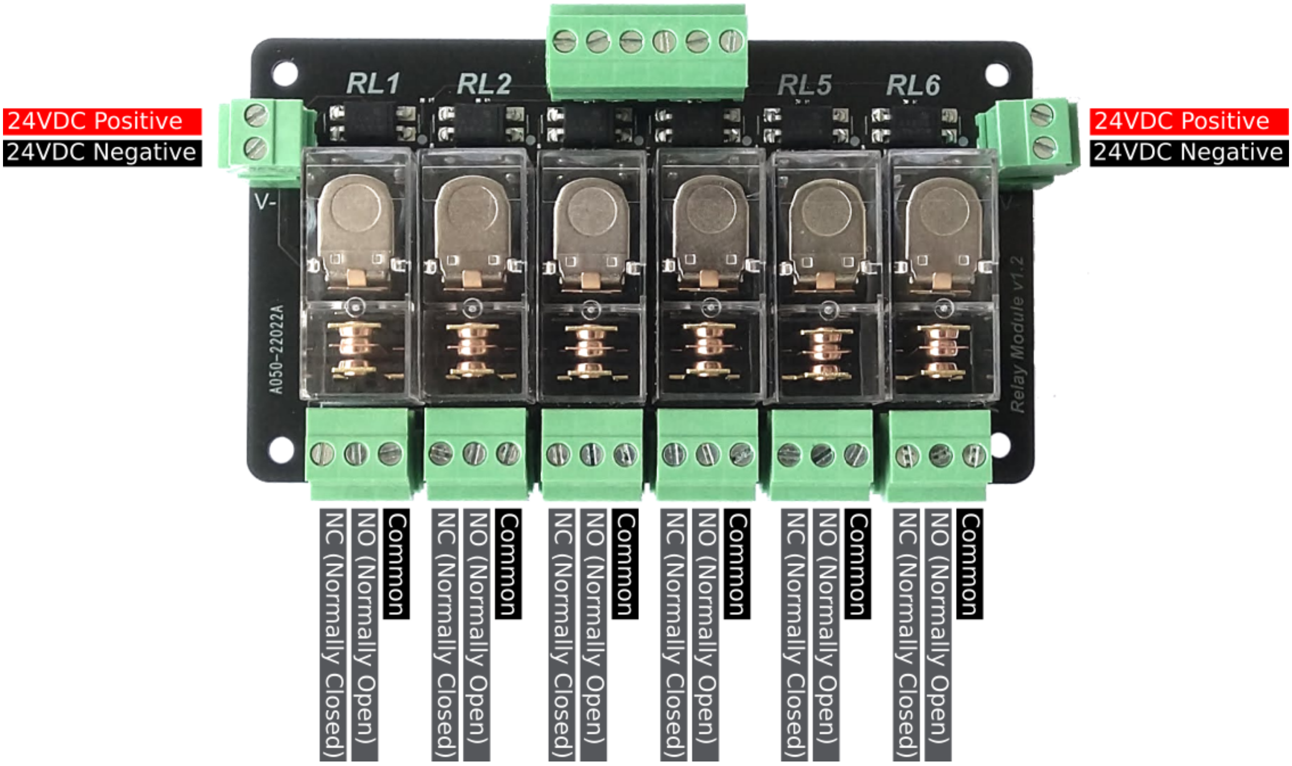
- Multi color LED's for each relay helps easily troubleshoot issues.
- **Green color LED** indicates that a signal is received to switch on the relay and the relay has been switched on.
- **Red color LED** indicates that a signal to switch on the relay has been received but the relay has failed and not working.
- Each relay can be used to control 5 Amp 28VDC or 5 Amp 240VAC load.
- Works with a single 24VDC power supply.
- Board dimensions: **95mm** (3.74 inch) x **25mm** (0.98 inch)

CAUTION: Connecting the power polarity in reverse will damage the relay module.

INFORMATION: Ordering MASSO relay module [CLICK HERE]

Scan the QR code to watch the MASSO video tutorial on YouTube

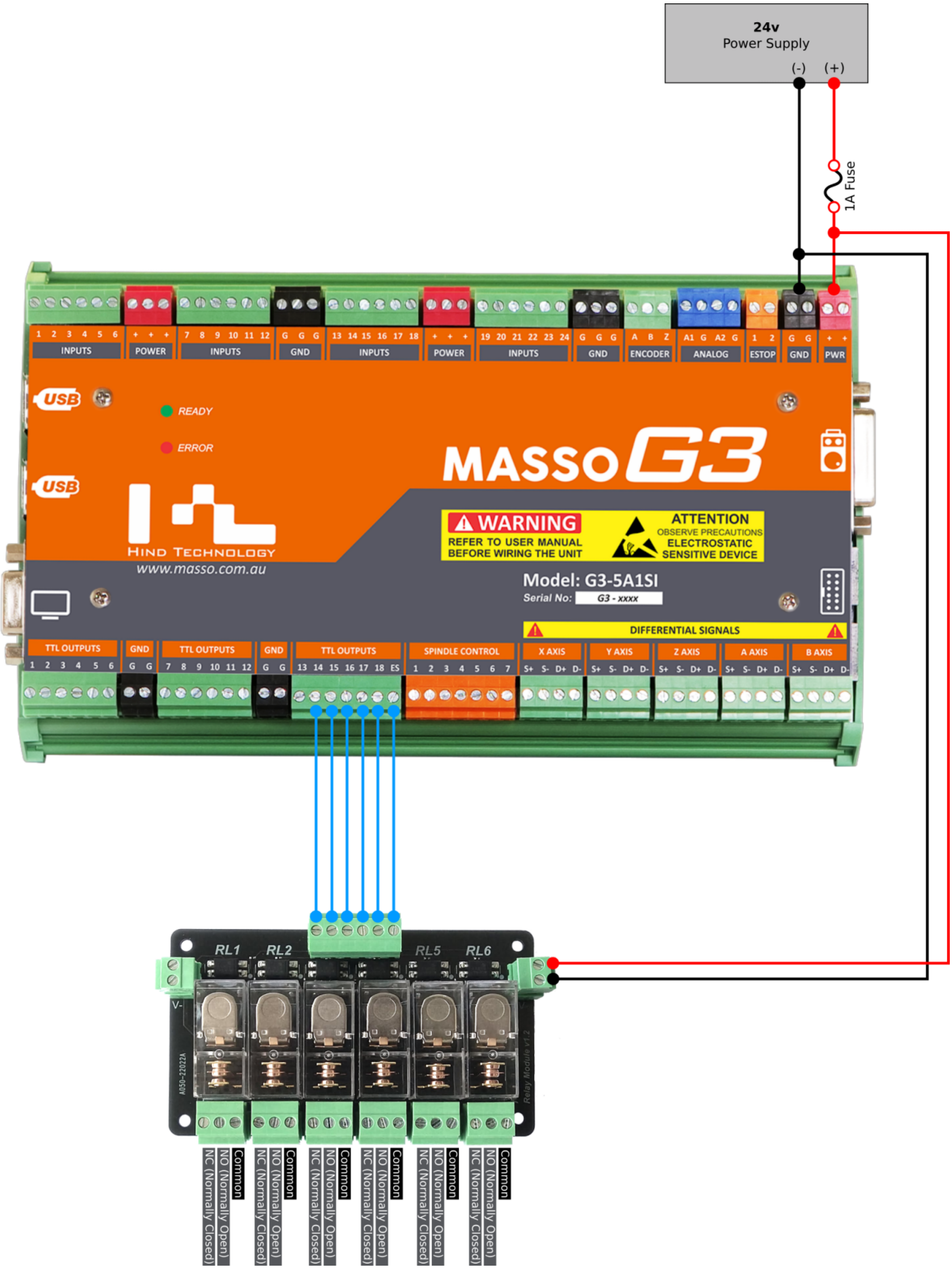
Or, [Click here to view the video]



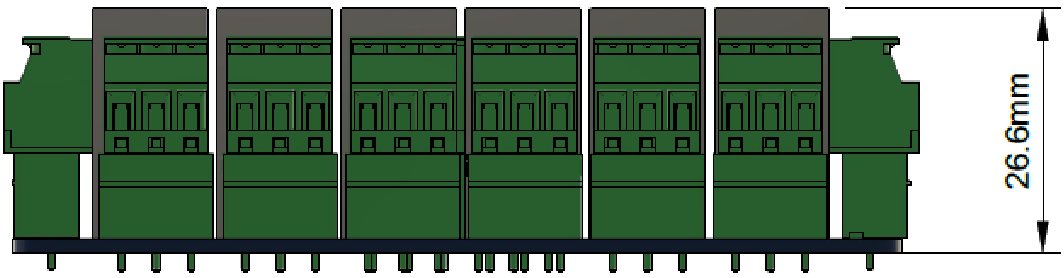
Green LED indicating relay ON

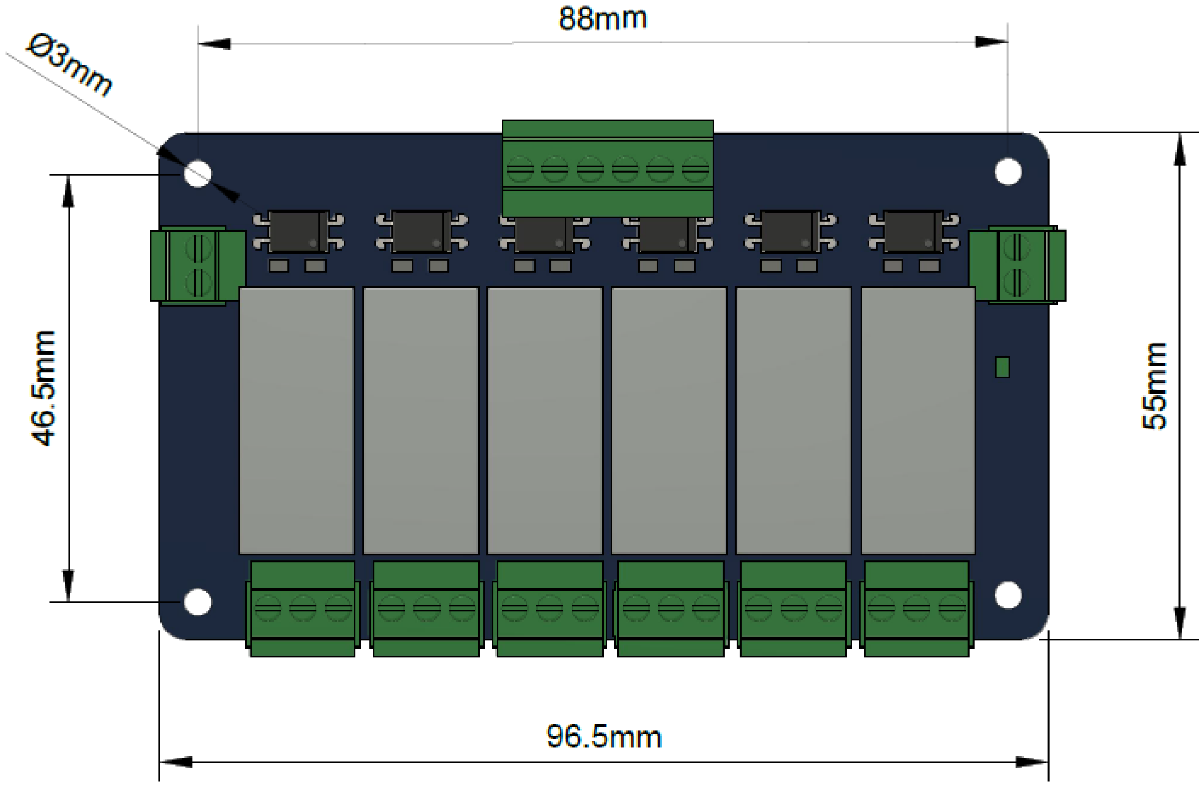
Red LED indicating relay failed

Wiring example


24v
Power Supply
(-) (+)
1A Fuse
INPUTS
POWER
GND
ENCODER
ANALOG
ESTOP
PWR
READY
ERROR
MASSO G3
HIND TECHNOLOGY
www.masso.com.au
WARNING
REFER TO USER MANUAL BEFORE WIRING THE UNIT
ATTENTION
OBSERVE PRECAUTIONS
ELECTROSTATIC SENSITIVE DEVICE
Model: G3-5A1SI
Serial No: G3 - xxxx
DIFFERENTIAL SIGNALS
TTL OUTPUTS
SPINDLE CONTROL
X AXIS
Y AXIS
Z AXIS
A AXIS
B AXIS
RL1
RL2
RL5
RL6
Common
NO (Normally Open)
NC (Normally Closed)

Mounting and Mechanical Data





11.25. MASSO G2 Drive and Relay wiring

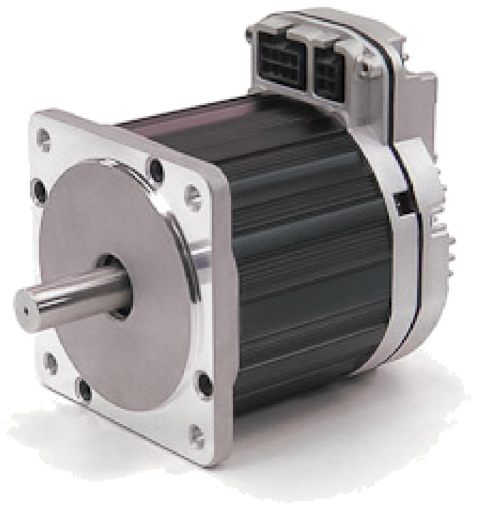
INFORMATION: This describes the wiring of the A & B axis on the Masso G2. For wiring of the X, Y & Z axis on the Masso G2 refer to examples in the G3 Section of this documentation.

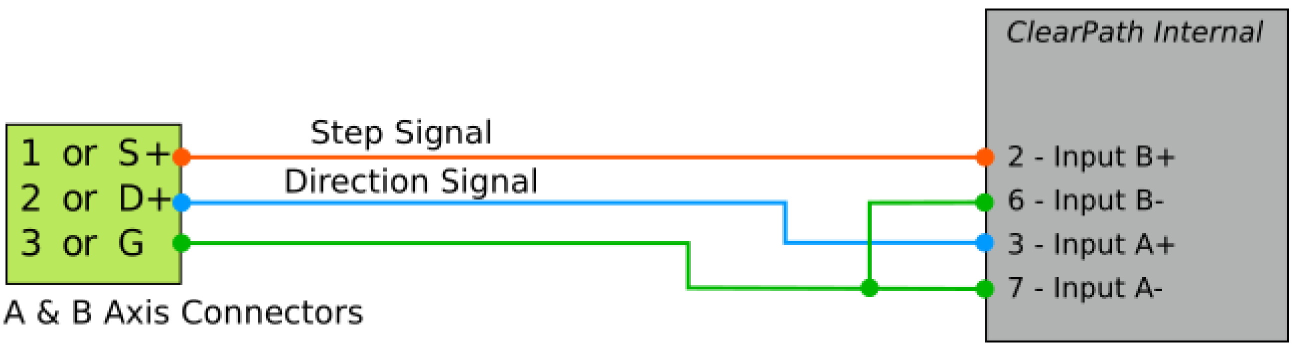
WARNING: Axis Step and Direction signals are common Ground and precautions must be taken to wire the controller to avoid any electrical damage to the system:

- All axis outputs are common Gnd with **+4** voltage signals.
- Never short-circuit the signals with each other or any other voltage.
- All signals must be isolated to other signals and connected directly to the drives

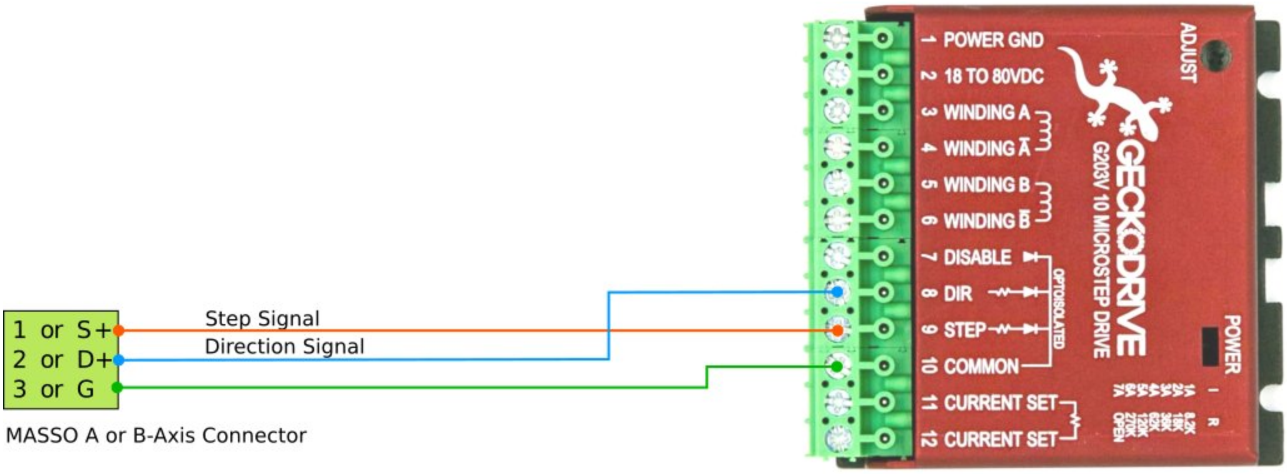
MASSO G2 A & B axis wiring examples

Teknic - ClearPath wiring

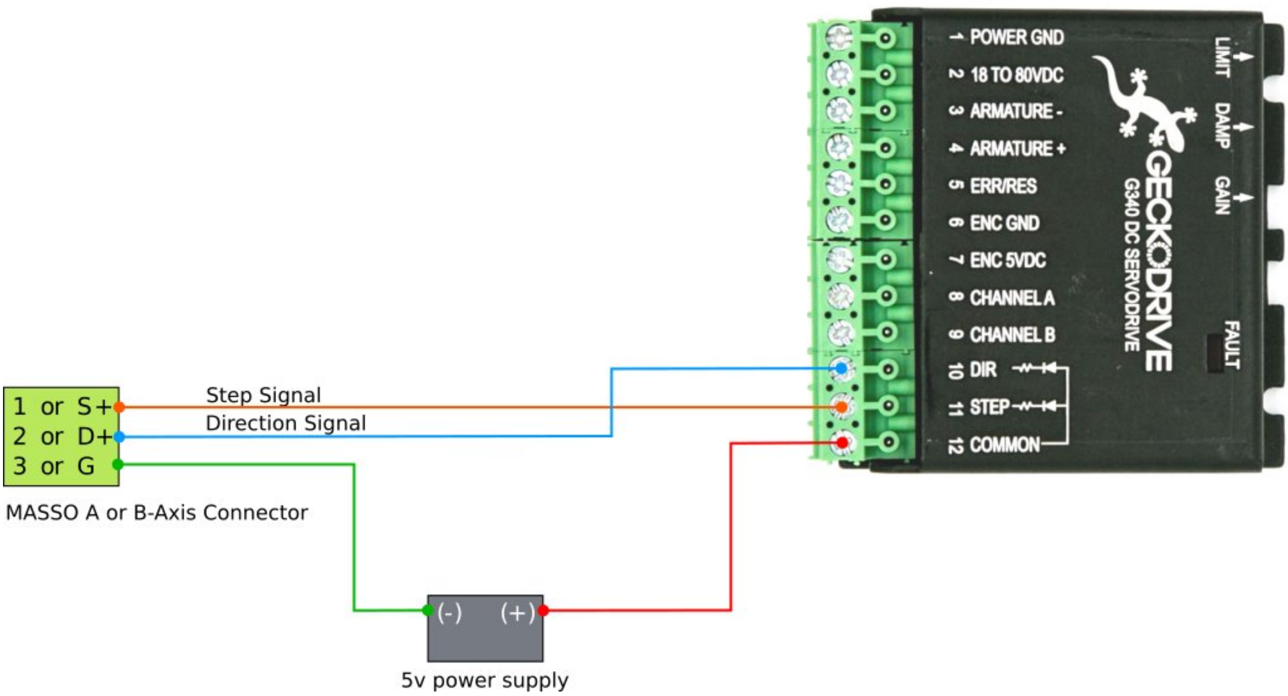




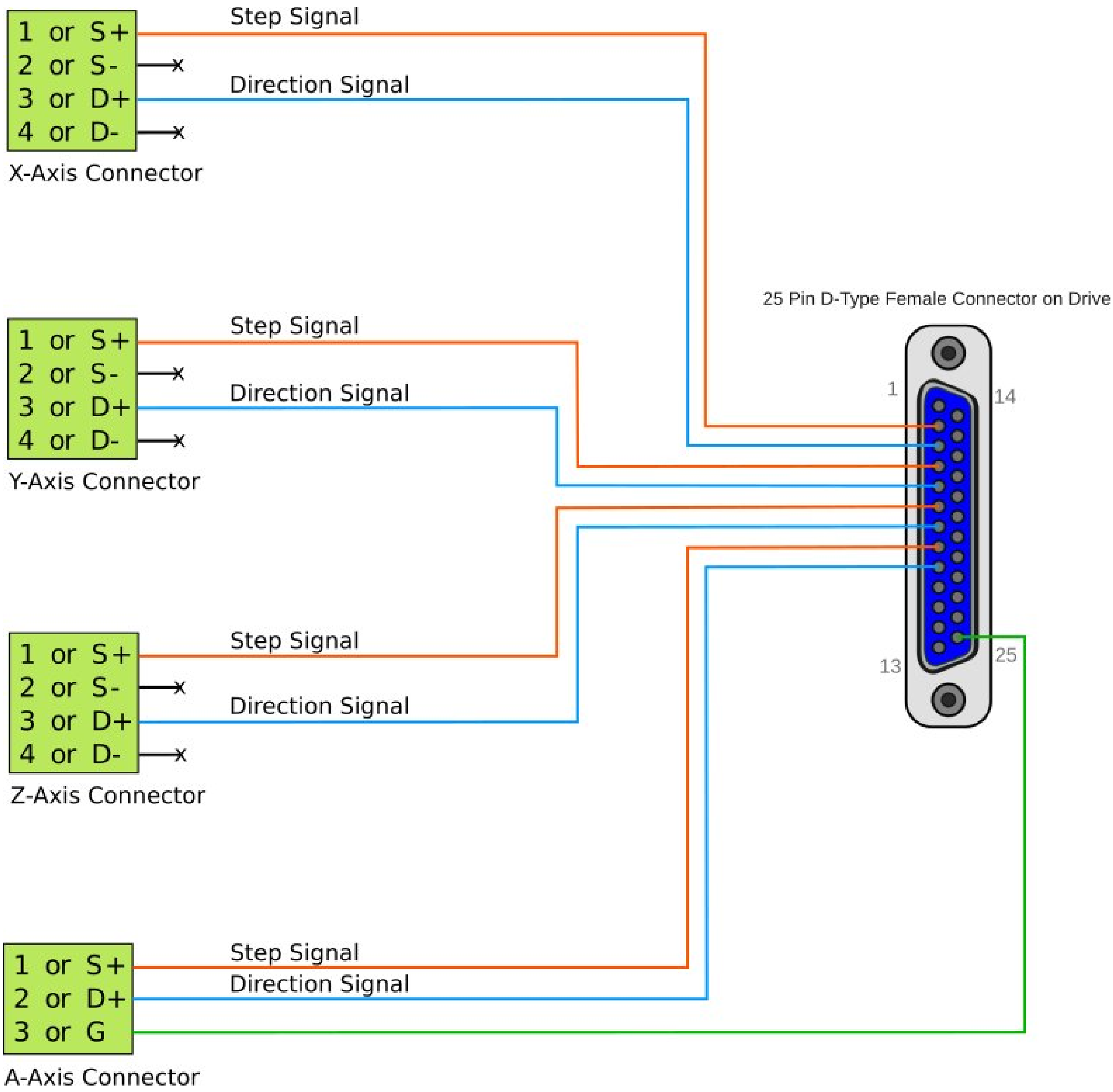
Gecko Drive 203V wiring



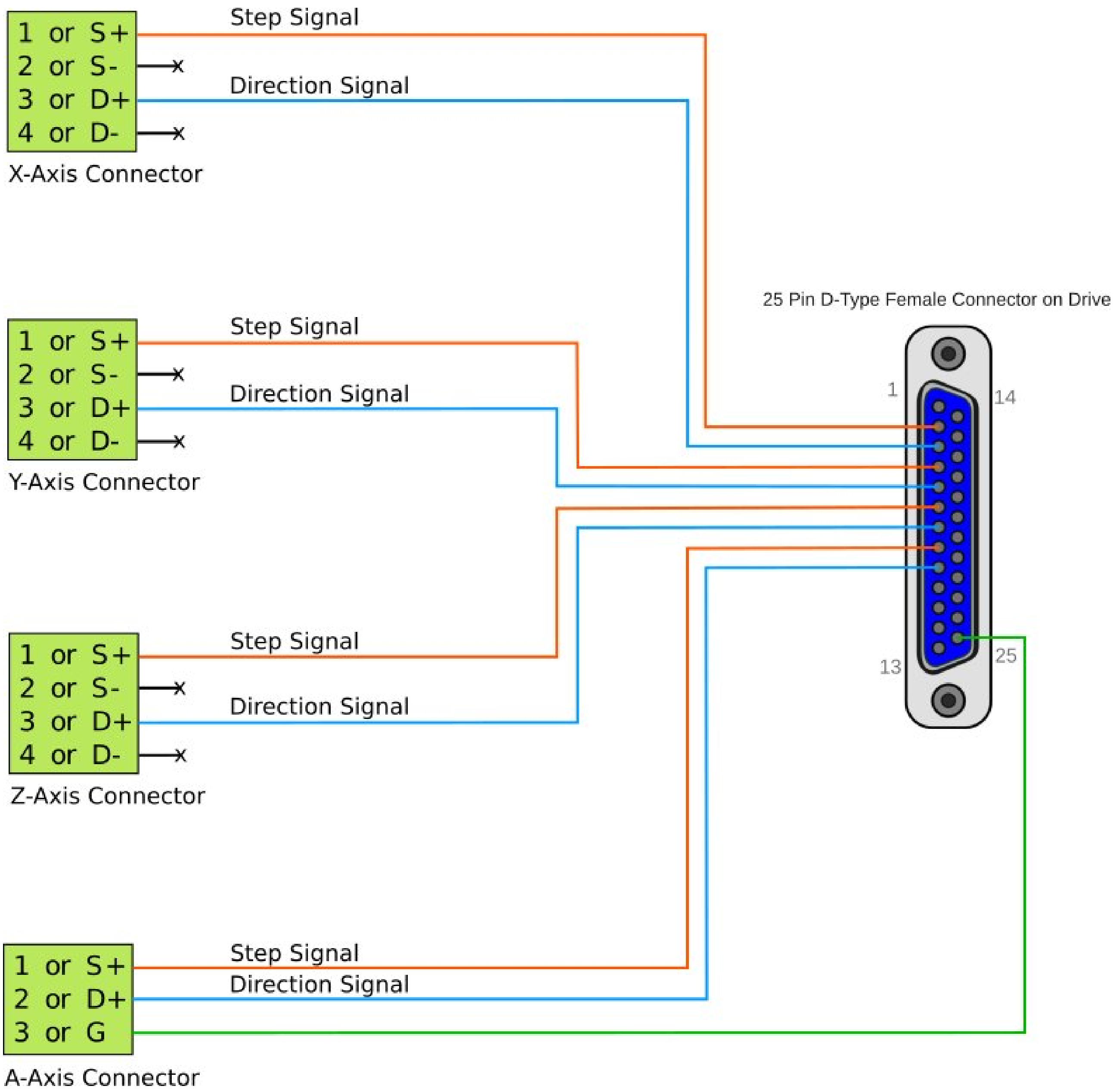
Gecko Drive G340 wiring



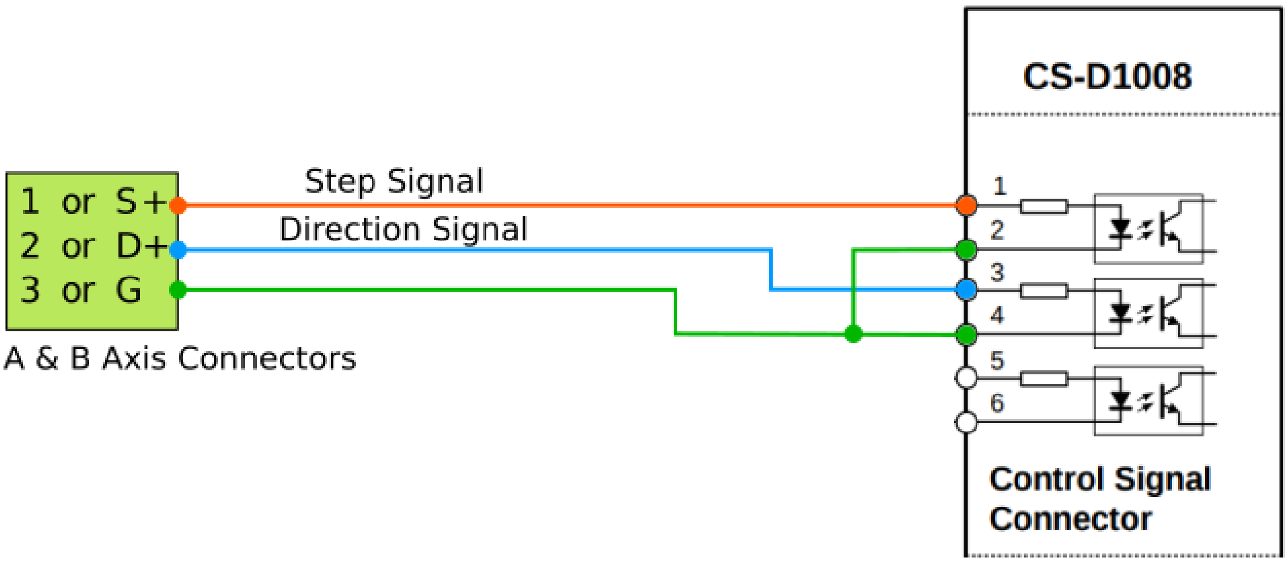
Gecko Drive G540 wiring



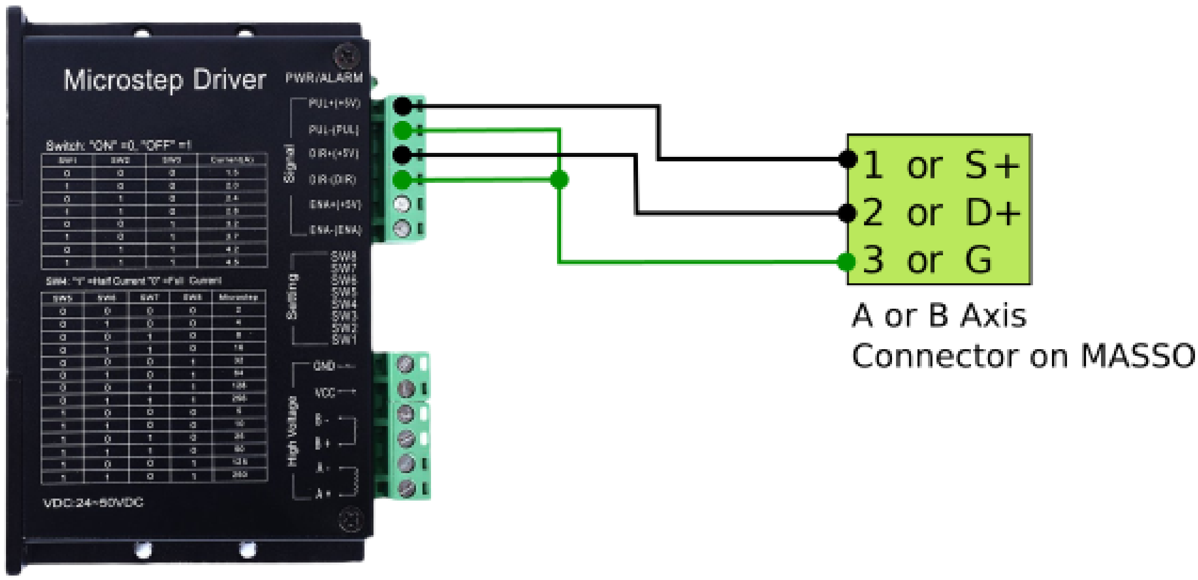
Leadshine Drive MX4660 wiring



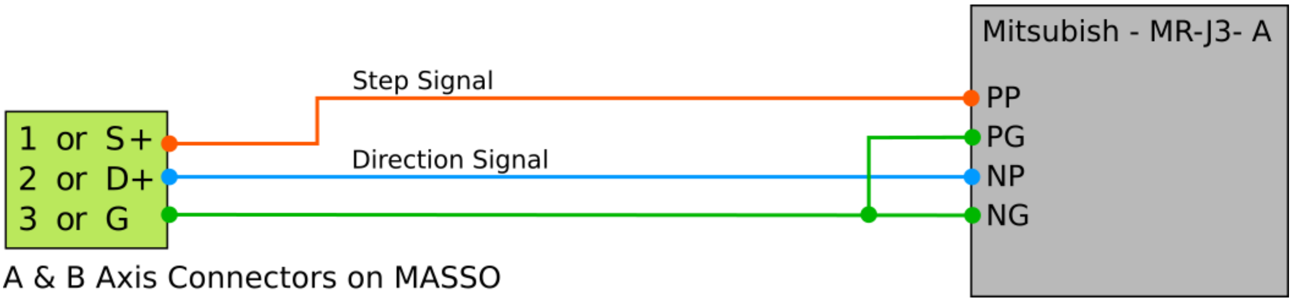
Leadshine Drive CS-D1008 wiring



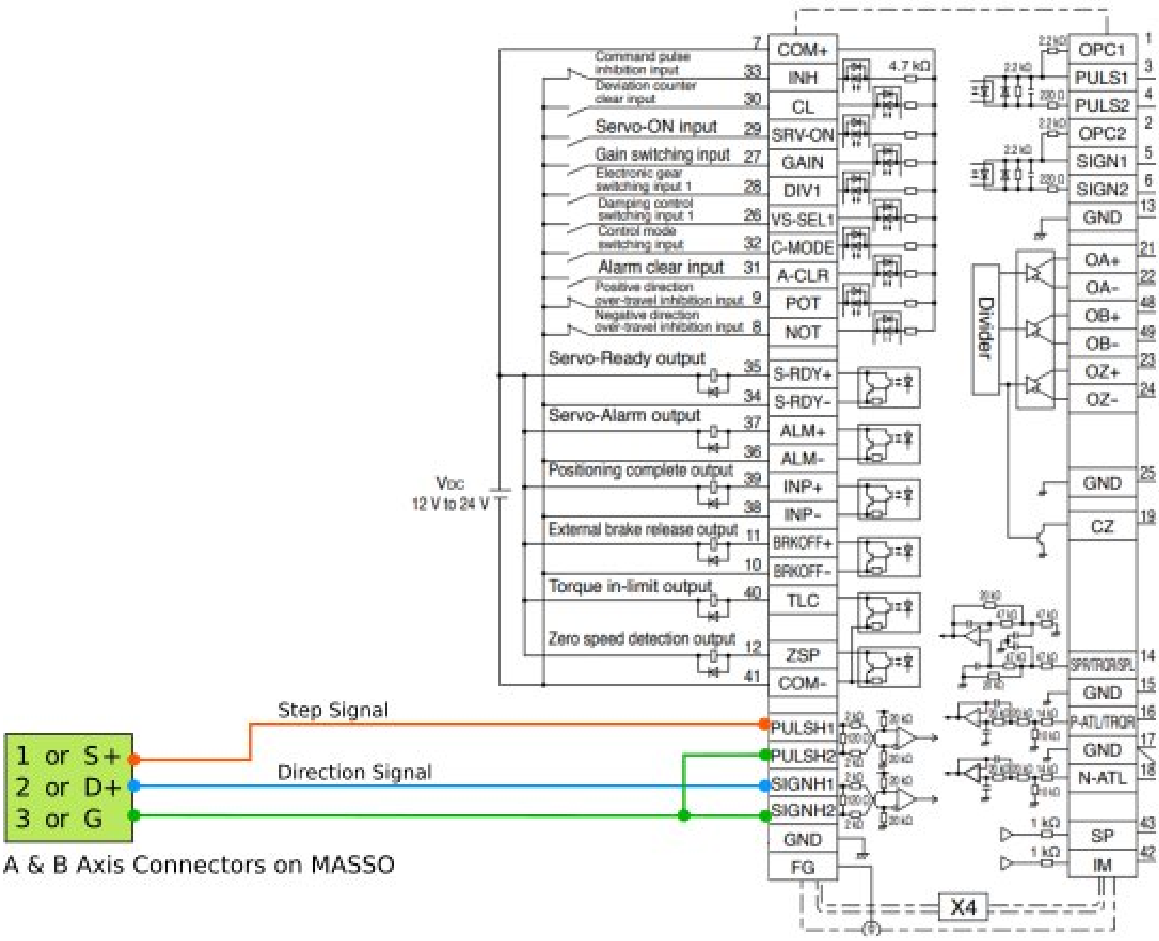
DM542A, DQ860MA wiring



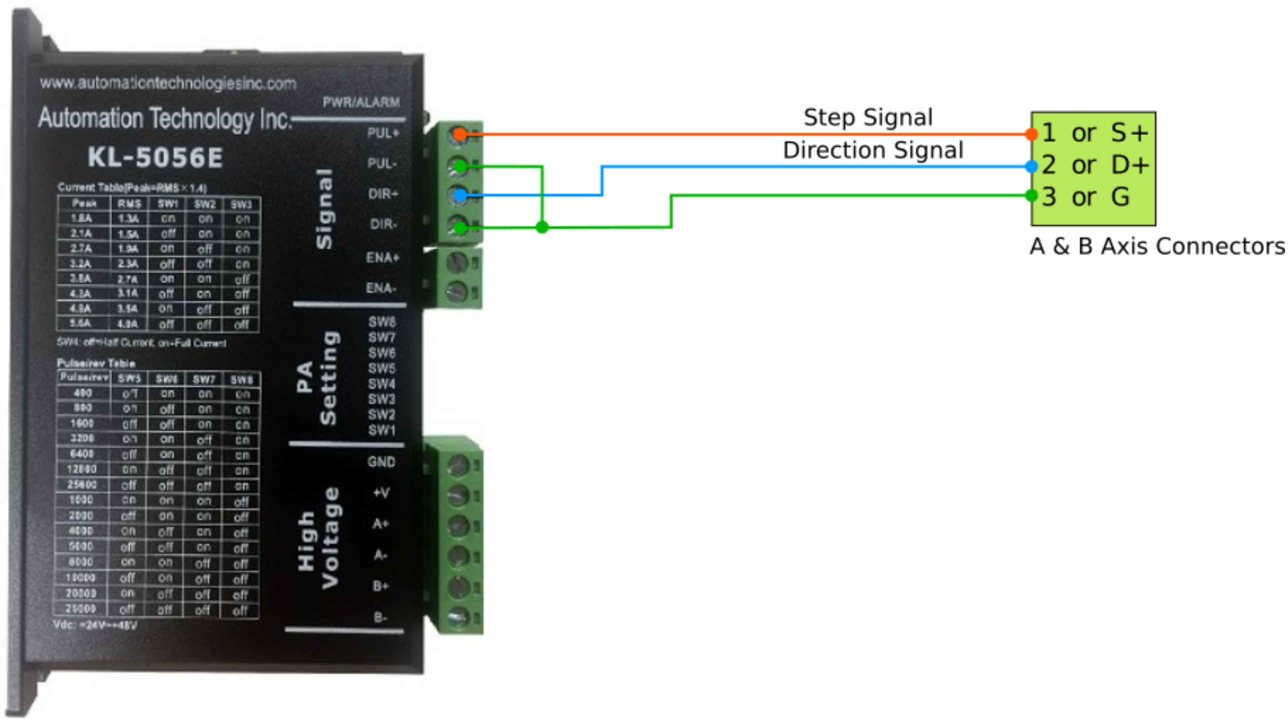
Mitsubishi - MR-J3 wiring



Panasonic - MCDHT3520 wiring



Automation Technology Inc. - KL5056E wiring



Information: If you have a MASSO-G3 or are wiring the X, Y or Z axis on A MASSO-G2 please [CLICK HERE]

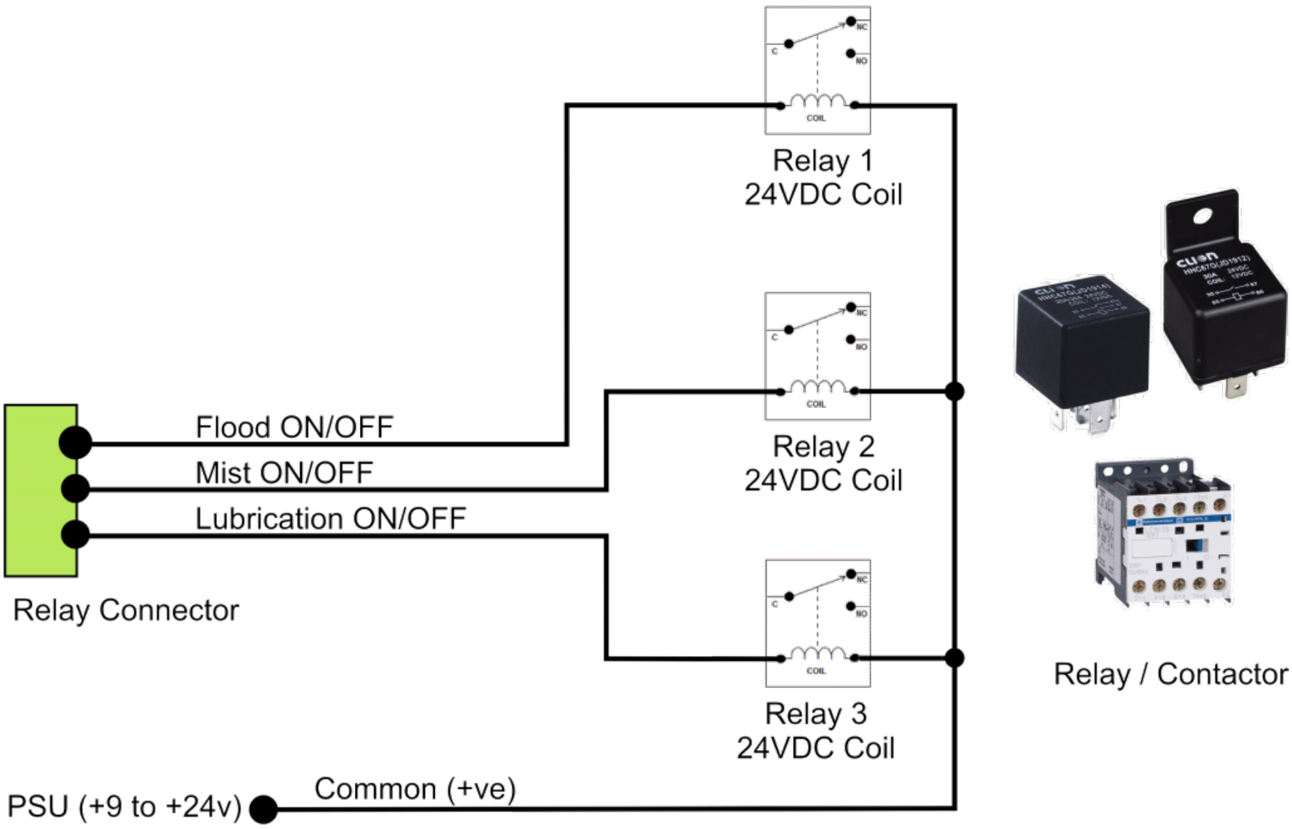
MASSO G2 Relay wiring example

INFORMATION: Assign the desired function to the Relay output you want to use by double clicking on the output and selecting the required function from the list.

INFORMATION: All output signals can be easily inverted by selecting the input in the **OUTPUTS** list and pressing the space-bar key on the keyboard to invert the input signal. These settings are automatically saved.

CAUTION: The Maximum current on any relay output must not exceed 400mA or the output will be damaged.

Pin No.	Description	Type
Pin 1	Relay 1 - Function configurable through software	Open collector (Max load 400 mA)
Pin 2	Relay 2 - Function configurable through software	Open collector (Max load 400 mA)
Pin 3	Relay 3 - Function configurable through software	Open collector (Max load 400 mA)
Pin 4	Relay 4 - Function configurable through software	Open collector (Max load 400 mA)
Pin 5	Relay 5 - Function configurable through software	Open collector (Max load 400 mA)
Pin 6	Relay 6 - Function configurable through software	Open collector (Max load 400 mA)
Pin 7	Relay 7 - **Output for E-Stop only**	Open collector (Max load 400 mA)



INFORMATION: If using TTL outputs on the MASSO-G2 or you are using the Masso-G3 please follow the link below.

[Using the MASSO Relay Module]()

11.26. Lubrication

Lubrication

An output can be assigned as lubrication to turn on a pump at set intervals to lubricate your machine.

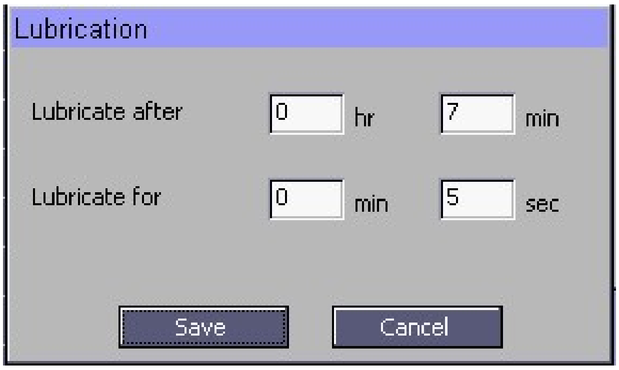
The output will go High automatically at the specified interval for the specified duration.

Lubrication operates while the program is running and will stop when the machine is idle or in an EStop condition.

Configuration

In the F1 screen select Lubrication.

Fill in the Interval and the duration. In this example the output will go high every 7 minutes for 5 seconds.



The lubrication output can be assigned to any of the TTL outputs in the F1 screen.

- Select the output you wish to use and double click with your mouse.
- Select Lubrication form the list of outputs and double click with your mouse.
- Your output is now assigned as lubrication.

Connect your lubrication pump to the TTL output using either the Masso relay module or other suitable interface module.

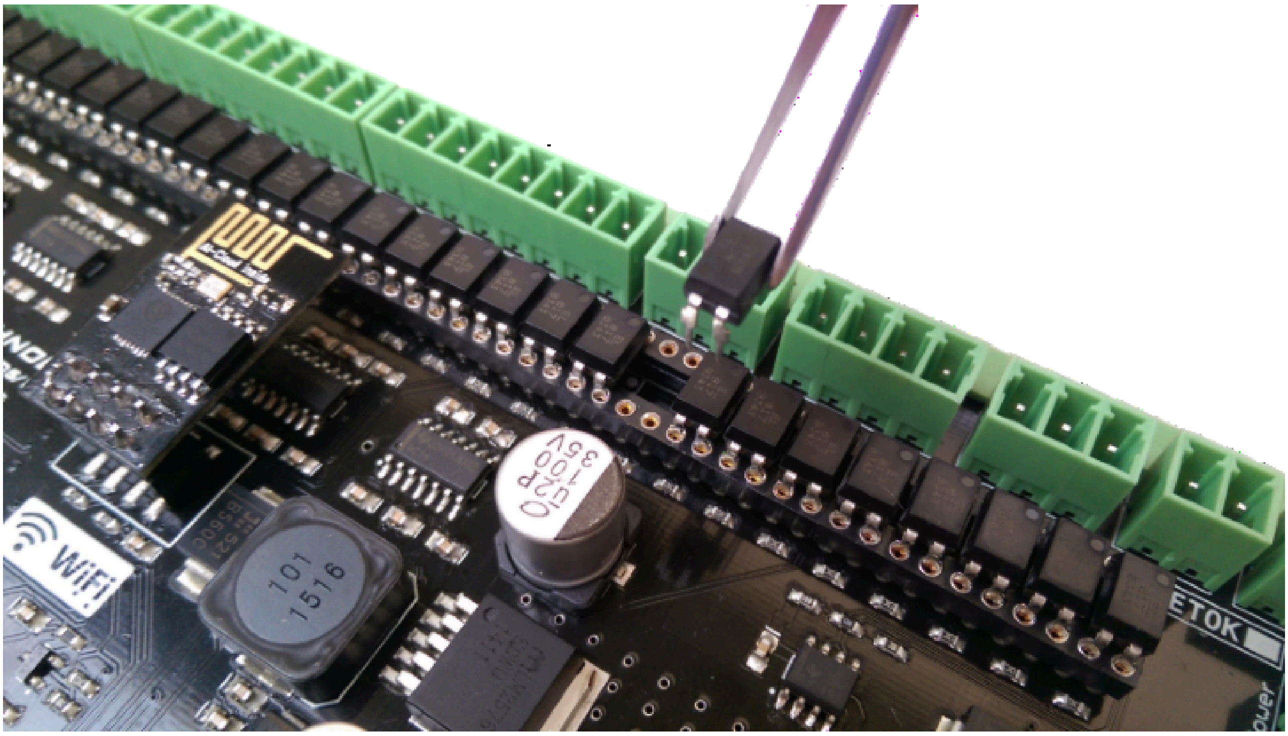
Lubricant Low alarm

If you have a lubricant vessel that has an alarm output you can connect it to Masso and a Lubrication alarm will display on Masso.

Top up your lubricant vessel and the alarm will automatically clear.

11.27. MASSO G2 Replacing Damaged Optocouplers

INFORMATION: This page is for the MASSO G2 only.



Sourcing replacement parts

INFORMATION: Damaged Optocouplers can be purchased from one of the following suppliers, please click the link below to directly jump to the part order page:

Digi-Key: Optocoupler LTV-816

Newark Element 14: Optocoupler KB817

Mouser Electronics: Optocoupler LTV-816

Identifying Optocouplers

Input Type	Optocoupler Number on Controller	Input Type	Optocoupler Number on Controller
Input 1	U1	Input 19	U19
Input 2	U2	Input 20	U20
Input 3	U3	Input 21	U21
Input 4	U4	Input 22	U22
Input 5	U5	Input 23	U23
Input 6	U6	Input 24	U24
Input 7	U7	Input 25	U25
Input 8	U8	Input 26	U26
Input 9	U9	Input 27	U27
Input 10	U10	Input 28	U28
Input 11	U11	Input 29	U29
Input 12	U12	Input 30	U30
Input 13	U13	Input 31	U31
Input 14	U14	Input 32	U32
Input 15	U15	Encoder-A	U33
Input 16	U16	Encoder-B	U34
Input 17	U17	Encoder-Z	U35
Input 18	U18		

Input Type	Optocoupler Number on Controller
MPG-A	U36
MPG-B	U37
X-Axis Select	U38
Y-Axis Select	U39
Z-Axis Select	U40
A-Axis Select	U41
B-Axis Select	U42
Resolution 1	U43
Resolution 2	U44
Resolution 3	U45
E-Stop	U46

Input Type	Optocoupler Number on Controller
Spindle CW	U47
Spindle CCW	U48

Testing procedure for Inputs 1 - 32

- Remove any wire connected to the input you want to test
- Go to the F1 screen and observe the logic state of the suspected input. It will show either HIGH or LOW depending on whether the input is inverted or not.
- Test the optocoupler by connecting the +ve of the MASSO power supply through a 5.6K resistor to the input you want to test.

- On the F1 screen you should see the input change from LOW to HIGH or from HIGH to LOW.
- If the input changes from one state to the other the optocoupler is ok and does not need replacing.

Testing procedure for Spindle Encoder Inputs

- Remove any wires connected to the Encoder inputs.
- Go to the F1 screen.
- Test the optocoupler by connecting the +ve of the MASSO power supply through a 5.6K resistor to the chosen encoder input.
- Encoder-A input you will see the Signal-A input of MASSO change from LOW to HIGH.
- Encoder-B input you will see the Signal-B input of MASSO change from LOW to HIGH.
- Encoder-Z input you will see the Index:0 Pos: 100 input of MASSO change from LOW to HIGH.
- If the input changes from one state to the other the optocoupler is ok and does not need replacing.
- If one is faulty only replace that optocoupler

Testing procedure for MPG Inputs

- Go to the F1 Screen
- Using your Pendant rotate the Manual pulse Generator, (MPG), and you will see the MPG-A and MPG-B flicker between HIGH and LOW randomly. If you see them flicker the Optocouplers are ok and do not need replacing.
- Use the Pendant Axis selector switch and rotate through Axis X,Y,Z,A & B and you will see the corresponding Axis select input change from LOW to HIGH as each is selected. If the inputs change they do not need replacing. If one is faulty only replace that optocoupler
- Use the Pendant Resolution selector switch to select between 1,10 & 100 and you will see Resolution inputs 1, 2 & 3 Change from LOW to HIGH as they are selected. If the inputs change they do not need replacing. If one is faulty only replace that optocoupler

Testing procedure for the Estop Input

- Remove the wire connected to Estop 2
- Go to the F1 screen and make sure the Estop input shows LOW and is not inverted.
- Test the optocoupler by connecting the +ve of the MASSO power supply through a 5.6K resistor to EStop2 input
- On the F1 screen you should see the input change from LOW to HIGH.
- If the input changes from one state to the other the optocoupler is ok and does not need replacing.

Testing procedure for CW & CCW outputs

Testing the CW output

- Remove the wires from spindle control terminals 4 & 5
- Go to the F1 screen and ensure the CW output is not inverted. If it is remove the invert and remember to put it back on when you are finished testing.
- Go to the F2 screen and set the spindle to off
- Use your Digital multimeter set to continuity 2K

- Connect one lead of your multimeter to terminal 4 and the other lead to terminal 5 of spindle control
- You should read no continuity on your multimeter.
- Swap the meter leads around and you should still have no continuity reading on your meter.
- If you get a continuity reading in either polarity of your meter the optocoupler is faulty and needs replacing.
- Go to the F2 screen and set the spindle to CW by clicking the Spindle CW button on the screen
- You should read 200 ohms or less on your meter
- If you get no continuity reading reverse the leads of your meter and retest as this is a polarity conscious output.
- If you still do not get a reading to 200 ohms or less when the spindle is on the optocoupler is faulty and needs replacing.

Testing the CCW output

- Remove the wires from spindle control terminals 6 & 7
- Go to the F1 screen and ensure the CCW output is not inverted. If it is remove the invert and remember to put it back on when you are finished testing.
- Go to the F2 screen and set the spindle to off
- Use your Digital multimeter set to continuity 2K
- Connect one lead of your multimeter to terminal 6 and the other lead to terminal 7 of spindle control
- You should read no continuity on your multimeter.
- Swap the meter leads around and you should still have no continuity reading on your meter.
- If you get a continuity reading in either polarity of your meter the optocoupler is faulty and needs replacing.
- Go to the F2 screen and set the spindle to CCW by clicking the Spindle CCW button on the screen
- You should read 200 ohms or less on your meter
- If you get no continuity reading reverse the leads of your meter and retest as this is a polarity conscious output.
- If you still do not get a reading to 200 ohms or less when the spindle is on the optocoupler is faulty and needs replacing.

Replacement Process

WARNING: Ensure that you turn the power off to MASSO and observe standard Antistatic precautions before changing an optocoupler.

CAUTION: Ensure that you observe the correct orientation of the optocoupler when replacing as they are polarity sensitive.

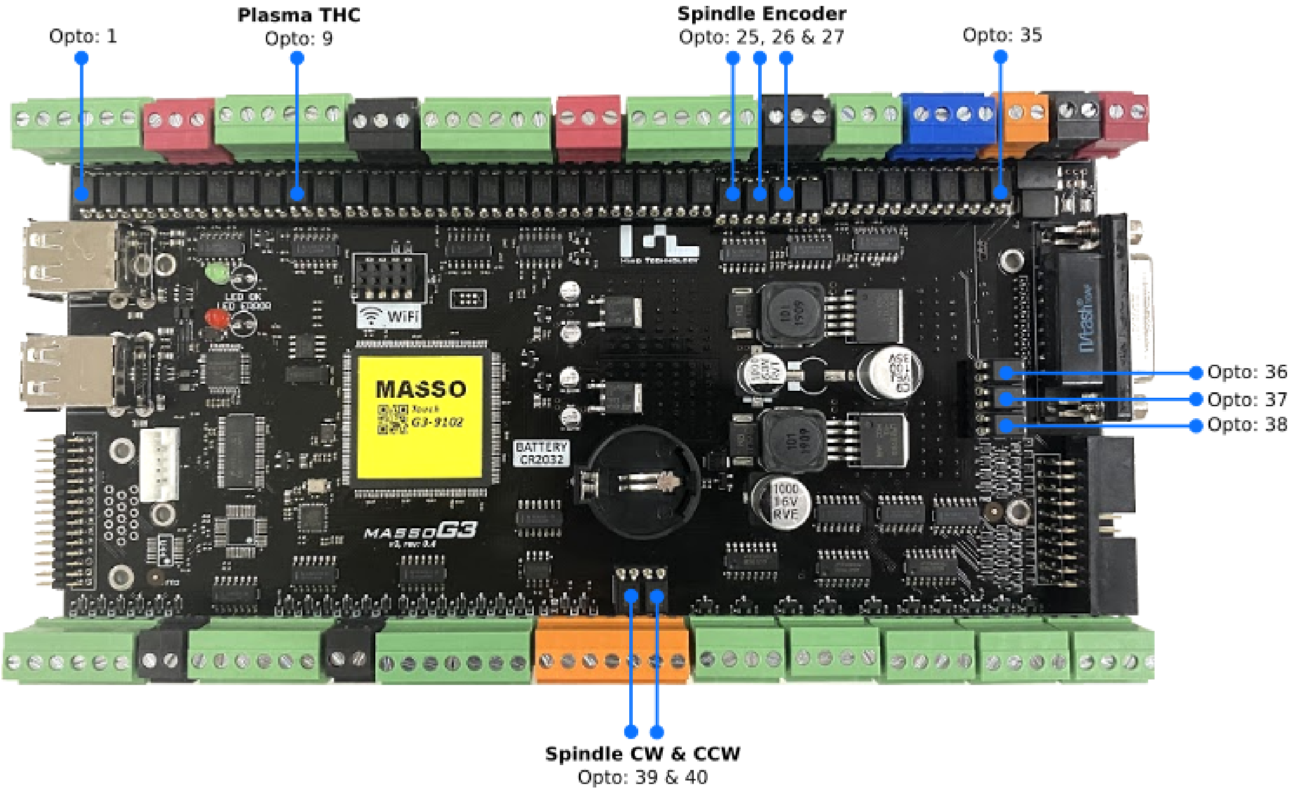
- Observe the polarity of the optocoupler. Take a photo if you are not sure. Each Optocoupler has a dot on it to identify pin 1
- Using a suitable pair of long nose pliers or tweezers gently remove the faulty Optocoupler from it's socket. It should come out easily.
- Push the replacement Optocoupler into place until it is correctly seated. Make sure all pins are in the

socket.

- Test to check that it is now working.

11.28. MASSO G3 Replacing Damaged Optocouplers

INFORMATION: This page is for the MASSO G3 and MASSO G3 Touch only.



Identifying Optocouplers

- **Inputs -** Opto 1 to 8, 10 to 24: **LTV-816 or KB817**
- **THC Input -** Opto 9: **SFH615A-2**
- **Spindle Encoder Inputs -** Opto 25, 26 & 27: **SFH615A-2**
- **MPG Inputs -** Opto 28 to 38: **LTV-816 or KB817**
- **Spindle CW & CCW Outputs -** Opto 39 & 40: **LTV-816 or KB817**

Sourcing replacement parts

INFORMATION: Damaged Optocouplers can be purchased from one of the following suppliers, please click the link below to directly jump to the part order page:

Digi-Key: Optocoupler LTV-816

Newark Element 14: [Optocoupler KB817]

Mouser Electronics: [Optocoupler LTV-816]

Testing procedure for Inputs 1 - 24

- Remove any wire connected to the input you want to test
- Go to the F1 screen and observe the logic state of the suspected input. It will show either HIGH or LOW depending on whether the input is inverted or not.
- Test the optocoupler by connecting the +ve of the MASSO power supply through a 5.6K resistor to the input you want to test.
- On the F1 screen you should see the input change from LOW to HIGH or from HIGH to LOW.
- If the input changes from one state to the other the optocoupler is ok and does not need replacing.

Testing procedure for Spindle Encoder Inputs

- Remove any wires connected to the Encoder inputs.
- Go to the F1 screen.
- Test the optocoupler by connecting the +ve of the MASSO power supply through a 5.6K resistor to the chosen encoder input.
- Encoder-A input you will see the Signal-A input of MASSO change from LOW to HIGH.
- Encoder-B input you will see the Signal-B input of MASSO change from LOW to HIGH.
- Encoder-Z input you will see the Index input of MASSO change from LOW to HIGH.
- If the input changes from one state to the other the optocoupler is ok and does not need replacing.
- If one is faulty only replace that optocoupler

Testing procedure for MPG Inputs

- Go to the F1 Screen
- Using your Pendant rotate the Manual pulse Generator, (MPG), and you will see the MPG-A and MPG-B flicker between HIGH and LOW randomly. If you see them flicker the Optocouplers are ok and do not need replacing.
- Use the Pendant Axis selector switch and rotate through Axis X,Y,Z,A & B and you will see the corresponding Axis select input change from LOW to HIGH as each is selected. If the inputs change they do not need replacing. If one is faulty only replace that optocoupler
- Use the Pendant Resolution selector switch to select between 1,10 & 100 and you will see Resolution inputs 1, 2 & 3 Change from LOW to HIGH as they are selected. If the inputs change they do not need replacing. If one is faulty only replace that optocoupler

Testing procedure for the Estop Input

- Remove the wire connected to Estop 2
- Go to the F1 screen and make sure the Estop input shows LOW and is not inverted.

- Test the optocoupler by connecting the +ve of the MASSO power supply through a 5.6K resistor to EStop2 input
- On the F1 screen you should see the input change from LOW to HIGH.
- If the input changes from one state to the other the optocoupler is ok and does not need replacing.

Testing procedure for CW & CCW outputs

Testing the CW output

- Remove the wires from spindle control terminals 4 & 5
- Go to the F1 screen and ensure the CW output is not inverted. If it is remove the invert and remember to put it back on when you are finished testing.
- Go to the F2 screen and set the spindle to off
- Use your Digital multimeter set to continuity 2K
- Connect one lead of your multimeter to terminal 4 and the other lead to terminal 5 of spindle control
- You should read no continuity on your multimeter.
- Swap the meter leads around and you should still have no continuity reading on your meter.
- If you get a continuity reading in either polarity of your meter the optocoupler is faulty and needs replacing.
- Go to the F2 screen and set the spindle to CW by clicking the Spindle CW button on the screen
- You should read 200 ohms or less on your meter
- If you get no continuity reading reverse the leads of your meter and retest as this is a polarity conscious output.
- If you still do not get a reading to 200 ohms or less when the spindle is on the optocoupler is faulty and needs replacing.

Testing the CCW output

- Remove the wires from spindle control terminals 6 & 7
- Go to the F1 screen and ensure the CCW output is not inverted. If it is remove the invert and remember to put it back on when you are finished testing.
- Go to the F2 screen and set the spindle to off
- Use your Digital multimeter set to continuity 2K
- Connect one lead of your multimeter to terminal 6 and the other lead to terminal 7 of spindle control
- You should read no continuity on your multimeter.
- Swap the meter leads around and you should still have no continuity reading on your meter.
- If you get a continuity reading in either polarity of your meter the optocoupler is faulty and needs replacing.
- Go to the F2 screen and set the spindle to CCW by clicking the Spindle CCW button on the screen
- You should read 200 ohms or less on your meter
- If you get no continuity reading reverse the leads of your meter and retest as this is a polarity conscious output.
- If you still do not get a reading to 200 ohms or less when the spindle is on the optocoupler is faulty and needs replacing.

Replacement Process

WARNING: Ensure that you turn the power off to MASSO and observe standard Antistatic precautions before changing an optocoupler.

CAUTION: Ensure that you observe the correct orientation of the optocoupler when replacing as they are polarity sensitive.

- Observe the polarity of the optocoupler. Take a photo if you are not sure. Each Optocoupler has a dot on it to identify pin 1
- Using a suitable pair of long nose pliers or tweezers gently remove the faulty Optocoupler from it's socket. It should come out easily.
- Push the replacement Optocoupler into place until it is correctly seated. Make sure all pins are in the socket.
- Test to check that it is now working.

11.29. Spindle RPM Encoder

An incremental encoder is used to monitor spindle RPM and also for synchronized threading on lathes.

Pin No.	Description	Type
Pin 1	Signal A	Opto input (5 to 24v)
Pin 2	Signal B	Opto input (5 to 24v)
Pin 3	Signal Z - Index	Opto input (5 to 24v)

Spindle Encoder Signal

The A & B signals is a Quadrature signal, ie 90 degrees out of phase with one another. MASSO can use this signal to determine speed and which direction the spindle is turning.

The A, B signal sequence runs as follows.

- A - High B - Low
- A - High B - High
- A - Low B - High
- B - Low B - Low

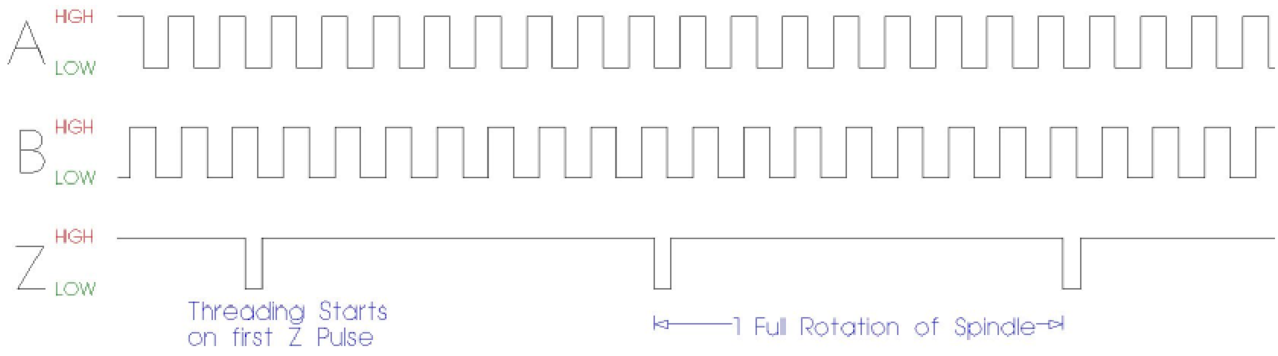
The sequence repeats.

The sequence will reverse if the spindle is run in the opposite direction.

The Z Index signal outputs a pulse once every rotation of the Spindle.

The Index pulse is used on Lathe to determine the start of threading and is used in conjunction with the A & B pulses to determine the Z axis speed during the Threading cycle.

Threading will not proceed until the first Z pulse is received.



The A, B & Z pulses can be seen on the F1 Screen by slowly turning the spindle by hand and observing the Encoder Signal - A, Encoder Signal- B and the Encoder Index signals.

Encoder	Signal - A	No	High
Encoder	Signal - B	No	Low
Encoder	Index	No	High

INFORMATION: The maximum pulse frequency on encoder inputs for MASSO G3 controllers is 60kHz.

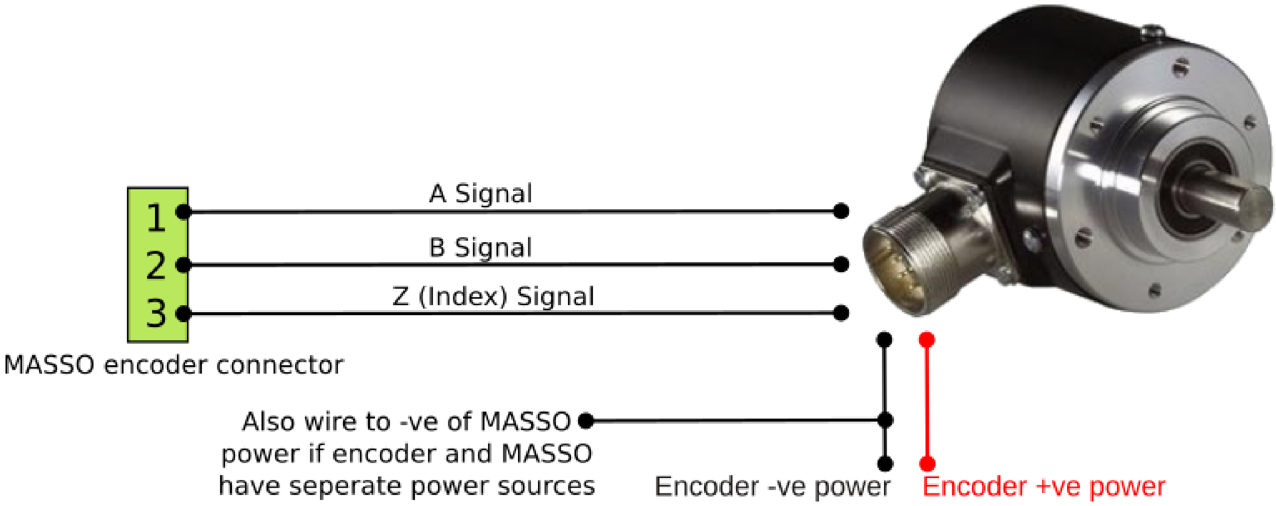
INFORMATION: The maximum pulse frequency on encoder inputs for MASSO G2 controllers is 8Khz

INFORMATION: The MASSO G2 can be modified to 20Khz by changing 3 Optocouplers and removing some capacitors.

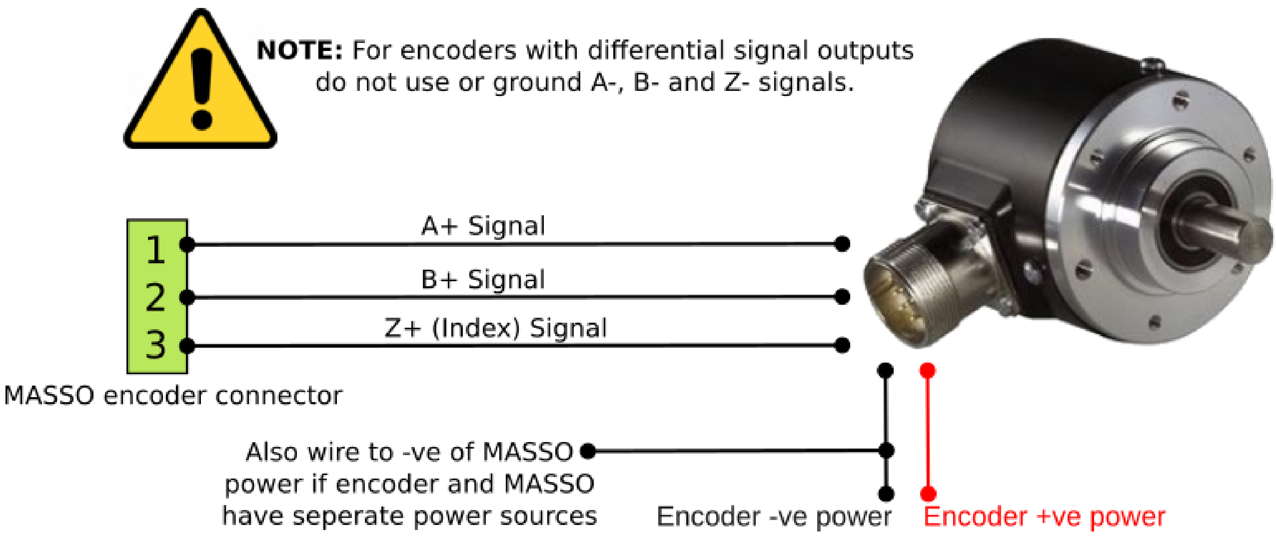
Upgrading the Spindle encoder on MASSO G2

INFORMATION: All input signals can be easily inverted by selecting the input in the **INPUTS** list and pressing the space-bar key on the keyboard to invert the input signal. These settings are automatically saved.

Voltage output signal wiring example



Differential / Line Driver output signal wiring example



Maximum Encoder Frequency

To confirm that the encoder frequency will be within the Masso maximum pulse frequency please use the Encoder Frequency Calculator

Encoder Frequency Calculator

Or you can manually calculate it using the formula below.

$$\text{Frequency Khz} = \frac{\text{Maximum spindle RPM} \times \text{Encoder PPR}}{60}$$

INFORMATION: For information on the MASSO encoder and printing a custom encoder disk please see here: https://docs.masso.com.au/index.php/wiring-and-setup/setup-and-calibration/masso-optical-encoder

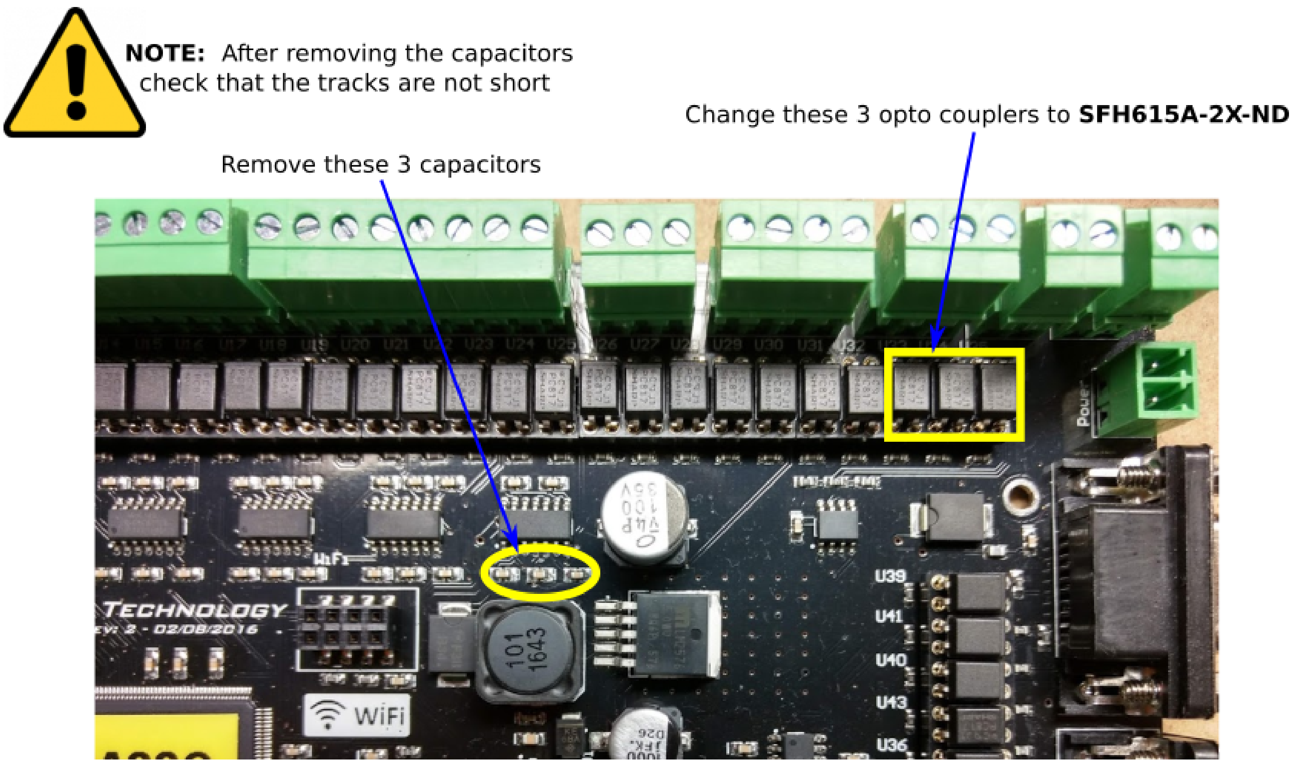
11.29.1. Upgrading the Spindle encoder on MASSO G2

Upgrading the MASSO G2 encoder inputs to take up frequency up to 20kHz

INFORMATION: This procedure is for only for the MASSO G2 as the G3 is capable of frequency up to 60Khz

- By default MASSO can take up to 8kHz encoder signals, to upgrade the inputs so that they can take up to 20kHz please follow the below procedures.
- To check the maximum frequency as per your machine spindle RPM and encoder PPR, please use [THIS CALCULATOR]
- If the calculated frequency is under 8Khz then you do not need to do the modification.
- Ordering the SFH615A optocouplers: https://www.digikey.com/product-detail/en/isocom-components-2004-ltd/SFH615A-2X/SFH615A-2X-ND/5037024

CAUTION: If you are at all unsure of how to remove the 3 capacitors from the main board please seek assistance from a qualified person as incorrect removal may cause damage to the main board.



12. Save & Load Settings

To make it easy for setting up machines in production or to save machine calibration profiles, all machine calibration and setup settings can be saved to file on the USB Flash drive. These settings can then be loaded to other MASSO controllers to quickly and easily finish the machine setup process.

Caution: The Save and load settings feature are slightly different between the MASSO G2 and MASSO G3 models. Please watch the video below that relates to your particular model.

INFORMATION: When the settings are saved to file, the WiFi network **Security Key** is not saved and is set as blank in the settings file for security reasons.

Saving settings to file

Go to the **F1-Setup** screen and open the **Save & Load Calibration Settings** window. Click the **Save to file** button and all calibration and setup settings will be saved to **MASSO_Settings.htg** and tool table **MASSO_Tools.htg** on to the USB Flash drive.

Sharing these files are useful in diagnosing settings issues you may have.

Printable settings File

The printable settings file option is available on the MASSO G3 only. It cannot be loaded back into your MASSO but it is your settings in a readable text file that you can uses as a written backup or share with others to help diagnose any issue you might have. It is one of the most valuable pieces of information that you can send to MASSO Support or share with others if you have an issue.

Loading settings from file

Go to the **F1-Setup** screen and open the **Save & Load Calibration Settings** window. Click the **Load from**

file button and all calibration and setup settings will be loaded from the **MASSO_Settings.htg** file and tool table settings from the **MASSO_Tools.htg** file on the USB Flash drive.

CAUTION: Please restart MASSO after loading settings from USB Flash drive so that the settings can take effect.

INFORMATION: Loading the tool table **MASSO_Tools.htg** is optional and does not need to be present to load the settings.

How to Load and Save on MASSO G3

Scan the QR code to watch the MASSO video tutorial on YouTube

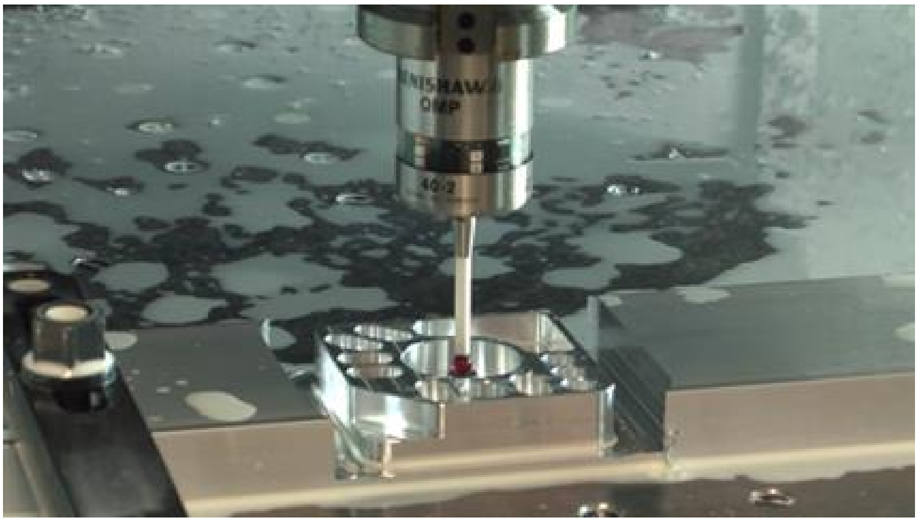
Or, Click here to view the video

How to Load and Save on MASSO G2

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

13. Touch Probe



A wired or wireless touch probe can be wired to MASSO to be used with **interactive part probing** or with **G38.2 probing cycle** gcode command.

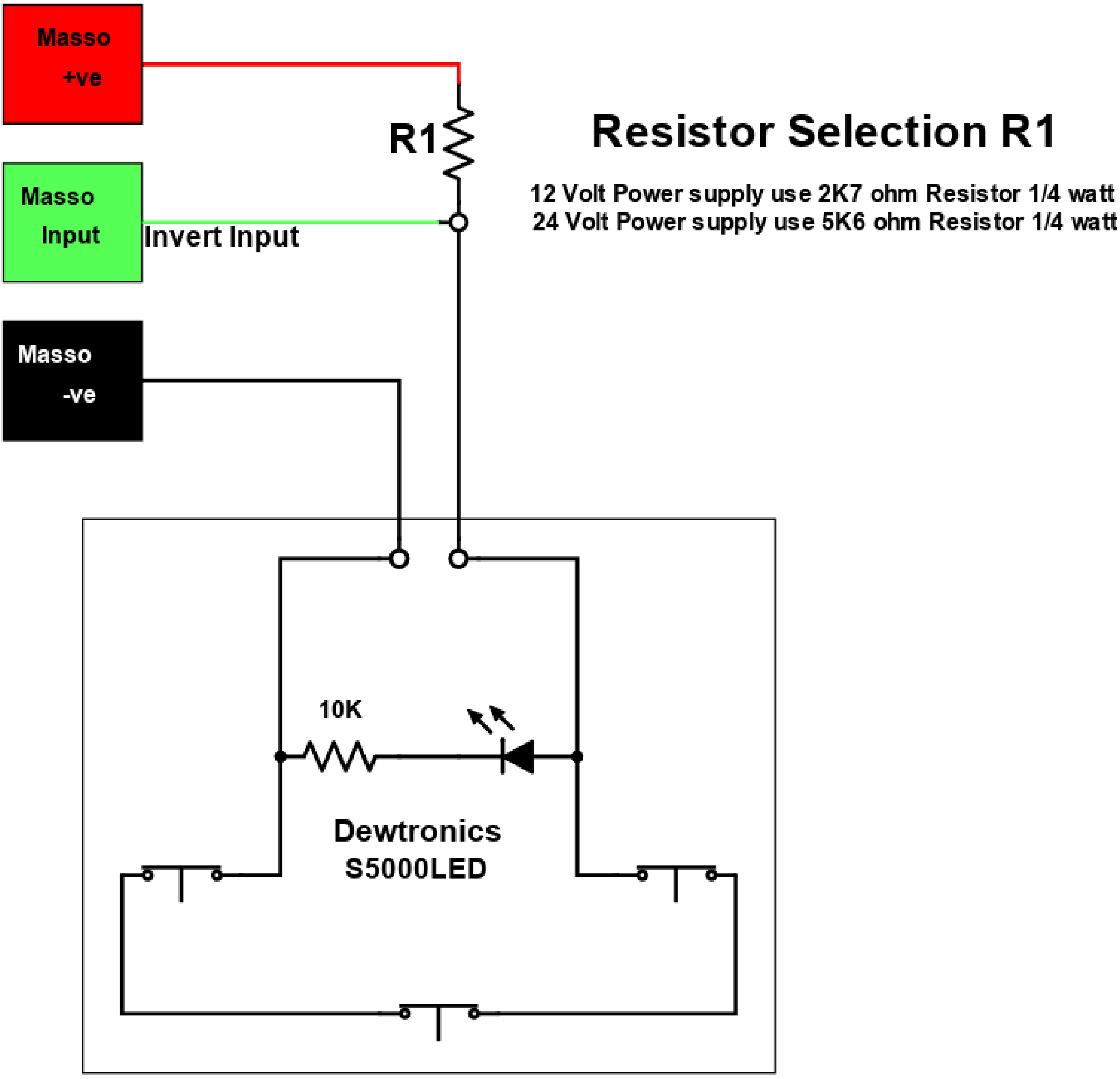
INFORMATION: For information about **interactive part probing** CLICK HERE

INFORMATION: For information about using **G38.2 probing cycle** CLICK HERE

Wiring the probe

The probe signal can be wired to one of the inputs on the MASSO. The voltage signal from the probe must be between 5 to 24v.

Wiring example of Drewtronics Probe

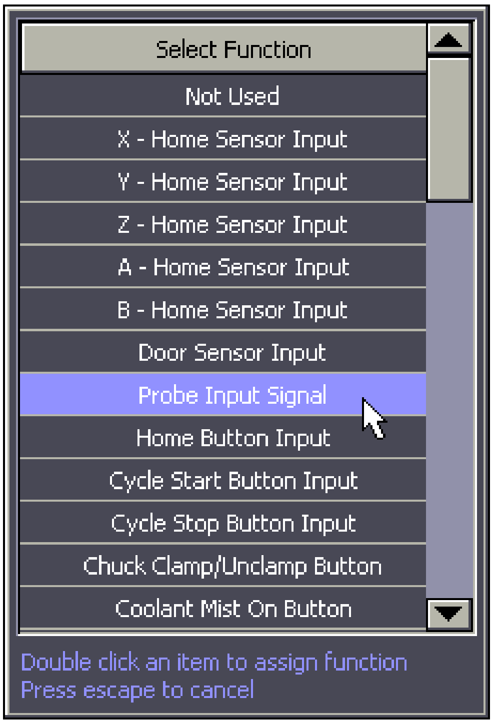


Assigning the probe input

Once the probe has been wired to one of the MASSO inputs, go to the **F1 - Setup** screen and assign the input as **Probe Input Signal**.

CAUTION: The input status must show LOW when the probe is not touched and should only show HIGH when triggered.

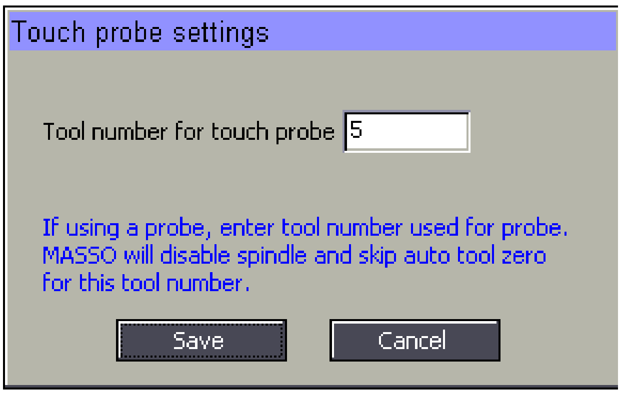
INFORMATION: To invert the input signal, invert by selecting the input in the **INPUTS** list and press the space-bar key on the keyboard. These settings are automatically saved.



INFORMATION: Touch probe to skip is available on MASSO G3 software version 3.47 and above.

When using a touch probe, if auto tool zero is enabled, the controller will try to automatically do an auto tool zero which can damage the touch probe. If a tool number is entered in the above settings then MASSO will automatically skip auto tool zero for this tool number and the user can enter the calibrated length of the touch probe in the F4-Tools & Work Offset screen.

This also disables the spindle so that it cannot be accidentally turned on when the touch probe is loaded.



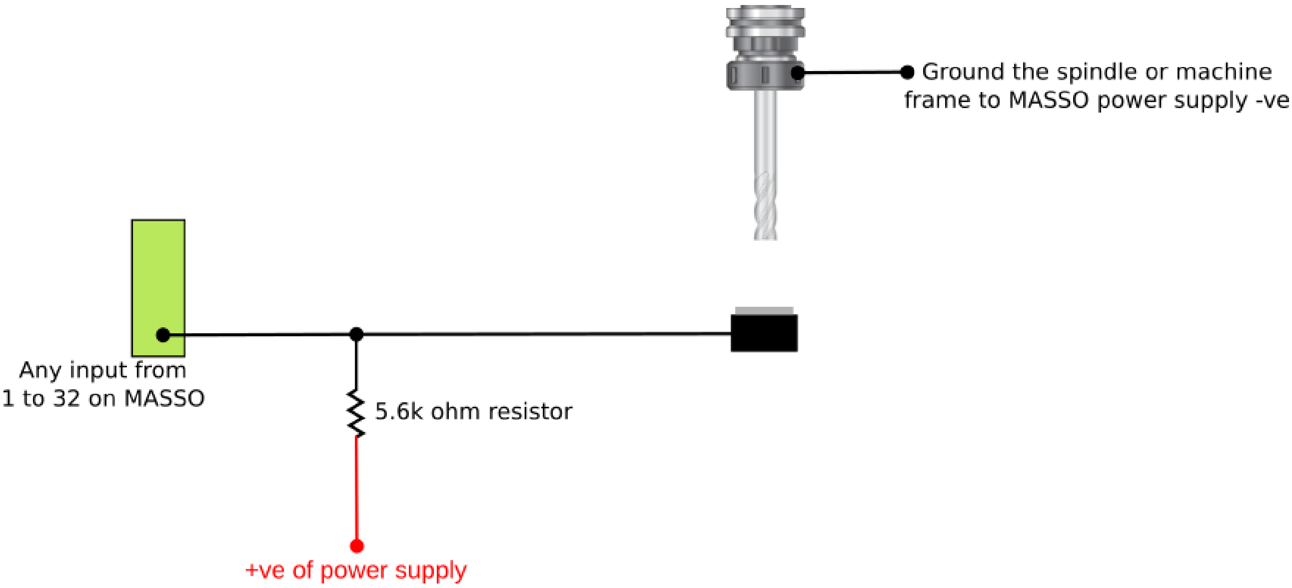
14. Tool Setter / Touch Plate

A tool setter or a simple touch plate can be wired to MASSO to be used with **interactive part probing** or with **G38.2 probing cycle** gcode command.

INFORMATION: For information about **interactive part probing** CLICK HERE

INFORMATION: For information about using **G38.2 probing cycle** CLICK HERE

Wiring example of a simple touch plate

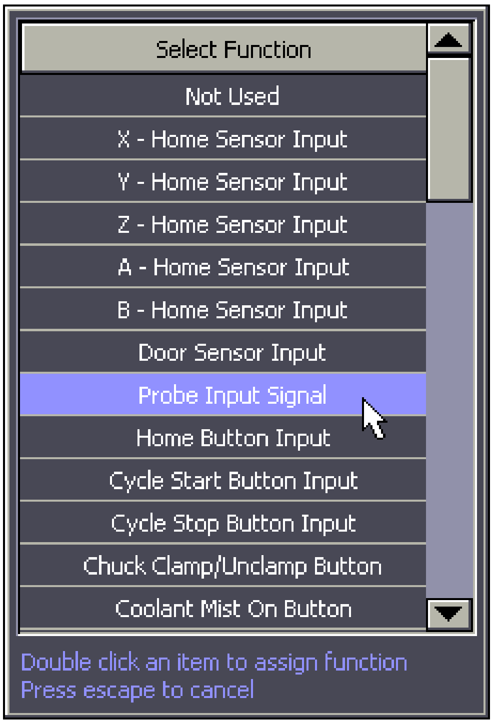


Assigning the probe input

Once the probe has been wired to one of the MASSO inputs, go to the **F1 - Setup** screen and assign the input as **Probe Input Signal**.

CAUTION: The input status must show LOW when the probe is not touched and should only show HIGH when triggered.

INFORMATION: To invert the input signal, invert by selecting the input in the **INPUTS** list and press the space-bar key on the keyboard. These settings are automatically saved.



14.1. How Tool Setter Works

Overview

A tool setter or a simple touch plate can be wired to MASSO and is used as a reference surface with the Auto Tool Zero feature.

When MASSO is homed the tool currently installed in the spindle is touched off of the tool setter.

From this touch off MASSO can measure the length of the tool in the spindle and stores this length to use as a comparison in future tool changes. This value will remain valid until the machine is homed again or it is turned off. The tool can now be zeroed to the surface of the stock as required.

WARNING: If you do change or alter the tool height without being instructed to do so by MASSO you must home your machine again. Failing to do so will cause the 2nd tool change and all following tool change heights to be wrong causing damage to your work and machine.

When MASSO is asked to change tool using the M06 GCode command it will measure the new tool length and compare it against the original measured tool, then adjust the tool height offset accordingly.

It is therefore critical that once the tool is measured that it is not changed or it's length altered as this will give incorrect tool heights on all future tool changes.

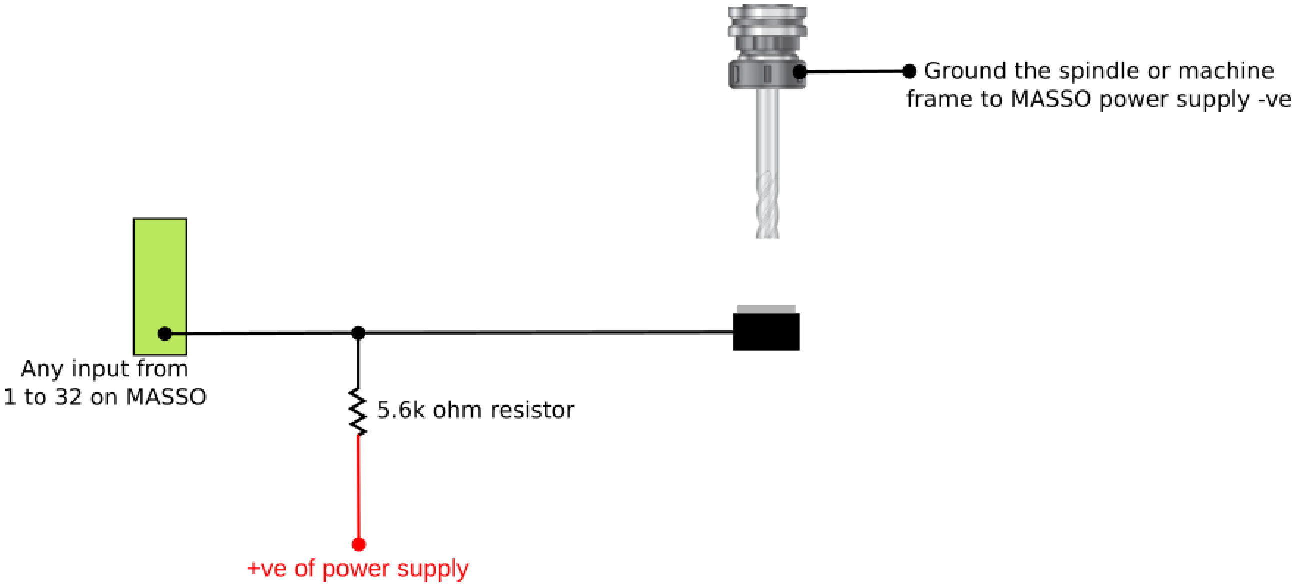
Because the Tool setter is a reference surface the height of the tool setter does not matter so long as it does not change it's height.

The tool setter should not be confused with a probing touch plate which is used to measure tool height above the surface of the material which requires the height of the probing plate to be known.

Prerequisites

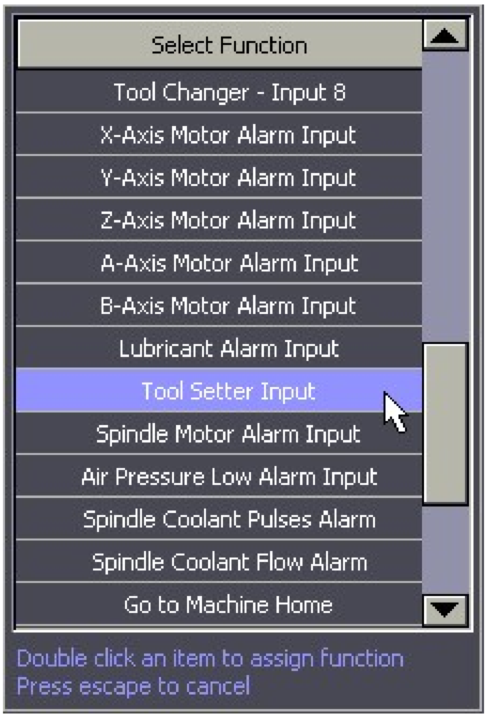
To use a tool setter you must have homing setup on you machine so that the spindle can find the tool setter.

Wiring example of a simple touch plate



Assign Tool Setter Input

- Select the input you want to use for your Tool setter input and double click
- Select Tool Setter Input from the from down box and Double click to assign



Tool Setter Logic

- The normal state for the tool setter when not active must be **LOW** as shown below or it will not work.
- If your input shows **HIGH** then highlight the input by clicking with the mouse and press the Spacebar to invert the logic to show **LOW**.

Input 1	Tool Setter Input	Yes	Low

Manual Tool Change

The Tool setter can be used with manual tool change as well as automatic tool changers.

When you manually change a tool MASSO will move to the Tool Setter and touch off. It will then automatically calculate the new tool height and continue machining having compensated for the difference in tool height.

How to Video

This video takes you through setting up a Tool setter step by step.

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, Click here to view the video

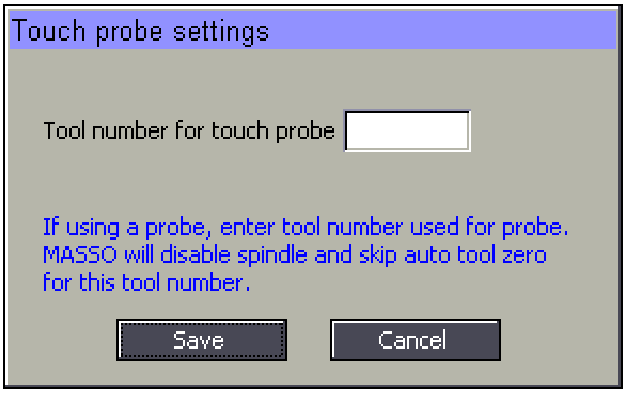
15. Automatic Tool Length Calibration

On milling machines or router where tools are manually changed and don't use tool holders, calibrating tool length can be a time consuming task. MASSO supports automatic tool length calibration feature called **Auto Tool Zero** which can be setup to automatically calibrate the length of each tool automatically after tool change.

Once setup, the user simply loads the tool into the spindle and MASSO will move the tool to the predefined tool setter location, calibrate the tool length automatically before going back to the machining position.

Touch probe to skip

INFORMATION: Touch probe to skip is available on MASSO G3 software version 3.47 and above.

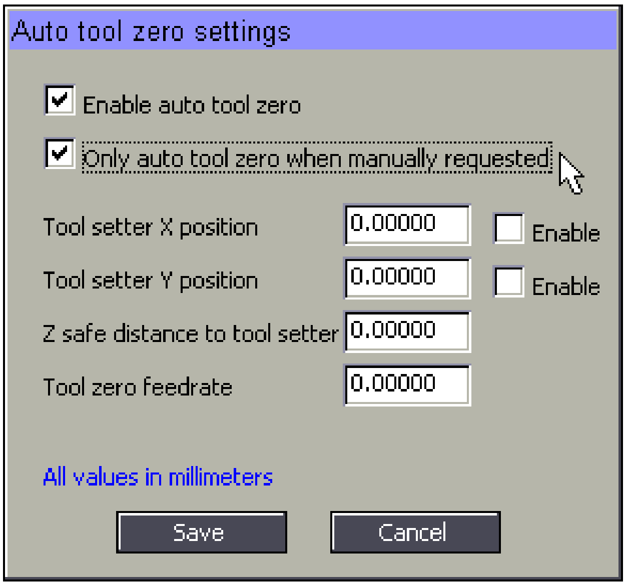


When using a touch probe, if auto tool zero is enabled, the controller will try to automatically do an auto tool zero which can damage the touch probe. If a tool number is entered in the above settings then MASSO will automatically skip auto tool zero for this tool number and the user can enter the calibrated length of the touch probe in the *F4-Tools & Work Offset* screen.

This also disables the spindle so that it cannot be accidentally turned on when the touch probe is loaded.

Only auto tool zero when manually requested

INFORMATION: Only auto tool zero when manually requested is available on MASSO G3 software version 3.47 and above.



On machines where pre-calibrated tool holders are used for changing tools, auto tool zero is not required on each tool change and only required when calibrating the tool into the tool holder.

If the above option is enabled then MASSO will not do an auto tool zero on tool change but the user can manually run the auto tool zero cycle by pressing the **"Auto Tool Zero"** button in the *F4-Tools & Work Offset* screen under the edit tool options. After pressing the **"Auto Tool Zero"** button, the system will run the auto tool cycle and the length of the tool is automatically saved into the memory.

Here is a great video from CNCnutz explaining the entire process

Scan the QR code to watch the MASSO video tutorial on YouTube

Or, [Click here to view the video]

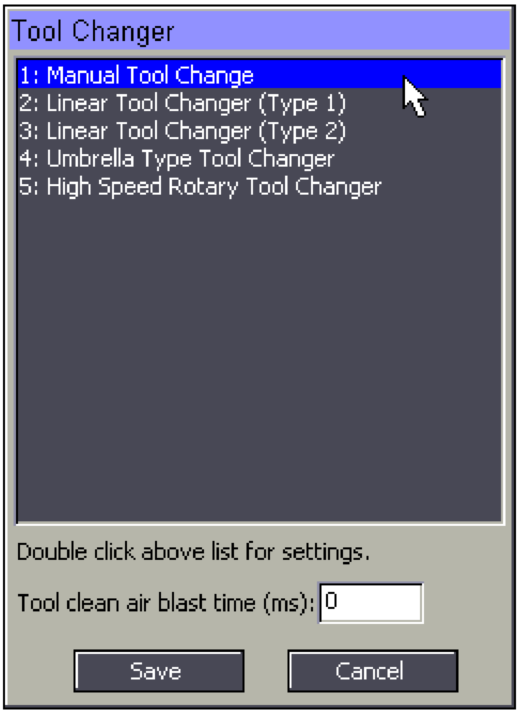
16. Tool Changers

16.1. Mill Tool Changers

16.1.1. Manual Tool Changer

Setting up manual tool changer

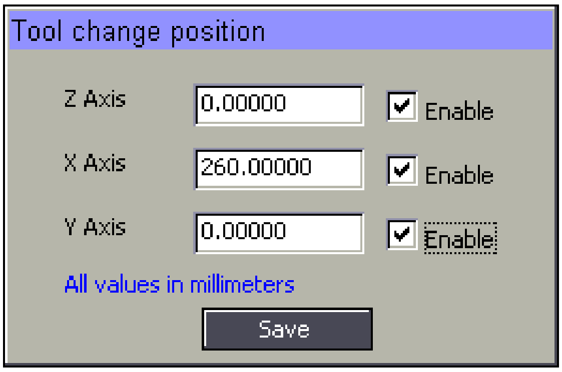
- Go to **F1-Setup** screen and open **Tool Changer** window.
- From the list select Press enter to open **Tool Changer** list and select the the **Manual Tool Change** from the list.



Setting tool change position

To be able to change tools easily, a tool change position can be set. This option is also helpful if your machine bed is very large and you want the spindle moved to a certain location for easy tool change, for example on the front of the machine every time a tool change is required.

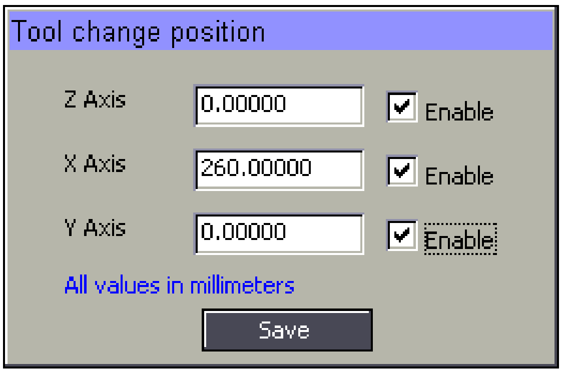
Double click the **1: Manual Tool Change** in the list and the below **Tool change position** window will open where the the axis position for a tool change can be entered.



Setting tool change position

To be able to change tools easily, a tool change position can be set. This option is also helpful if your machine bed is very large and you want the spindle moved to a certain location for easy tool change, for example on the front of the machine every time a tool change is required.

Double click the **1: Manual Tool Change** in the list and the below **Tool change position** window will open where the the axis position for a tool change can be entered.

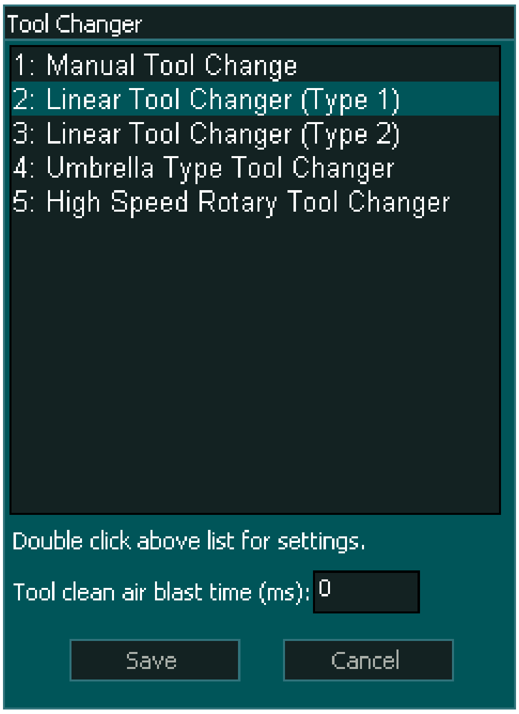


16.1.2. Linear Tool Changer (Type 1)

Two types of linear tool changer are supported with some different control logic inputs and outputs. Please see both **Type 1** and **Type 2** logic explanations and see the one that fits best to your machine requirements.

Selecting the tool changer

In the **Tool Changer window** select **Linear Tool Changer (Type 1)** and double click for settings.



Setting up the tool changer logic

INFORMATION: To set up the tool changer logic please see this page: CLICK HERE

Tool Changer Inputs and Outputs

INPUTS

1. **Tool Changer - Input 1** for **Spindle draw bar Status** *(Low for clamped and High for un-clamped)*
2. **Tool Changer - Input 2** for **Dust Hood UP OK** signal
3. **Tool Changer - Input 3** for **Dust Hood DOWN OK** signal
4. **Tool Changer - Input 4** for **Tools Tray UP OK** signal
5. **Tool Changer - Input 5** for **Tools Tray DOWN OK** signal

OUTPUTS

1. **Chuck Clamp M10/M11** for spindle **drawbar clamp and un-clamp** *(Low to clamp and High to un-clamp)*
2. **Tool Changer - Output 1** to move **Dust Hood UP**
3. **Tool Changer - Output 2** to move **Dust Hood DOWN**
4. **Tool Changer - Output 3** to move **Tools Tray UP**
5. **Tool Changer - Output 4** to move **ToolsTray DOWN**

Tool Changer logic

When a tool change command is received, the tool changer logic works in the followings steps:

1. **Spindle is turned OFF** and the system waits for the spindle to stop as per the spindle **"Spin down delay"** value in the spindle settings.
2. The system checks if the **current tool in the spindle** is setup in a slot is the **F4-Tools** screen, else gives an error.
3. The system checks if the **tool to load** is setup in a slot is the **F4-Tools** screen, else gives an error.
4. **Z-Axis moves up** to the homing position.
5. **"Tool Changer - Output 1"** goes **HIGH** to move **Dust Hood UP,** then the system waits for 6 seconds for the **"Tool Changer - Input 2" (Dust Hood UP OK)** signal to go **HIGH**, else gives an error.
6. **"Tool Changer - Output 1"** goes **LOW.**
7. **"Tool Changer - Output 3"** goes **HIGH** to move **Tools Tray UP,** then the system waits for 6 seconds for the **"Tool Changer - Input 4" (Tools Tray UP OK)** signal to go **HIGH**, else gives an error.
8. **"Tool Changer - Output 3"** goes **LOW.**
9. **X & Y-Axis moves** to tool unload position.
10. "**Chuck Clamp M10/M11"** goes **HIGH** to unclamp the tool**,** then the system waits for 6 seconds for the **"Tool Changer - Input 1" (Spindle draw bar Status)** signal to go **HIGH**, else gives an error.
11. **X & Y-Axis moves** to the new tool load position.
12. "**Chuck Clamp M10/M11"** goes **LOW** to clamp the tool**,** then the system waits for 6 seconds for the **"Tool Changer - Input 1" (Spindle draw bar Status)** signal to go **LOW**, else gives an error.
13. **Axis moves** to slide out the new tool.
14. **"Tool Changer - Output 4"** goes **HIGH** to move **Tools Tray DOWN,** then the system waits for 6 seconds for the **"Tool Changer - Input 5" (Tools Tray DOWN OK)** signal to go **HIGH**, else gives an error.
15. **"Tool Changer - Output 4"** goes **LOW.**
16. **"Tool Changer - Output 2"** goes **HIGH** to move **Dust Hood DOWN,** then the system waits for 6 seconds for the **"Tool Changer - Input 3" (Dust Hood DOWN OK)** signal to go **HIGH**, else gives an error.
17. **"Tool Changer - Output 2"** goes **LOW.**

INFORMATION: All input & output signals can be easily inverted by selecting the input or output in the list and pressing the space-bar key on the keyboard to invert the signal. These settings are automatically saved.

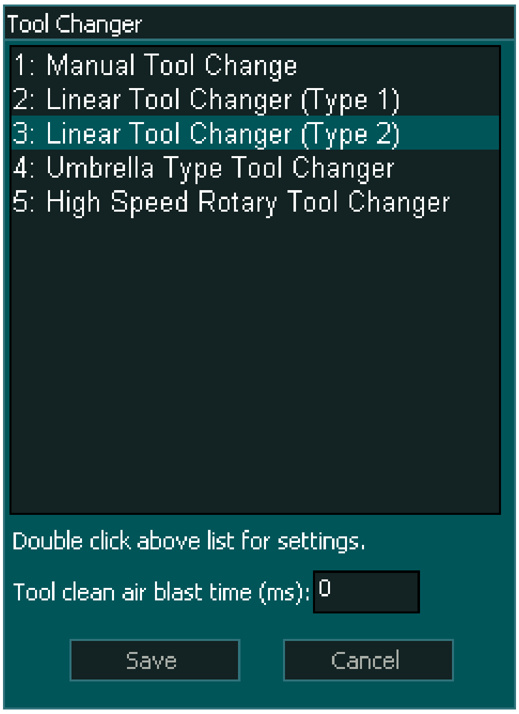
INFORMATION: Make sure to assign each tool into a tool slot in the **F4 - Tools & Work offset** screen else on a tool change command if the tool is not set in a slot you will get a tool error alarm.

16.1.3. Linear Tool Changer (Type 2)

Two types of linear tool changer are supported with some different control logic inputs and outputs. Please see both **Type 1** and **Type 2** logic explanations and see the one that fits best to your machine requirements.

Selecting the tool changer

In the **Tool Changer window** select **Linear Tool Changer (Type 2)** and double click for settings.



Setting up the tool changer logic

INFORMATION: To set up the tool changer logic please see this page: **CLICK HERE**

Tool Changer Inputs and Outputs

INPUTS

- **Tool Changer – Input 1** for **Spindle drawbar Status** (Low for clamped and High for un-clamped)
- **Tool Changer – Input 2** for **Tool in place Status** (Alarm when Low)
- **Tool Changer – Input 3** for **Dust Hood UP OK** signal (High means hood UP)

OUTPUTS

- **Chuck Clamp M10/M11** for **spindle drawbar clamp and un-clamp** (Low to clamp and High to un-clamp)
- **Tool Changer – Output 1** to move **Dust Hood UP/DOWN** (When HIGH the hood will move UP)
- **Tool Changer – Output 2** for **air return** (Will stay high for 6 seconds after tool change)

INFORMATION: From MASSO software v3.48, if **"Tool Changer - Output 2"** is not assigned as an output in **F1-Setup** screen then the 6 second delay is automatically ignored by the logic.

Tool Changer logic

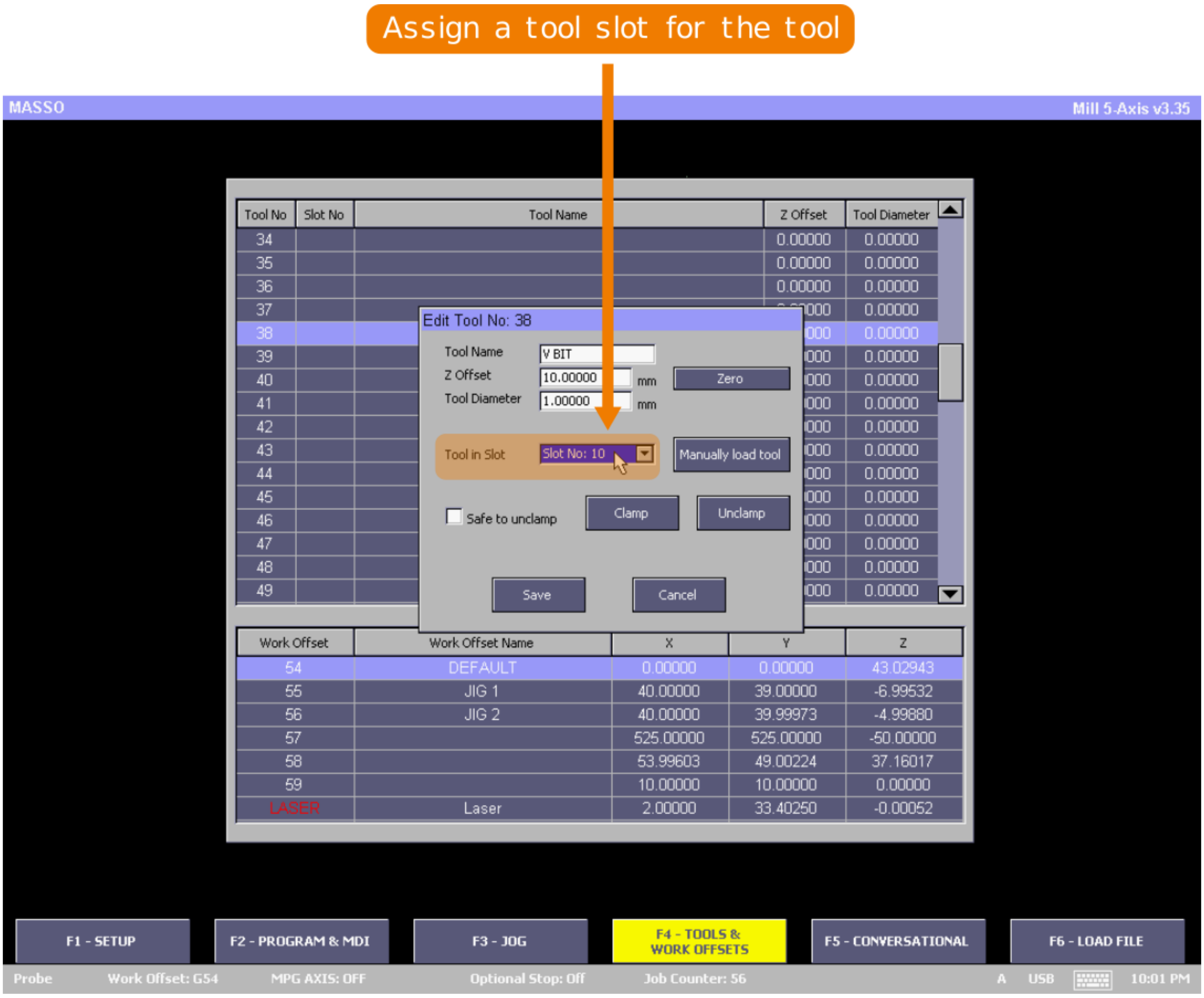
When a tool change command is received, the tool changer logic works in the followings steps:

1. **Spindle is turned OFF** and system waits for the spindle to stop as per the spindle **"Spin down delay"** value in the spindle settings.
2. System checks if the **current tool in the spindle** is setup in a slot is the **F4-Tools** screen, else gives an error.
3. System checks if the **tool to load** is setup in a slot is the **F4-Tools** screen, else gives an error.
4. **Z Axis moves up** to the homing position.
5. **"Tool Changer - Output 1"** goes **HIGH** to move **Dust Hood UP,** then system waits for 6 seconds for the **"Tool Changer - Input 3" (Dust Hood UP OK)** signal to go **HIGH**, else gives an error.
6. **X & Y Axis moves** to tool unload position.
7. **Z Axis moves down** to the tool unload position.
8. "**Chuck Clamp M10/M11"** goes **HIGH** to unclamp the tool**,** then system waits for 6 seconds for the **"Tool Changer - Input 1" (Spindle draw bar Status)** signal to go **HIGH**, else gives an error.
9. **Z Axis moves up** to the tool unload clearance position.
10. **X & Y Axis moves** to new tool load position.
11. **Z Axis moves down** to the tool load position.
12. "**Chuck Clamp M10/M11"** goes **LOW** to clamp the tool**,** then system waits for 6 seconds for the **"Tool Changer - Input 1" (Spindle draw bar Status)** signal to go **LOW**, else gives an error.
13. **Axis moves** to slide out the new tool.
14. **Z Axis moves up** to the homing position.
15. **"Tool Changer - Output 1"** goes **LOW** to move **Dust Hood DOWN,** then system waits for 6 seconds for the **"Tool Changer - Input 3" (Dust Hood UP OK)** signal to go **LOW**, else gives an error.
16. **"Tool Changer - Output 2"** goes **HIGH** for 6 seconds (For spindles with air return requirement).

INFORMATION: From MASSO software v3.48, if **"Tool Changer - Output 2"** is not assigned as an output in **F1-Setup** screen then the 6 second delay is automatically ignored by the logic.

INFORMATION: All input & output signals can be easily inverted by selecting the input or output in the list and pressing the space-bar key on the keyboard to invert the signal. These settings are automatically saved.

INFORMATION: Make sure to assign each tool into a tool slot in the **F4 - Tools & Work offset** screen else on a tool change command if the tool is not set in a slot you will get a tool error alarm.


Assign a tool slot for the tool
MASSO
Mill 5-Axis v3.35
Edit Tool No: 38
Tool Name
V BIT
Z Offset
10.00000
Tool Diameter
1.00000
Zero
Tool in Slot
Slot No: 10
Manually load tool
Safe to unclamp
Clamp
Unclamp
Save
Cancel
F1 - SETUP
F2 - PROGRAM & MDI
F3 - JOG
F4 - TOOLS & WORK OFFSETS
F5 - CONVERSATIONAL
F6 - LOAD FILE
Probe
Work Offset: G54
MPG AXIS: OFF
Optional Stop: Off
Job Counter: 56
USB
10:01 PM

16.1.4. Linear Tool Changer configuration

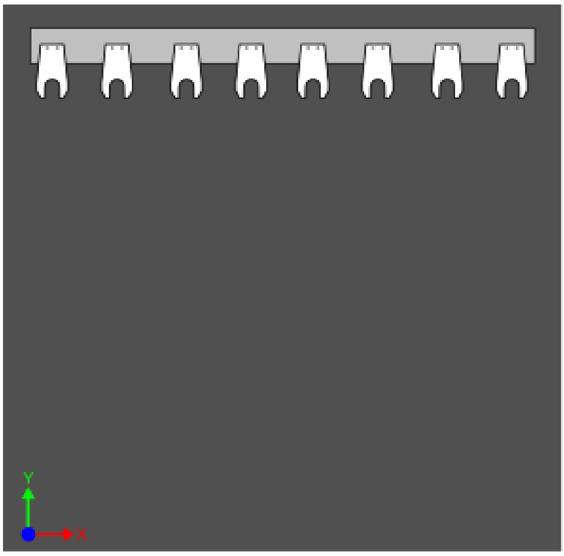
INFORMATION: This tool changer logic is only available on **MASSO G3** controllers running software version **4.02** and above.

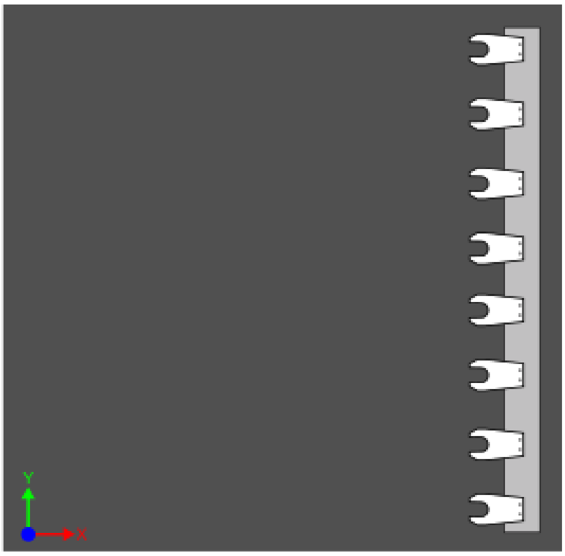
WARNING: Please exercise great care when setting the tool changer parameters as incorrect settings may produce strange results and cause damage to your tool changer. If you are at all unsure about your settings you may find it useful to use feed rate override to slow the machine down while you are setting it up. Feed override

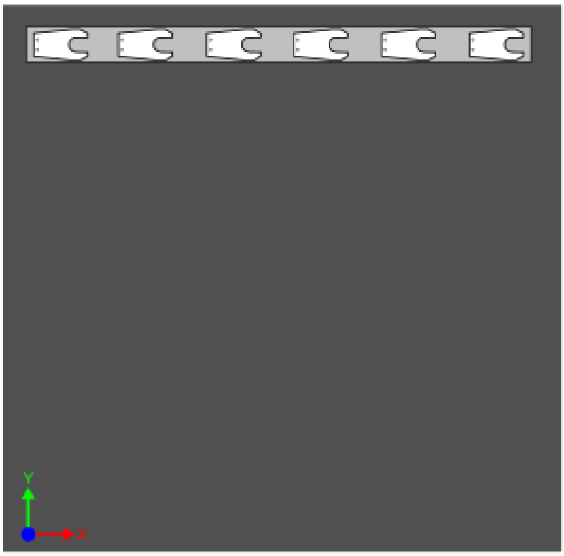
Introduction

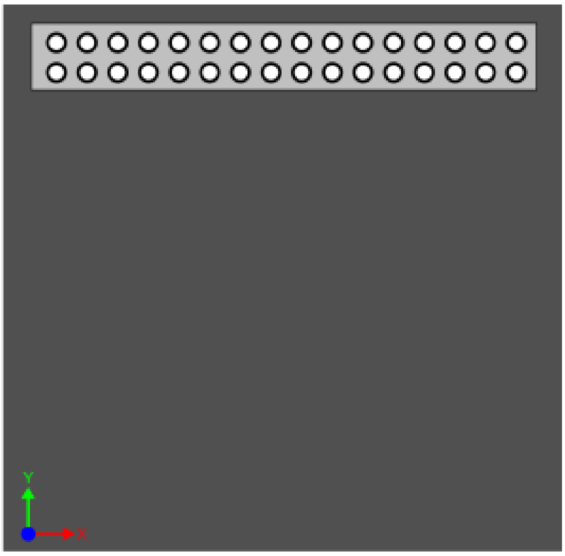
The linear tool changer logic allows multiple types of linear tool changer setups to be easily configured. Each tool can be positioned independently giving the user the option to have tools in single or multiple rows.

Below are some common examples:


Tool holders mounted along the X - Axis


Tool holders mounted along the Y - Axis


Tool holders mounted along the X - Axis with sliders turned 90 deg


Tool holders with multiple rows

Setup process

The below window shows all the parameters that are required to set up the tool changer logic.

Assigning the number of slots

- The Linear tool changer allows for up to 30 tool slots to be assigned. When you first open the Linear Tool Changer page you will see 4 slots displayed.
- To increase or decrease the number of slots displayed for your tool changer use the up and down arrows beside the **Number of slots:** box to change the value.

Tool Change Feedrate

- This parameter defines the feed rate that is used to slide a tool into and out of a tool holder.
- The feed rate is defined in the native unit of measurement, either metric or imperial that you have set under general settings in the F1 Screen.
- The Distance that a tool slides in and out is defined by the **Tool Change offset**.
- All other movements are performed at rapid speeds.

Tool holder Z clearance

- This parameter defines the position that the Z axis will move to when it has dropped the old tool into its slot and is traveling to the new slot to pick up the new tool.
- The Z clearance height is a machine coordinate.
- Travel between tools will be at rapid speed.
- Travel will take the most direct route to the next tool to be picked up and may travel across the top of other tool holders.

Pick & place Z Position

- This parameter defines the height of the Z axis as a tool slides into or out of a tool holder.
- This parameter defines the height the Z axis descends to when picking up or dropping off a tool in a pick and place tool changer.
- The Z position height is defined as a machine coordinate.
- The Z-axis moves at rapid speed when rising up from or dropping onto a tool.

Tool Clearance Offset

- This parameter defines where the spindle will move to begin the tool change process.
- The position is defined by X & Y coordinates and these are relative coordinate values that will be added to the slot position coordinate value.
- You can use positive or negative values to determine which side of the tool holder you approach from.
- The values are defined in the native unit of measurement, either metric or imperial that you have set under general settings in the F1 Screen.
- Once the spindle has moved to the Tool clearance offset position it will rapid toward the **Tool change offset** position
- The Tool clearance offset is only used at the start of the tool change process before dropping off the old tool.

Tool change offset

- This parameter defines the position where the spindle will begin the slide into or out of the tool slot.
- The feed rate used for the slide in the process is defined by the **Tool Change feed rate** parameter
- On a sliding tool change usually only one of the position values will be used and the other is left at 0. If both X & Y positions have defined values the tool will enter the slot at an angle.
- On a Pick and place tool changer this parameter must be set to X0, Y0.
- The position is defined by X & Y coordinates and these are relative coordinate values that will be

added to the slot position coordinate value.
- You can use positive or negative values to determine which side of the tool holder you approach from.
- The values are defined in the native unit of measurement, either metric or imperial that you have set under general settings in the F1 Screen.

Defining the Tool Position

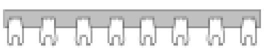
- The Center of each slot is defined by the Slot #: X, Y position parameter box.
- These coordinates are used to define the tool position and are Machine coordinates.
- The values are defined in the native unit of measurement, either metric or imperial that you have set under general settings in the F1 Screen.
- Because each tool holder's position is defined by both an X & Y coordinate you can place the tools anywhere on the table.
- When using a Pick and place tool holder you can define multiple rows of tools.

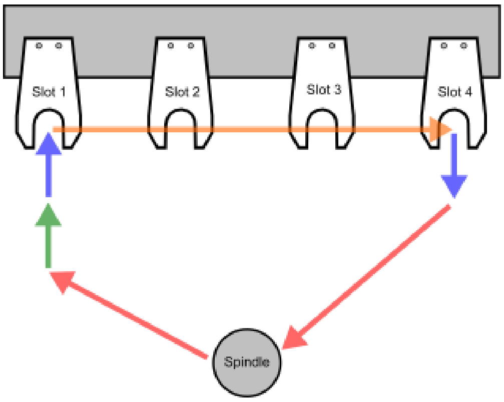
INFORMATION: Tool slot coordinates can be located outside of the machine's soft limits.

Coordinate Calculations

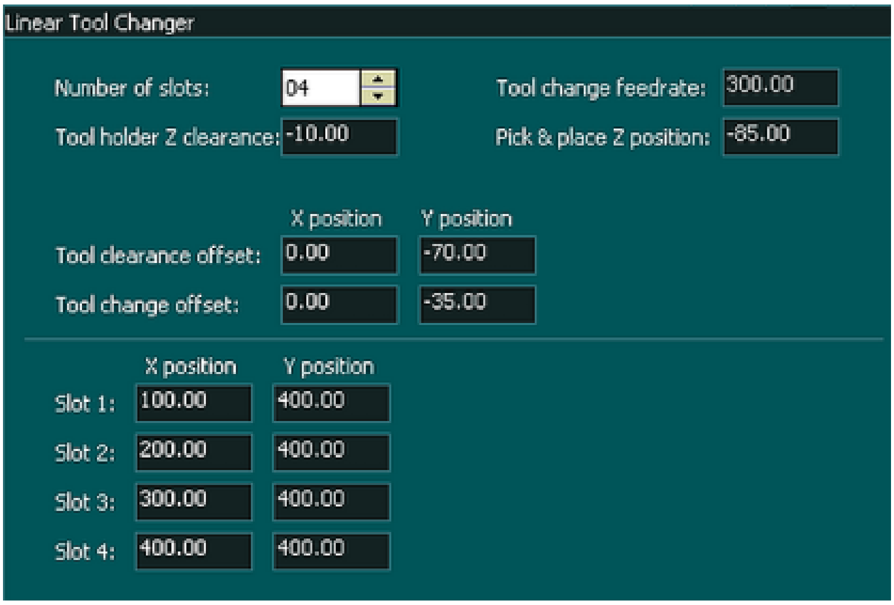
Calculate coordinate positions as follows:

- **Tool clearance offset coordinate X, Y =** Slot position X **+** Tool clearance offset position X**,** Slot position Y **+** Tool clearance offset position Y
- **Tool change offset coordinate X, Y =** Slot position X **+** Tool change offset position X**,** Slot position Y **+** Tool change offset position Y

Example: 1 

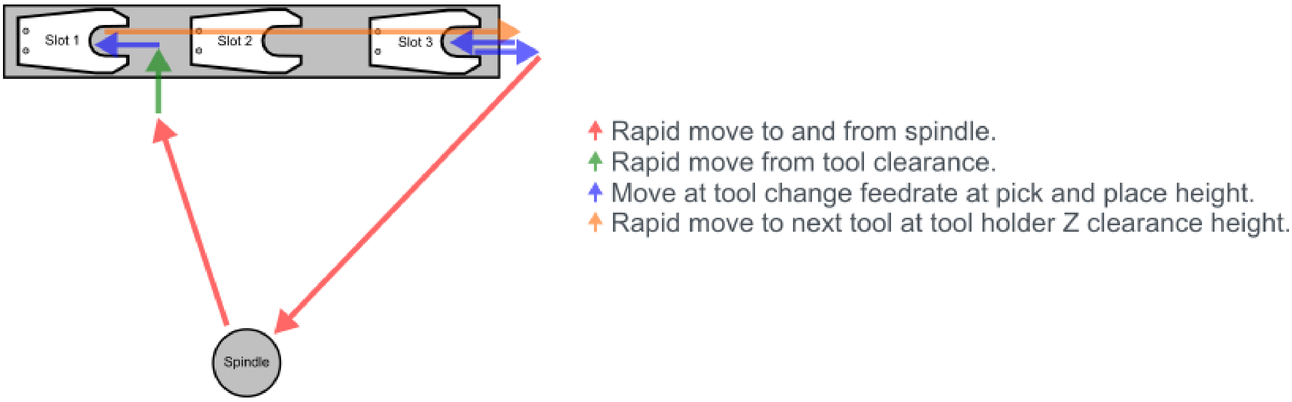


- Rapid move to and from spindle.
- Rapid move from tool clearance.
- Move at tool change feedrate at pick and place height.
- Rapid move to next tool at tool holder Z clearance height.

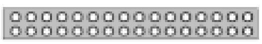


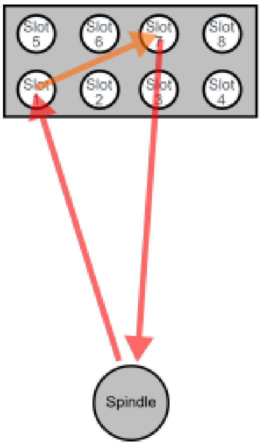
- In the following example Tool 1 is in Slot1 and Tool 2 is in Slot 3
- Current tool loaded Tool 1
- Gcode T2 M06
- Spindle rapids to Machine coordinate X100 Y330 (Tool clearance offset coordinate)
- Rapid move to Machine coordinate X100 Y365 (Tool Change offset coordinate)
- Move at feed rate 300mm/m at a Machine coordinate Z height of Z-85 to X100 Y400 (Slot 1 Coordinate)
- Chuck clamp released and Z rises to Machine coordinate Z-10
- Rapid move to X300 Y400 (Slot 3 Coordinate)
- Z descends to Z-85 and chuck clamp locks
- Move at feed rate 300mm/m at a Machine coordinate Z height of Z-85 to X300 Y365 (Tool Change offset coordinate)
- Z-axis ascends maximum height and rapids to original spindle position
- Machining resumes.

Example: 2

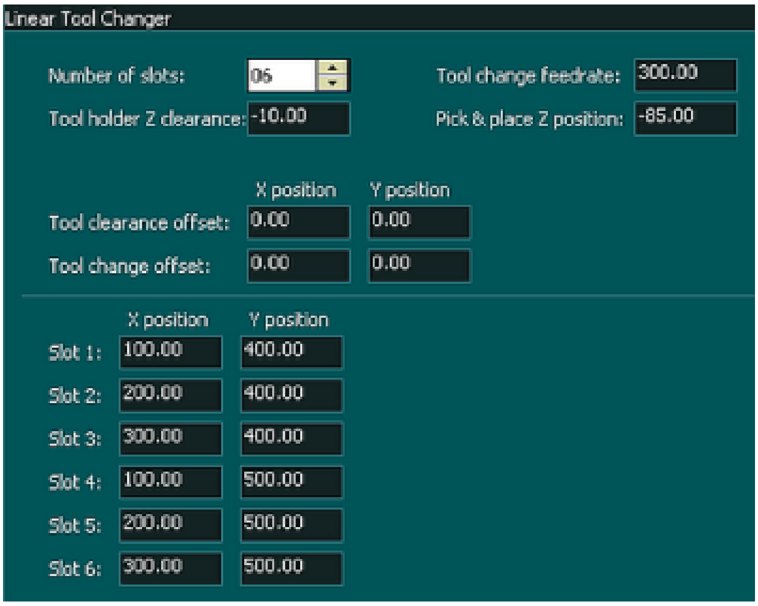


- In the following example Tool 1 is in Slot 1 and Tool 2 is in Slot 3
- Current tool loaded Tool 1
- Gcode T2 M06
- Spindle rapids to Machine coordinate X135 Y325 (Tool clearance offset coordinate)
- Rapid move to Machine coordinate X135 Y400 (Tool Change offset coordinate)
- Move at feed rate 300mm/m at a Machine coordinate Z height of Z-85 to X100 Y400 (Slot 1 Coordinate)
- Chuck clamp released and Z rises to Machine coordinate Z-10
- Rapid move to X300 Y400 (Slot 3 Coordinate)
- Z descends to Z-85 and chuck clamp locks
- Move at feed rate 300mm/m at a Machine coordinate Z height of Z-85 to X335 Y400 (Tool Change offset coordinate)
- Z-axis ascends maximum height and rapids to original spindle position
- Machining resumes.

Example: 3 

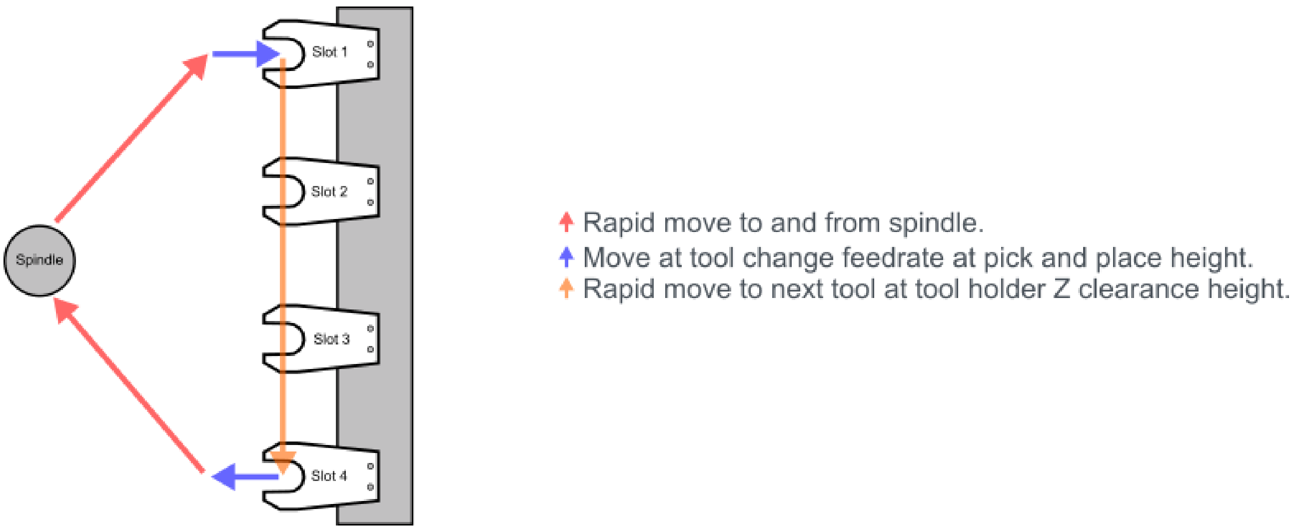


Rapid move to and from spindle.
Rapid move to next tool at tool holder Z clearance height.



- In the following example Tool 1 is in Slot 1 and Tool 2 is in Slot 7
- Current tool loaded Tool 1
- Gcode T2 M06
- Spindle rapids to Machine coordinate X100 Y400 at Z maximum Z height (Tool slot1)
- Tool moves down to Z-85 and Chuck clamp releases tool (Pick & place Z position)
- Chuck clamp released and Z rises to Machine coordinate Z-10 (Tool Holder Z clearance)
- Rapid move to X300 Y500 (Slot 7 Coordinate)
- Z descends to Z-85 and chuck clamp locks tool in the spindle
- Z-axis ascends maximum height and rapids to original spindle position
- Machining resumes.

Example: 4



- In the following example Tool 1 is in Slot 1 and Tool 2 is in Slot 4
- Current tool loaded Tool 1
- Gcode T2 M06
- Spindle rapids to Machine coordinate X365 Y400 (Tool clearance / Tool change offset coordinate)
- Because the Tool clearance offset and the Tool change offset are in the same position the next move is the Tool change
- Move at feed rate 300mm/m at a Machine coordinate Z height of Z-85 to X400 Y400 (Slot 1 Coordinate)
- Chuck clamp released and Z rises to Machine coordinate Z-10
- Rapid move to X400 Y200 (Slot 4 Coordinate)
- Z descends to Z-85 and chuck clamp locks
- Move at feed rate 300mm/m at a Machine coordinate Z height of Z-85 to X365 Y200 (Tool Change offset coordinate)
- Z-axis ascends maximum height and rapids to original spindle position

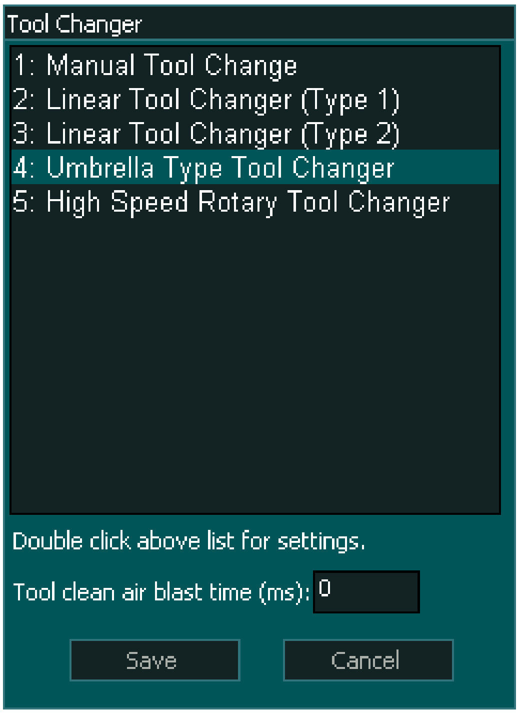
- Machining resumes.

16.1.5. Umbrella Tool Changer

WARNING: The below instructions are for MASSO G3 controllers running software v4.02 and above. For any other software version, the below instructions **CAN NOT** be used, please contact support if you have any other software version with umbrella tool changer.

Selecting the tool changer

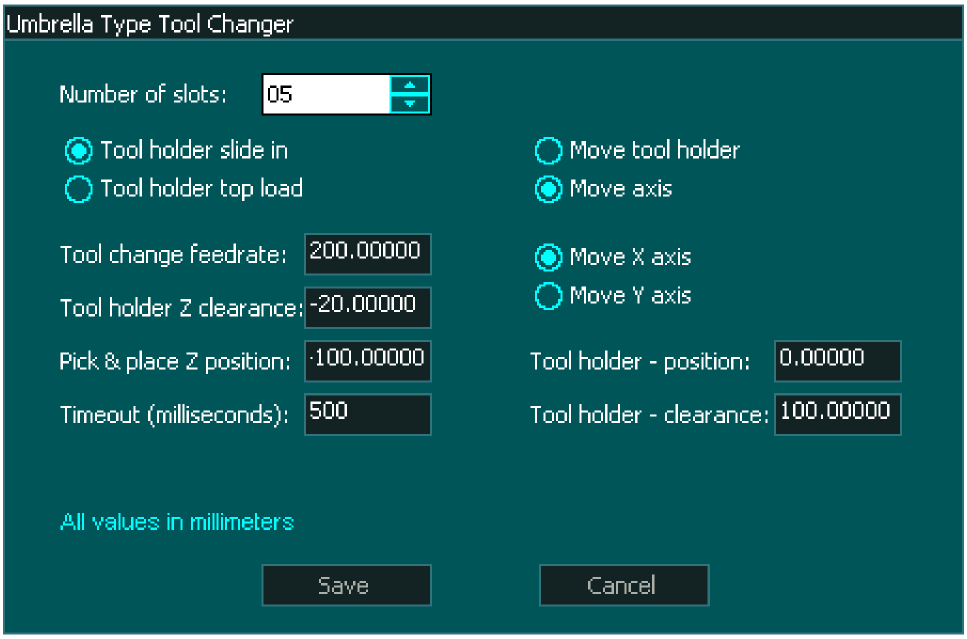
In the Tool Changer window select the tool changer and double click for settings.



Setting up the tool changer as per your machine

There are different types of umbrella tool changer setups depending on the tool changer design. In most cases, an external arm moves the tools into position for tool unloading and loading, but in some designs, the machine's axis is used to position the spindle above the tool change position.

MASSO umbrella tool changer logic provides options to easily set up tool changer logic as per your machine requirements.



Settings 1 - Tool holder sliding or top-loading type

- If the machine requires the tool holder to slide in/out from the side, then select the **"Tool holder slide in"** option.
- If the machine requires the tool holder to be loaded from the top, then select the **"Tool holder top load"** option.

Settings 2 - Tool holder moving under spindle or spindle moved using axis

- If the machine requires the tools to be moved under the spindle using an external arm, then select the **"Move tool holder"** option.
- If the machine requires the X or Y axis to move the spindle to the tool change position, then select the **"Move axis"** option.

"Move axis" option

If the **"Move Axis"** option is used then the following settings are required:

- Select the machine axis X or Y that will be used to position the spindle for tool change.
- **Tool holder - position:** The X or Y axis machine coordinates to position the tool holder in the center of the spindle.
- **Tool holder - clearance:** The X or Y axis machine coordinates to position the tool holder away from the tool holder clamp.

Tool Changer Inputs and Outputs

WARNING: The below input and output pins are for MASSO G3 controllers running software v4.02 and above. For any other software version, the below instructions **CAN NOT** be used, please contact support if you have any other software version with umbrella tool changer.

INPUTS

- **Tool Changer – Input 1** for **Homing Sensor** *(to be used to find Slot-1 position when the machine is homed)*
- **Tool Changer – Input 2** for **Pulse Counter Sensor** *(this pulse signal is required as each tool passes the sensor)*
- **Tool Changer – Input 3** for **Dust Hood UP OK** signal (High means hood UP)
- **Tool Changer – Input 4** for **Tools Retract OK** *(signal from sensor or switch telling the system that the tools are retracted away from the spindle)*
- **Tool Changer – Input 5** for **Tools In Position OK** *(signal from a sensor or switch telling the system that the tools fully extended and at loading position)*
- **Tool Changer – Input 6** for **Spindle in INDEX position** *(signal from VFD, telling the system that the spindle is Indexed and locked in position)*
- **Tool Changer – Input 7** for **Drawbar Locked** *(signal from sensor or switch telling the system that drawbar is in the locked position)*
- **Tool Changer – Input 8** for **Drawbar Unlocked** *(signal from sensor or switch telling the system that drawbar is in unlocked position)*

OUTPUTS

- **Chuck Clamp M10/M11** for spindle **drawbar clamp and un-clamp** *(Low to clamp and High to un-clamp)*
- **Tool Changer – Output 1** to move **Dust Hood UP/DOWN** (When HIGH the hood will move UP)
- **Tool Changer – Output 2** to **Rotate Tools Tray**
- **Tool Changer – Output 3** when **LOW** will **Retract Tools (away from spindle)** and when **HIGH** will **Bring Tools In Position (for tool change)**
- **Tool Changer – Output 4** when **HIGH** will give a signal to VFD to **Start JOGGING the spindle at very low RPM.**
- **Tool Changer – Output 5** when **HIGH** will give a signal to VFD to **Automatically stop and lock in INDEX position.**

Tool Changer logic

During machine homing:

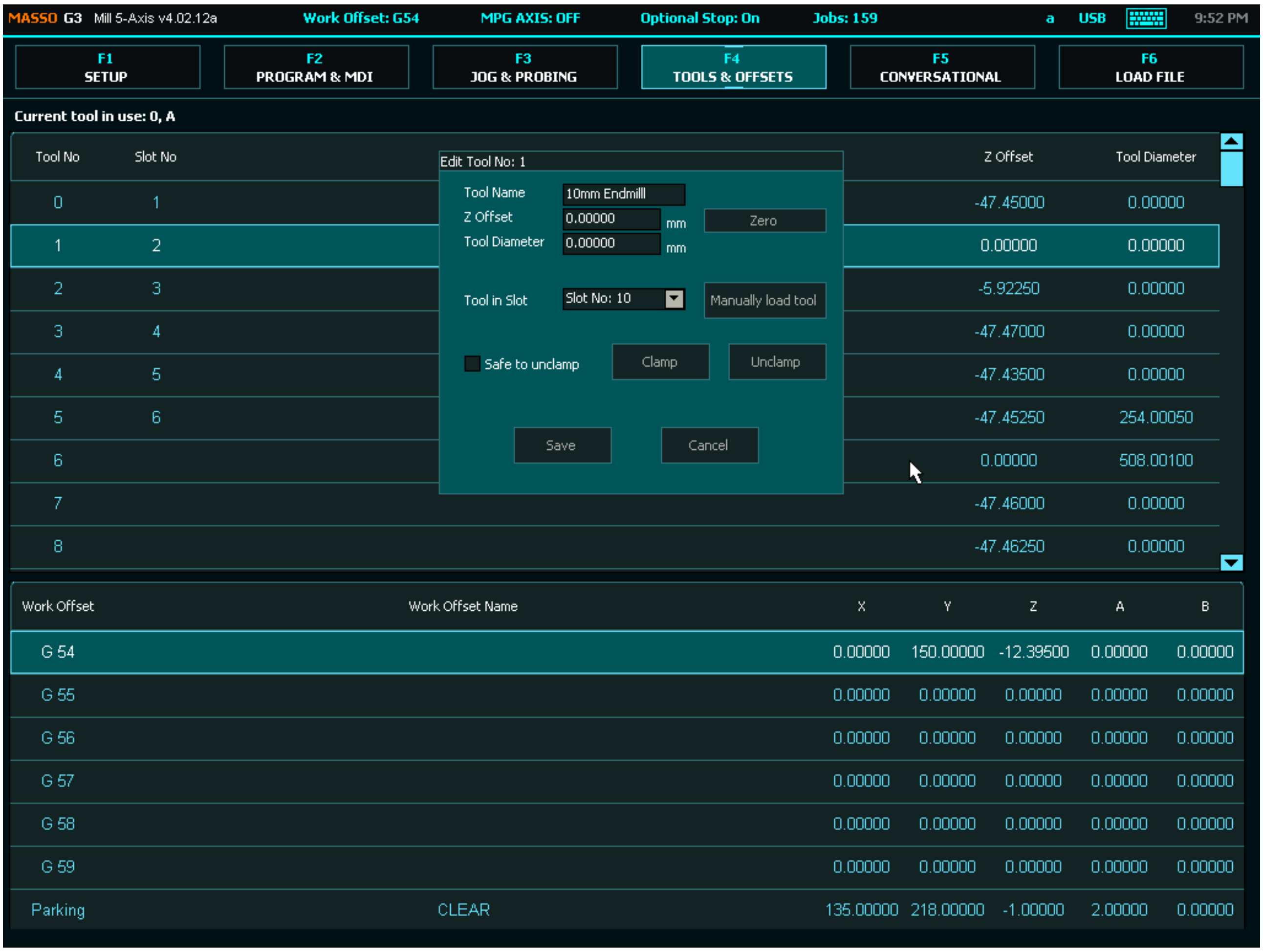
1. After all the axis of the machine has been homed as per the homing sequence the tool changer logic will home the tool changer.
2. The **tools will be retracted** and the system will wait as per the timeout period set up in the **Umbrella Toll Changer Settings.**
3. Once retraced the tools will rotate until the homing sensor on the tools is not activated.
4. Then the system will automatically rotate the tool to the last loaded position (empty tool slot).
5. **IMPORTANT:** The home position of the tool changer must be marked as Slot "1".

When a tool change command is received, the tool changer logic works in the followings steps:

1. **The spindle is turned OFF** and the system waits for the spindle to stop as per the spindle **"Spin down delay"** value in the spindle settings.
2. The system checks if the **current tool in the spindle** is set up in a slot is the **F4-Tools** screen, else gives an error.
3. The system checks if the **tool to load** is set up in a slot is the **F4-Tools** screen, else gives an error.
4. **Z-Axis moves UP** to the Tool **Pick & Place Z position.**
5. If spindle indexing is required and "**Tool Changer - Input 6 (Spindle in INDEX position)"** is assigned to one of the MASSO inputs then:
6. **Tool Changer - Output 4** goes **HIGH** for VFD to **Start JOGGING the spindle at a very low RPM.**
7. **Tool Changer - Output 5** goes **HIGH** for VFD to **Automatically stop and lock in INDEX position.**
8. The system waits for the **"Tool Changer - Input 6 (Spindle in INDEX position)"** to go **HIGH.**
9. **"Tool Changer - Output 3"** goes **HIGH** to move **Tools In Position** to unload the current tool. The system waits for time setup in **Timeout** settings for the **"Tool Changer - Input 5" (Tools In Position)** signal to go **HIGH**, else gives an error.
10. "**Chuck Clamp M10/M11"** goes **HIGH** to unclamp the tool**.**
11. If spindle "**Drawbar Locked & Unlocked"** signals are assigned to any of the MASSO inputs then:
12. The system waits for the **"Tool Changer - Input 7 (Drawbar Locked)"** to go **LOW.**
13. And waits for the **"Tool Changer - Input 8 (Drawbar unlocked)"** to go **HIGH.**
14. **Z-Axis moves up** to the **Tool holder Z clearance** position.
15. **"Tool Changer - Output 2"** goes **HIGH** to **Rotate Tools** and counts pulses from**"Tool Changer - Input 2"**.
16. Once the desired tool is in position the **"Tool Changer - Output 2"** goes **LOW** to stop tool tray rotation.
17. **Z-Axis moves DOWN** to the Tool **Pick & Place Z position.**
18. "**Chuck Clamp M10/M11"** goes **LOW** to clamp the tool.
19. If spindle "**Drawbar Locked & Unlocked"** signals are assigned to any of the MASSO inputs then:
20. The system waits for the **"Tool Changer - Input 7 (Drawbar Locked)"** to go **HIGH.**
21. And waits for the **"Tool Changer - Input 8 (Drawbar unlocked)"** to go **LOW.**
22. **"Tool Changer - Output 3"** goes **LOW** to **Retract the tools** away from the spindle. The system waits for time setup in **Timeout** settings for the **"Tool Changer - Input 4" (Tools In Position)** signal to go **HIGH**, else gives an error.

INFORMATION: All input & output signals can be easily inverted by selecting the input or output in the list and pressing the space-bar key on the keyboard to invert the signal. These settings are automatically saved.

INFORMATION: Make sure to assign each tool into a tool slot in the **F4 - Tools & Work offset** screen else on a tool change command if the tool is not set in a slot you will get a tool error alarm.

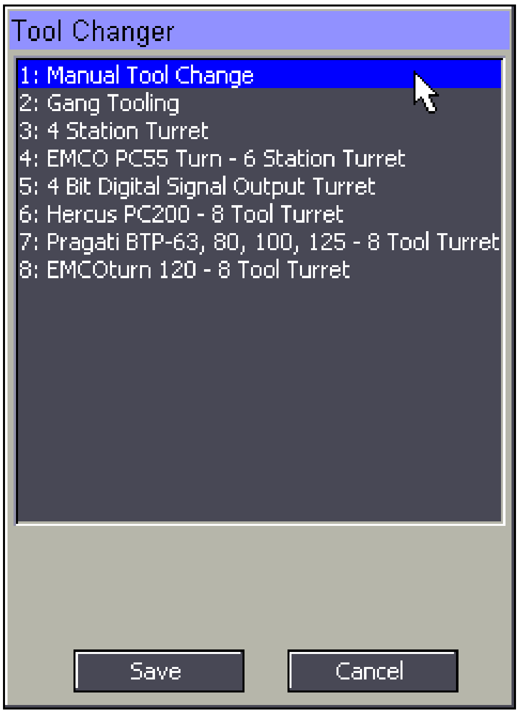


16.2. Lathe Tool Changers

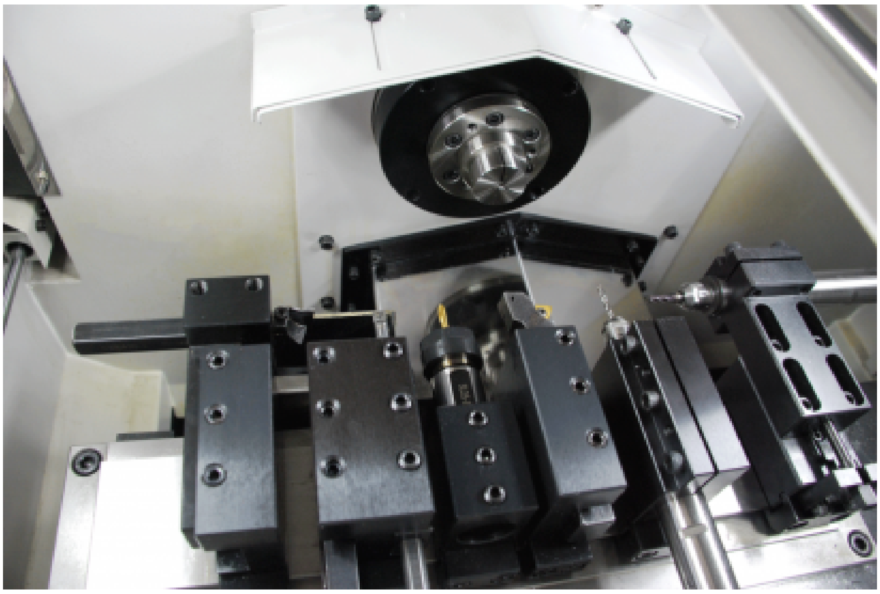
16.2.1. Manual Tool Change

Setting up the tool changer

- Go to **F1-Setup** screen and open **Tool Changer** window.
- From the list select Press enter to open **Tool Changer** list and select the the **Manual Tool Change** from the list.

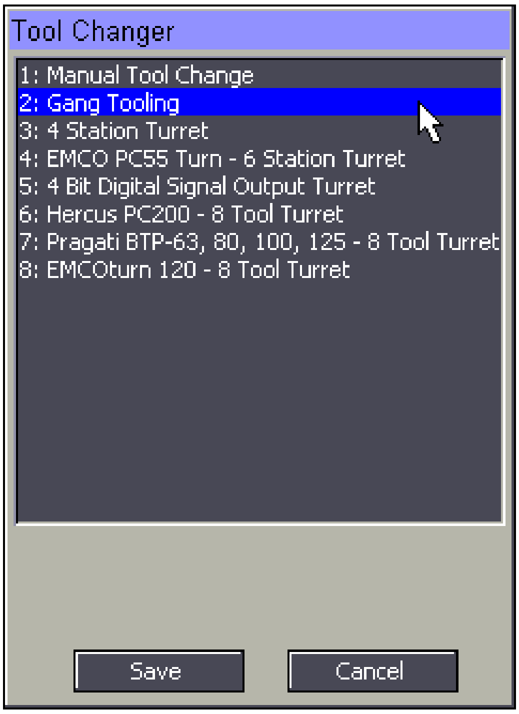


16.2.2. Linear - Gang Type Setup



Setting up the tool changer

- Go to **F1-Setup** screen and open **Tool Changer** window.
- From the list select Press enter to open **Tool Changer** list and select the the **Gang Tooling** from the list.

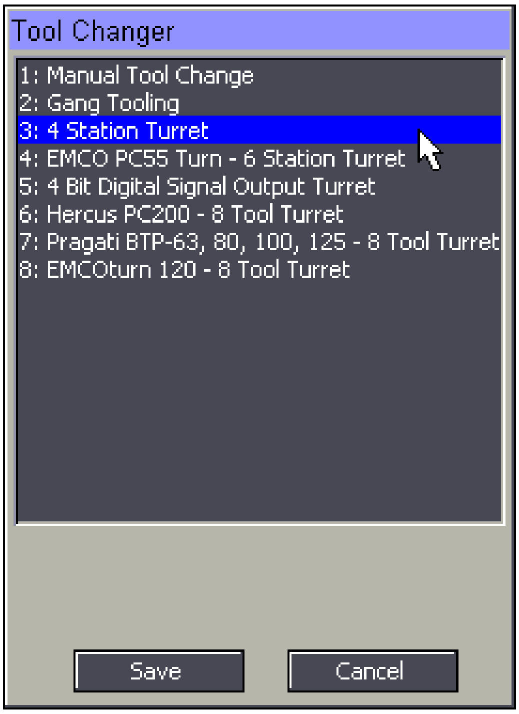


16.2.3. 4 Station Turret

The 4 station type turret outputs the turret tool position to corresponding 4 signals going high representing the tool in position.

Setting up the tool changer

- Go to **F1-Setup** screen and open **Tool Changer** window.
- From the list select Press enter to open **Tool Changer** list and select the the **4 Station Turret** from the list.

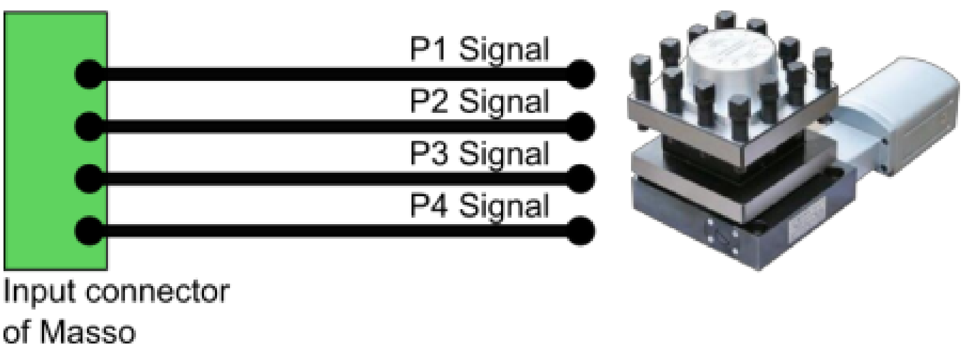


Tool changer logic

On a tool change request, MASSO will make the **Tool Changer - Output 1 HIGH** to turn the tool changer head clockwise till the desired tool has been loaded in position. Once the tool is in position t**he Tool Changer - Output 1** becomes **LOW** and **Tool Changer - Output 2** goes **HIGH** to turn the tool changer head counterclockwise for 400ms to lock the tool in position.

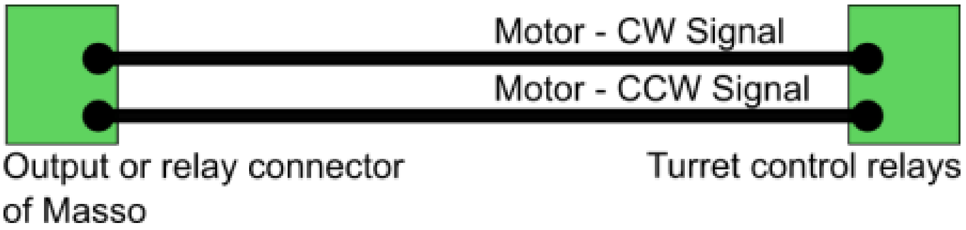
Input Signals

Wire the **P1, P2, P3 & P4** signals to any free inputs on MASSO and in the **INPUTS** list assign them to **Tool Changer - Input 1** to **Tool Changer - Input 4.**



Output Signals

Wire the turrets control electronics **CW** and **CCW** signals on any free outputs on MASSO and in the **OUTPUTS** list assign them to the **CW** signal to **Tool Changer - Output 1** and **CCW** signal to **Tool Changer - Output 2.**

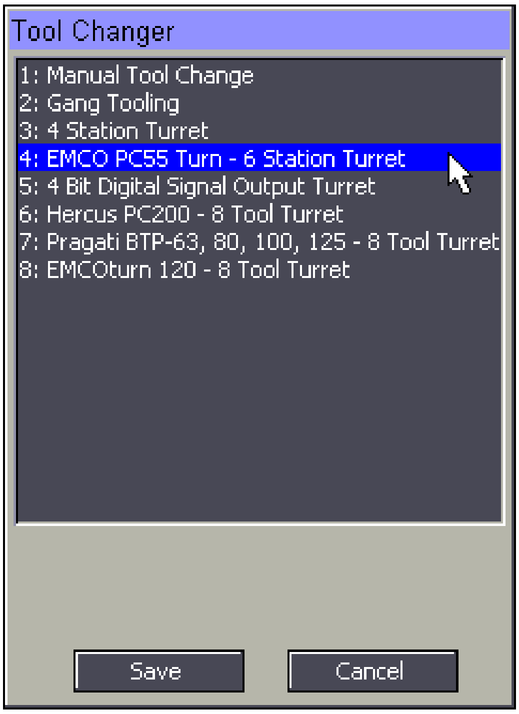


16.2.4. EMCO PC55 Turn

This 6 station turret outputs two control signals. The first signal is the home position signal which tells the system that the first tool is in position. The second signal is the pulse signal, this signal pluses once on each tool change and is used to count tool number position as the turret turns.

Setting up the tool changer

- Go to **F1-Setup** screen and open **Tool Changer** window.
- From the list select Press enter to open **Tool Changer** list and select the the **EMCO PC55 Turn - 6 Station Turret** from the list.



Tool changer logic

On a tool change request, MASSO will make the **Tool Changer - Output 1 HIGH** to turn the tool changer head clockwise till the desired tool has been loaded in position. Once the tool is in position t**he Tool Changer - Output 1** becomes **LOW**.

Input Signals

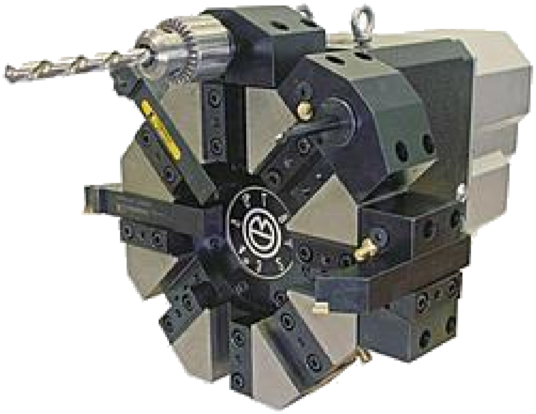
Wire the sensor inputs and assign to MASSO as below:

- **Tool Changer - Input 1** for **Turret home signal.**
- **Tool Changer - Input 2** for **Tool change pulse signal.**

Output Signals

Wire the turrets control electronics **CW** signals on any free output on MASSO and in the **OUTPUTS** list assign it to **Tool Changer - Output 1.**

16.2.5. 4 Bit Digital Signal Output Turret

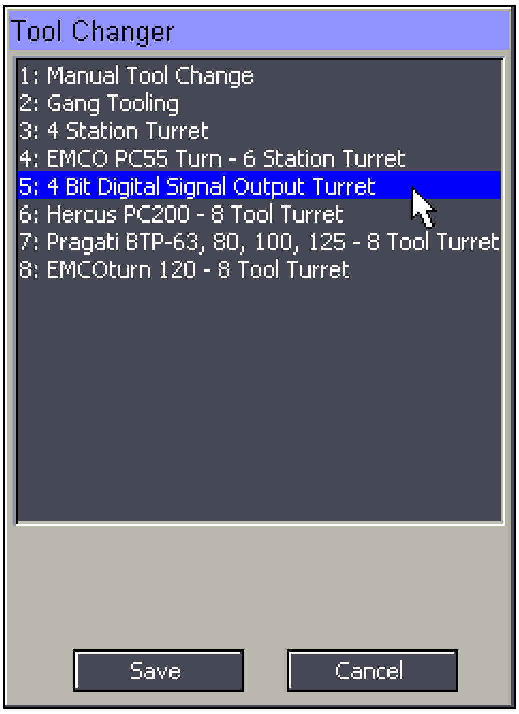


The 4 bit output type turret outputs the turret tool position in a 4 bit binary output as below:

- Tool 0 signal - Binary 0001
- Tool 1 signal - Binary 0010
- Tool 2 signal - Binary 0011
- Tool 3 signal - Binary 0100
- and so on...

Setting up the tool changer

- Go to **F1-Setup** screen and open **Tool Changer** window.
- From the list select Press enter to open **Tool Changer** list and select the **4 Bit digital Signal Output Turret** from the list.

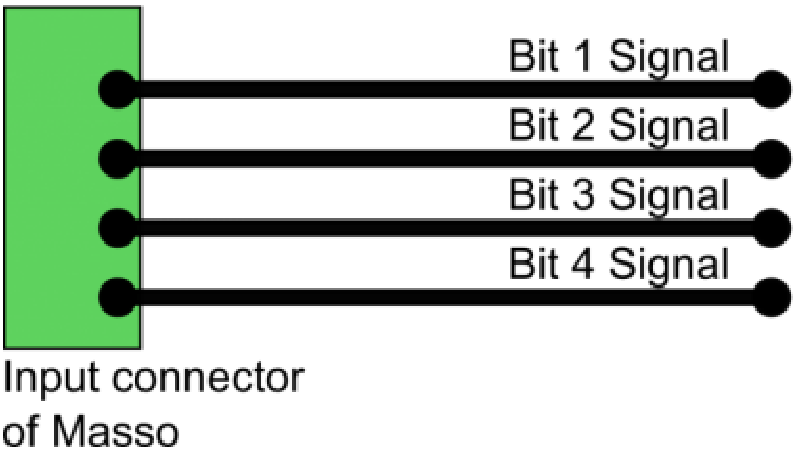


Tool changer logic

On a tool change request, MASSO will make the **Tool Changer - Output 1 HIGH** to turn the tool changer head clockwise till the desired tool has been loaded in position. Once the tool is in position the **Tool Changer - Output 1** becomes **LOW** and **Tool Changer - Output 2** goes **HIGH** to turn the tool changer head counterclockwise for 400ms to lock the tool in position.

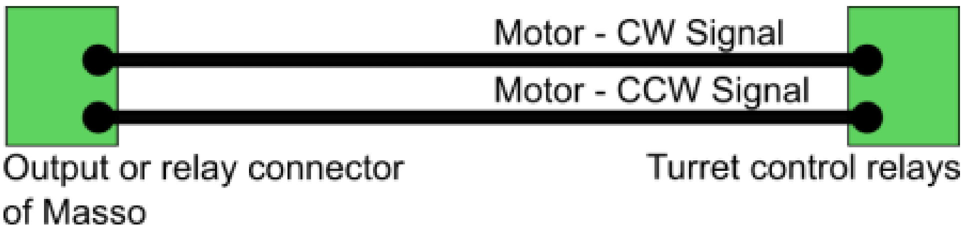
Input Signals

Wire the **Bit 1, Bit 2, Bit 3 & Bit 4** signals to any free inputs on MASSO and in the **INPUTS** list assign them to **Tool Changer - Input 1** to **Tool Changer - Input 4.**



Output Signals

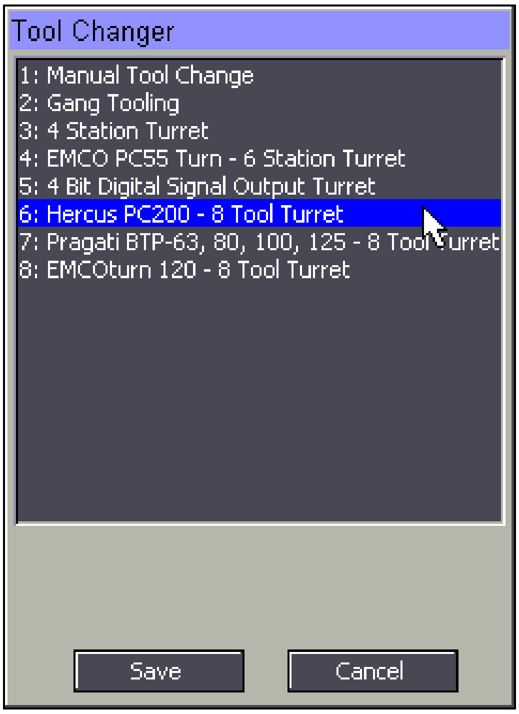
Wire the turrets control electronics **CW** and **CCW** signals on any free outputs on MASSO and in the **OUTPUTS** list assign them to the **CW** signal to **Tool Changer - Output 1** and **CCW** signal to **Tool Changer - Output 2.**



16.2.6. Hercus PC200 - 8 Tool Turret

Setting up the tool changer

- Go to **F1-Setup** screen and open **Tool Changer** window.
- From the list select Press enter to open **Tool Changer** list and select the the **Hercus PC200 - 8 Tool Turret** from the list.



Input Signals

Wire the sensor inputs and assign to MASSO as below:

- **Tool Changer - Input 1** for Tool 0 signal input (used to home the turret during machine homing).
- **Tool Changer - Input 2** for Tool counter signal input.
- **Tool Changer - Input 3** for Locking pin signal input.

Output Signals

Wire the control outputs and assign to MASSO as below:

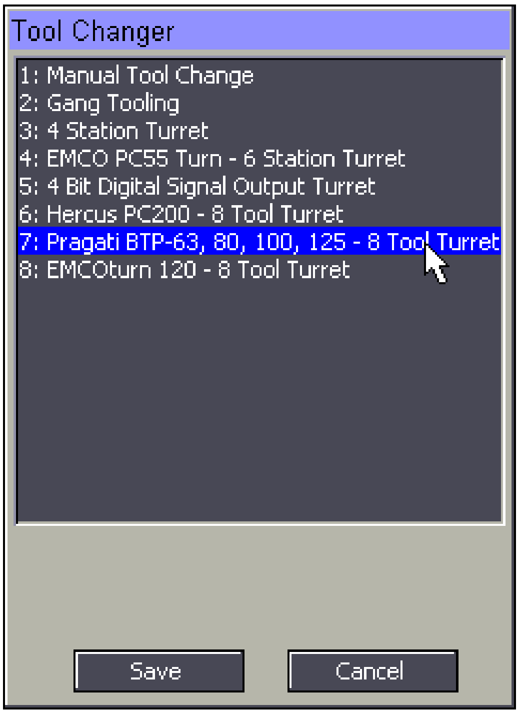
1. **Tool Changer - Output 1** to rotate turret for tool change rotation.
2. **Tool Changer - Output 2** to rotate turret in tool lock direction.

16.2.7. Pragati BTP-63, BTP-80, BTP-100, BTP-125

INFORMATION: This tool changer logic is designed as per Pragati tool turret requirements which is also used in other brands of tool turrets, please see the PDF document for details.

Setting up the tool changer

- Go to **F1-Setup** screen and open **Tool Changer** window.
- From the list select Press enter to open **Tool Changer** list and select the the **Pragati BTP-63, 80, 100,125 - 8 Tool Turret** from the list.



Tool changer logic

After all the axis of the machine have been homed as per the homing sequence the tool changer logic will read the encoder data from Turret to get the current tool in position.

If a valid tool number is received then the current tool number is updated on the controller else an ERROR message is displayed on the screen telling the user that the signals from Turret were not correct.

> **CAUTION:** As MASSO tool numbers start from Tool No. 0, when a command is given to load Tool No. 0, on the Pragati Turret Tool No. 1 is loaded. When tool load command is given for Tool No. 7, on the Pragati Turret Tool No. 8 is loaded.

Input Signals

Wire the sensor inputs and assign to MASSO as below:

- **Tool Changer - Input 1** for **BIT-1**
- **Tool Changer - Input 2** for **BIT-2**
- **Tool Changer - Input 3** for **BIT-3**
- **Tool Changer - Input 4** for **BIT-4**
- **Tool Changer - Input 5** for **PARITY**
- **Tool Changer - Input 6** for **STROBE**
- **Tool Changer - Input 7** for **CLAMP**

- **Tool Changer - Input 8** for **THERMAL ALARM**

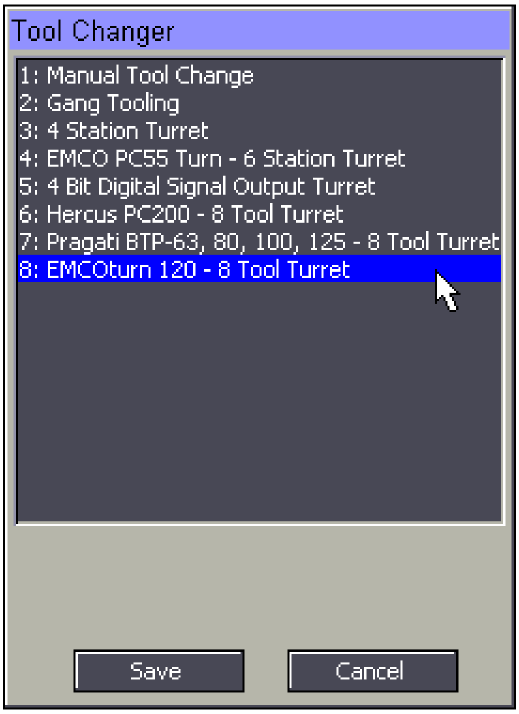
Output Signals

- **Tool Changer - Output 1** for **CW rotate**
- **Tool Changer - Output 2** for **CCW rotate**

16.2.8. EMCOturn 120

Setting up the tool changer

- Go to **F1-Setup** screen and open **Tool Changer** window.
- From the list select Press enter to open **Tool Changer** list and select the **EMCOturn 120** from the list.



Tool changer logic

After all the axis of the machine has been homed as per the homing sequence the tool changer logic will read the encoder data from Turret to get the current tool in position.

If a valid tool number is received then the current tool number is updated on the controller else an ERROR message is displayed on the screen telling the user that the signals from Turret were not correct.

On a tool change request, MASSO will make the **Tool Changer - Output 1 HIGH** to turn the tool changer head clockwise till the desired tool has been loaded in position. Once the tool is in position **the Tool Changer - Output 1** becomes **LOW** and **Tool Changer - Output 2** goes **HIGH** to turn the tool changer head counterclockwise for 1000ms to lock the tool in position.

Input Signals

Wire the sensor inputs and assign to MASSO as below:

- **Tool Changer - Input 1** for **Turret signal-1**
- **Tool Changer - Input 2** for **Turret signal-2**
- **Tool Changer - Input 3** for **Turret signal-3**
- **Tool Changer - Input 4** for **Turret signal-4**

Input Signal Sequence Chart

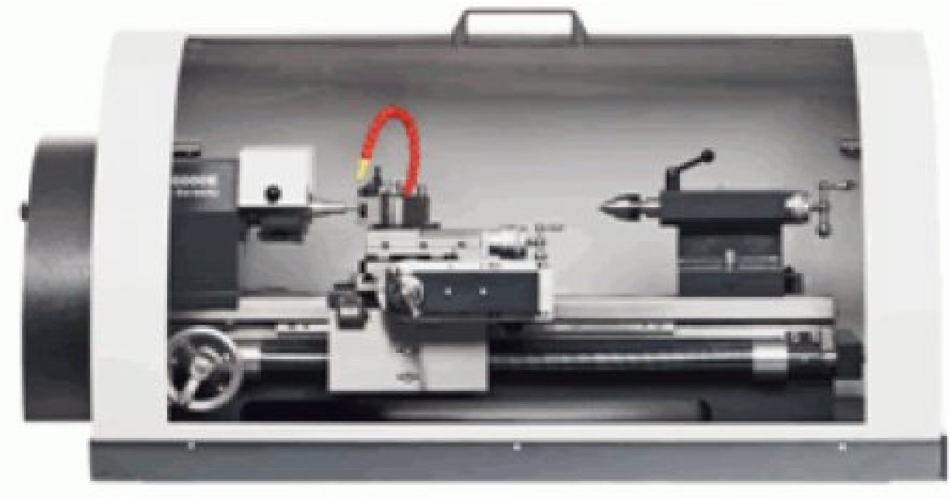
The below chart shows the signal sequence as per EMCO documentation. Check that your tool turret provides the signals as shown below to work properly with MASSO.

Tool Number	Tool Changer Input 1	Tool Changer Input 2	Tool Changer Input 3	Tool Changer Input 4
0	**HIGH**	**HIGH**	**HIGH**	LOW
1	**HIGH**	**HIGH**	LOW	LOW
2	**HIGH**	**HIGH**	LOW	**HIGH**
3	**HIGH**	LOW	LOW	**HIGH**
4	**HIGH**	LOW	**HIGH**	**HIGH**
5	LOW	LOW	**HIGH**	**HIGH**
6	LOW	**HIGH**	**HIGH**	**HIGH**
7	LOW	**HIGH**	**HIGH**	LOW

Output Signals

Wire the turrets control electronics **CW** and **CCW** signals on any free outputs on MASSO and in the **OUTPUTS** list assign them to the **CW** signal to **Tool Changer - Output 1** and **CCW** signal to **Tool Changer - Output 2.**

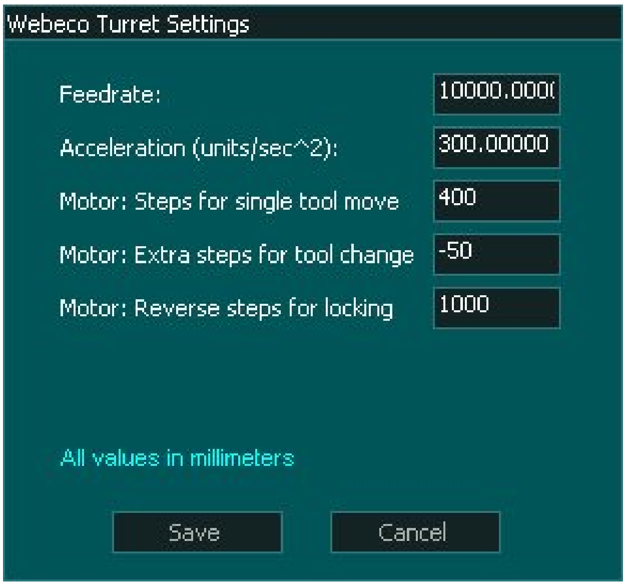
16.2.9. WABECO 8 Tool Turret



INFORMATION: This tool changer is only avilable on MASSO-G3 software v4.0 and above.

Setting up the tool changer

- Go to **F1-Setup** screen and open **Tool Changer** window.
- From the list select Press enter to open **Tool Changer** list and select the **WABECO 8 Tool Turret** from the list and double click it to open the below settings window.



Tool changer logic

After all the axis of the machine have been homed as per the homing sequence, the tool changer logic will start rotating the stepper motor for the turret till a home (Tool 0) signal is received.

If a valid tool home singal is received in one full revolution, the controller will display an alarm on the screen.

On a tool change request, MASSO will start rotating the turret stepper motor till the desired tool has been loaded into position.

Input Signals

Wire the homing sensor input and assign to MASSO as below:

- **Tool Changer - Input 1** for **Turret home position sensor.**

Output Signals

The turret stepper motor's STEP and DIRECTION signals should be wired to the MASSO Y-axis STEP and DIRECTION connector.

17. Plasma - Torch Height Control

MASSO supports simple control signals for torch heigh control so that external THC's can be easily integraded with MASSO.

Input signals used for THC:

- **THC Input - 1 -** is used to tell MASSO to move the Z axis up. When this input goies HIGH, MASSO will start moving the Z axis up.
- **THC Input - 2 -** is used to tell MASSO to move the Z axis down. When this input goies HIGH, MASSO will start moving the Z axis down.
- **Plasma Arc OK Signal -** This signal is required to tell MASSO that the arc has been successful. This signal should go HIGH by the THC on successful arc start.

17.1. Proma Compact THC 150

MASSO supports THC control signals to easily connect different types of THC's. THC's that are designed for to control Z axis directly using STEP and DIRECTION signals are not supported.

INFORMATION: Before the Z axis can be automatically controlled by THC, THC control must be enabled via gcode commands and proper sequence of commands must be executed.

Control signals

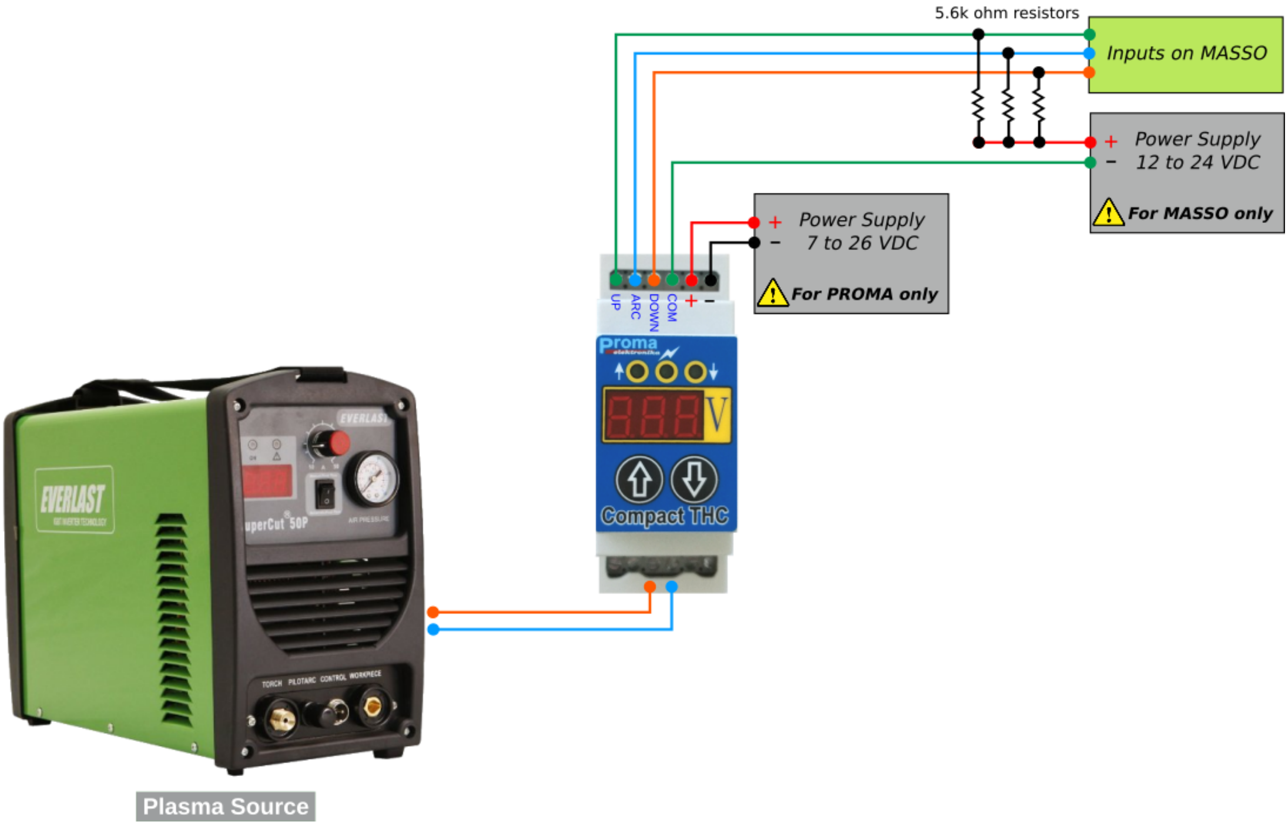
- **Plasma Arc OK Signal -** This signal is required to tell MASSO that the arc has been successful. This signal should go HIGH by the THC on successful arc start. Wire this to one of the inputs on MASSO and assign the input as **Plasma Arc OK Signal.**
- **Z Up Signal -** When this signal goes HIGH the Z axis is moved up. Wire this to one of the inputs on MASSO and assign the input as **THC Input - 1.**
- **Z Down Signal -** When this signal goes HIGH the Z axis is moved down. Wire this to one of the inputs on MASSO and assign the input as **THC Input - 2.**

Information: THC Input - 3 & THC Input - 4 are not used at this time.

PROMA 150 wiring example

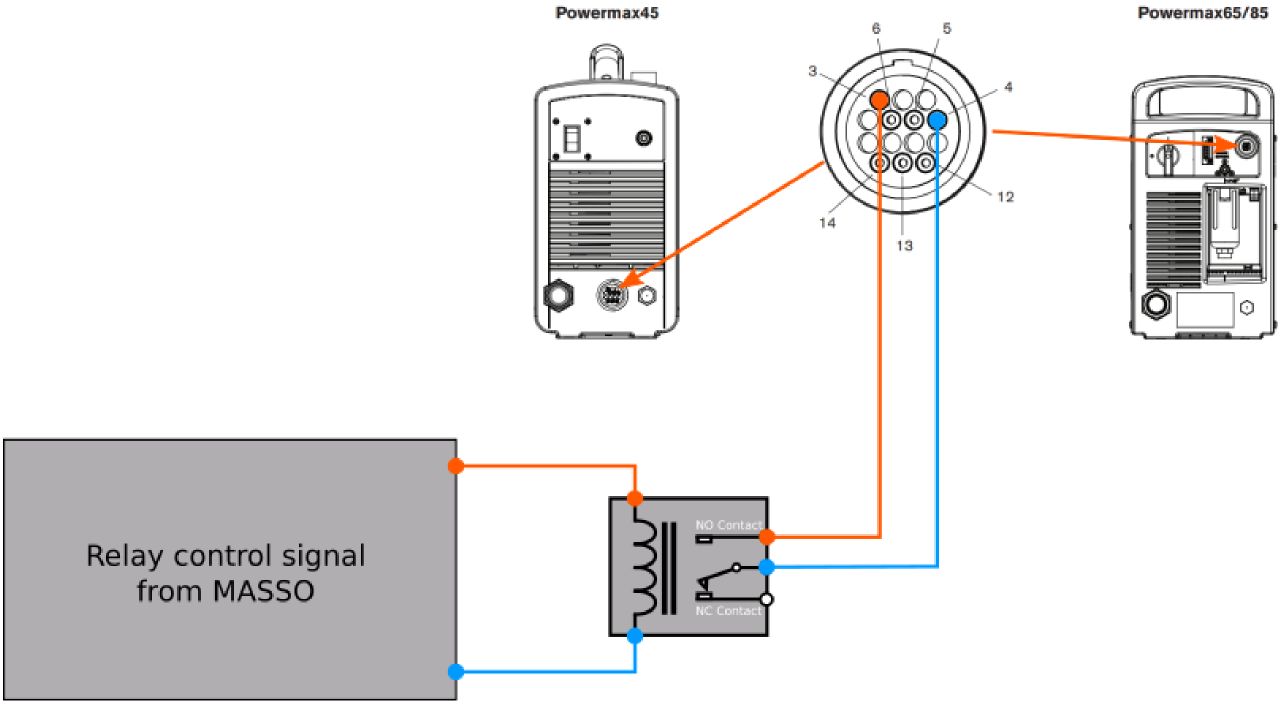
WARNING: Use a separate power supply to power your THC unit as shown in the example below. Failure to do so can result in noise related issues and in case of THC failure damage to MASSO as using the same power supply bypasses input optical isolation.

INFORMATION: The below wiring example is how its recommended by PROMA 150 manufacturers. As plasma sources induce high voltages and electrical noise, its very important to do the proper wiring and used shielded wires.



17.2. Hypertherm 45, 65 & 85

Torch ON/OFF wiring example



INFORMATION: Once a relay driver has been wired to one of the outputs on MASSO, assign this output as **Plasma On/Off Signal** in the OUTPUTS list.

17.3. Torch Touch (floating head) Signal

The torch touch signal is used to find the top of the workpiece before starting a cut. Generally a switch or sensor is mounted on Z axis floating head, this input is then used internally by MASSO to automatically offset the Z axis gap from the switch / sensor. This input is used with G38.2 command.

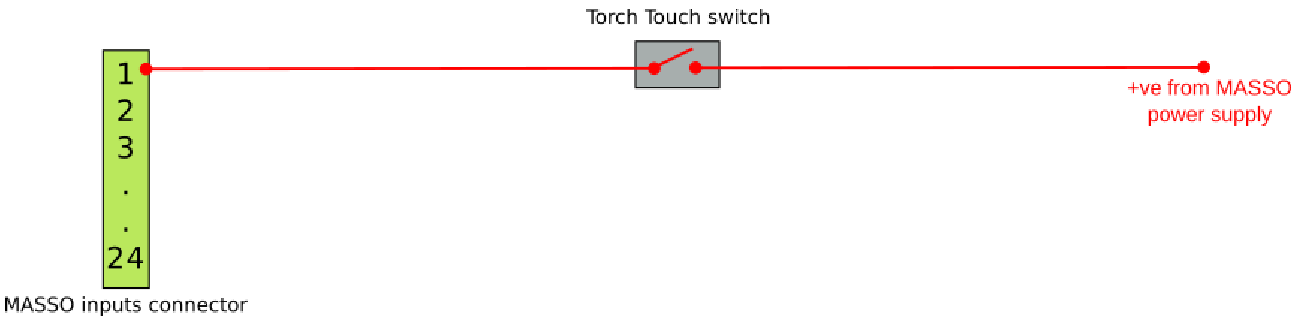
Floating head gap calibration

As each machine floating head gap between the switch / sensor to the torch tip is different, you can enter the distance in the **F1-Setup** screen under **Torch Height Control** settings.

By setting this value MASSO will internally offset this to automatically position the torch touch position, this also saves time and avoids confusion setting the offset values in CAM software.

Wiring example

Below is a simple wiring example showing how to wire a switch. A 5 to 24 VDC signal can be used.


Torch Touch switch
1
2
3
.
.
24
+ve from MASSO power supply
MASSO inputs connector

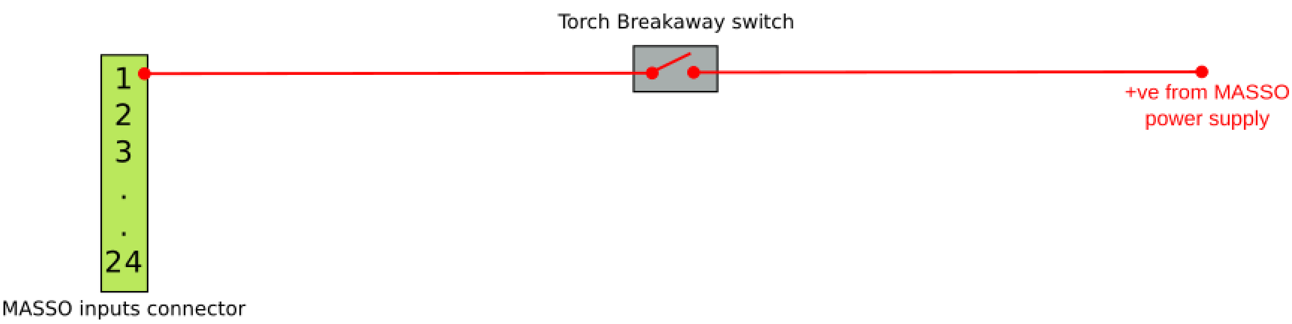
17.4. Torch Breakaway Signal

The torch breakaway signal is used to stop plasma and machine axis movements if the plasma torch is hit during a cut.

For this setup, generally the torch is mounted on magnetic holders and when the torch hits something such as a cut metal piece then the torch comes off the magnetic holders triggering a switch or sensor.

Wiring example

Below is a simple wiring example showing how to wire a torch breakaway switch. A 5 to 24 VDC signal can be used.



17.5. How THC works

WARNING Please treat your Plasma with care as the incorrect wiring of the THC or use of the Plasma may cause damage to MASSO or serious personal injury.

CAUTION: This document provides an overview of how THC works with MASSO, how to connect and how to test. Depending on what THC you are using you may need to wire it differently from the drawings shown below. Please consult your user manual.

Overview of the THC interface and Gcode

Under Torch Height Control on the MASSO F1 Screen select option 3 Proma Compact THC Controller 150

The MASSO THC interface uses 3 inputs and 1 output.

Inputs

- **Arc ok** – This signals MASSO when the Plasma arc is struck to let it know that it is ready to continue with the cut.
- **THC1** – Lets MASSO know that the torch is too low and needs to rise. Connects to the Up signal in the THC
- **THC2** – Lets MASSO know that the torch is too high and needs to descend. Connects to the Down signal in the THC

Outputs

A MASSO output is set as Plasma On/Off Signal and is used to turn the Plasma torch on and off as needed.

Gcode commands used with THC

M667 - This command is used to switched On the THC automatic Z axis control function.

You can specify a feed rate which sets the speed at which the Z axis moves while under THC control.

Syntax

M667 F50

M666 - This command is used to switched OFF the THC automatic Z axis control function

Syntax

M666

M3 - Turn Plasma Arc on

Syntax

M3

M5 - Turn Plasma Arc off

Syntax

M5

Overview of Plasma operation

Prerequisites

- Under Torch Height Control on the MASSO F1 Screen select option 3
- Proma Compact THC Controller 150 if you are using a THC.
- The THC must output Arc OK, Up and Down signals to be compatible.

Operation

- An M3 command is issued and the Plasma arc is struck
- The THC sees the arc and sends back an Arc ok signal to MASSO by changing MASSO the input from Low to High
- MASSO sees the Arc ok signal and lights the Plasma on button on the screen.
- If the Arc Ok does not show high within 15 seconds of the M3 a “NO ARC OK” alarm will present and the MASSO will stop running the program.
- The Plasma starts cutting as per the program but will ignore further input from the THC until the function is turned on in MASSO

- An M667 F## command is issued turning on the THC function at a feed rate of ## within MASSO
- On the first axis move the THC button lights up on the MASSO screen.

- As it moves the THC will send out Up and Down signals on the THC1 & THC 2 inputs
- If Input THC1 changes to High MASSO will move the torch up
- If Input THC2 changes to High MASSO will move the torch down
- If both inputs THC1 & THC2 are High MASSO will ignore the error and the torch will not move.
- If both inputs THC1 & THC2 are Low then the plasma is at the correct height and the torch will not move.
- MASSO will continue to adjust the torch height until it receives an M666 command to turn off the THC function on the next axis move.

Notes:

- The MASSO Z axis cannot be jogged while the THC function is turned on.
- MASSO will ignore Gcode instructions to move the Z axis while the THC function is turned on.
- Use software version 3,47 of later to ensure no hesitation in motion when the THC is turned on or off. A motion command must be issued before the THC will turn on or off. eg G01 X150 Y246
- The M667 command allows for a Z axis feed rate to be specified. This will only affect the Z axis speed when in THC mode. The primary use of this feed rate is to slow down the speed of the z axis so that it does not move too fast and overshoot. Example: M667 F50. It does not affect the feed rate of the X or Y axis and the Z axis feed rate will return to the previous value when THC is turned off.
- The Z axis feed rate at power on is the rapid speed for your Z axis.
- Once a feed rate is set using M667 command the Z axis will remember this until it is changed or MASSO is powered off.
- If while cutting you find that the torch head bounces up and down in an uncontrolled manner you may need to adjust the THC voltage settings or slow down the Z axis feed rate specified in the M667 command. Example: M667 F50

Connection of the THC inputs to MASSO

WARNING: Use a separate power supply to power your THC unit as shown in the example below. Failure to do so can result in noise related issues and in case of THC failure damage to MASSO as using the same power supply bypasses input optical isolation.

CAUTION: Plasma's generate a lot of electrical noise and interfere with electrical equipment in the vicinity. Please ensure you correctly earth your machine for safety and to reduce the electrical noise. Earth your plasma in accordance with manufactures instruction and best practice.

INFORMATION: The following section explains 2 methods of connecting the THC and why one is preferred over the other. The actual connection of your Arc ok, THC1 & THC2 inputs to MASSO will depend on the THC unit that you are using and what type of outputs the unit uses. Please consult your user manual.

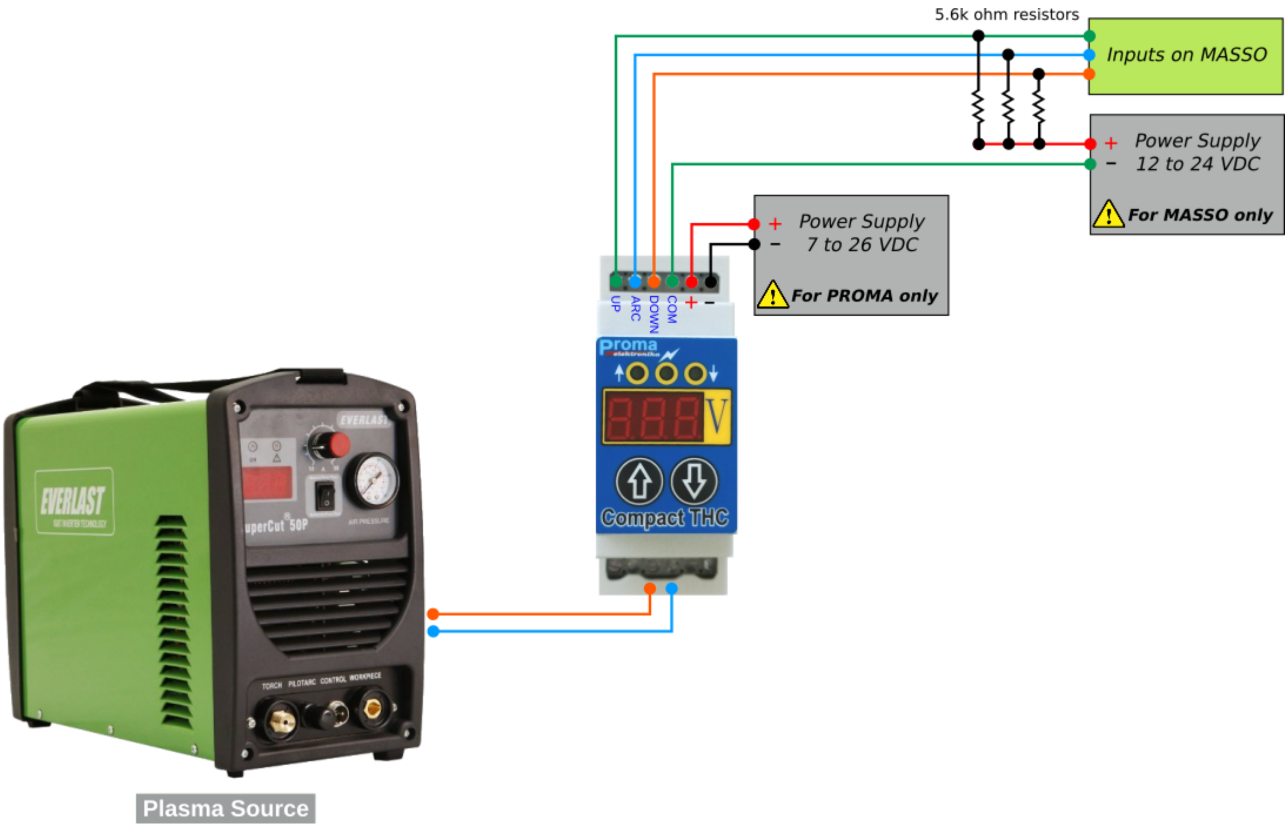
Preferred method

The diagram below is the recommended way to connect the proma Compact THC 150 to MASSO. The use of resistors from the positive of the MASSO power supply to the MASSO inputs will turn the Inputs on and the THC will switch MASSO ground to the inputs to turn them off. Because this logic is wrong for MASSO the inputs are inverted on the F1 screen so that they show Low in the normal state and High when the THC sends a output.

When there is no signal coming from the THC the input will be turned on which reduces the chance of noise entering the input and providing a false signal. When the THC sends a signal ground signal will turn the Input hard off and again the chance of noise entering the input is greatly reduced. By wiring it in this manner the inputs will have very high noise immunity. When wiring in this manner use 1/4W or higher resistors and **do not** leave them out and connect the +ve direct to the inputs or you will damage your THC and possibly MASSO. Actual resistance values may need to be decreased slightly depending on the type of switch used in the THC. The values shown are correct for mechanical relay output and may need to be changed for use with solid state switches within the THC.

Consult your user manual for more details and the best method to connect your THC.

It is recommended a separate power supply is used to power the THC.



Input 13	Plasma Arc OK Signal	Yes	Low
Input 14	THC - Input 1	Yes	Low
Input 15	THC - Input 2	Yes	Low

THC input settings. Note these are inverted.

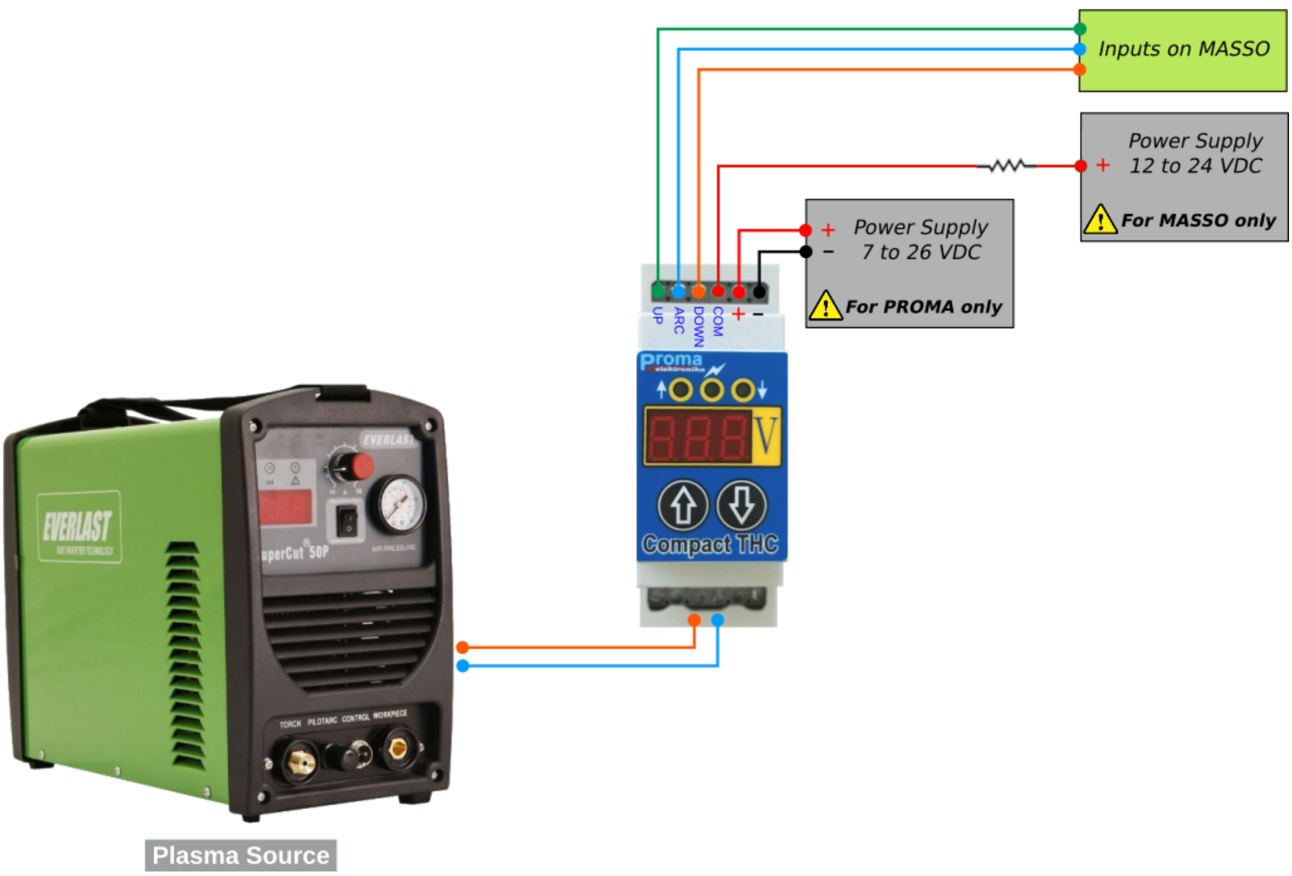
INFORMATION: To invert the logic of an input select the input and press the space bar to reverse the logic.

Alternative wiring method

Another option though not recommended is to switch the Positive rail of the MASSO Power supply with a suitable sized resistor in series through the THC. This can create noise problems from the Plasma arc. When there is no signal coming from the THC it means the inputs have no signal on them at all. The length of wire between the THC and MASSO will act as an antenna, picking up all of the electrical noise generated by the plasma. If a high enough voltage is generated it will turn inputs on. This will create false inputs to MASSO and cause issues. While the wiring is easier there is a chance of problems from noise generated by the plasma arc. The actual resistance value will depend on the type of switch used within the THC. The purpose of the resistor is to limit the fault current in case a THC output is accidentally grounded. Using this method the inputs are not inverted.

Consult your user manual for more details and the best method to connect your THC.

It is recommended a separate power supply is used to power the THC.



Input 13	Plasma Arc OK Signal	No	Low
Input 14	THC - Input 1	No	Low
Input 15	THC - Input 2	No	Low

THC input settings. Note these are not inverted

Setting up the MASSO output

- Assign the MASSO output of your choice as Plasma On/Off Signal. On the MASSO G3 this will be a TTL output and will connect to a TTL relay board such as the

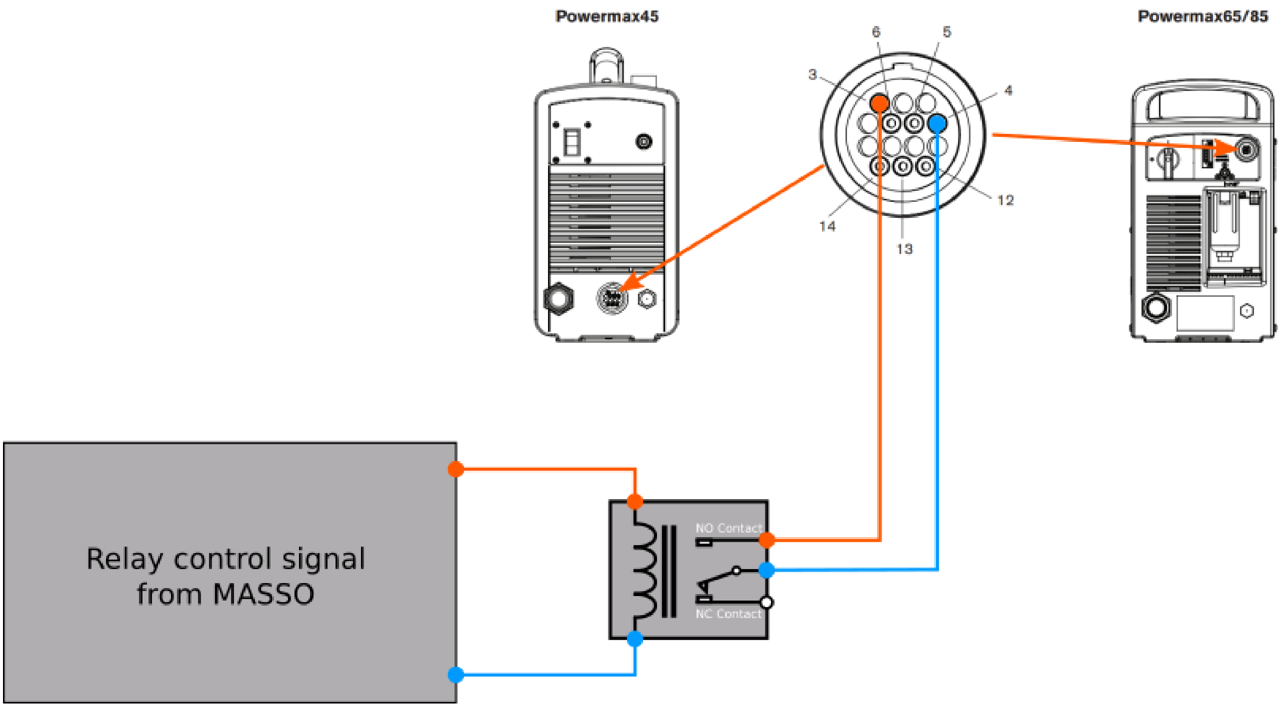
MASSO TTL relay module.

- On the MASSO G2 you can use either a TTL relay as with the G3 on one of the 16 TTL outputs or you can use one of the 6 Relay outputs and connect a suitable relay direct to the output.

How to connect a suitable relay direct to the output

- Wire the normally open or normally closed contact from the relay to the Plasma unit in accordance with the manufacturers instructions. This is used to turn the torch on and off as needed under control of the M3 / M5 commands.

In the example below the normally closed contact is used and output 18 is configured as Plasma on / off.



Output 18	Plasma On/Off Signal	No	Low

Testing

- From the F1 screen go to Torch Height Control and select option 1 Without THC and Arc Ok Signal
- Click on the Plasma on button in the F2 screen to turn the plasma on, the relay will operate and the Plasma should strike an arc.
- Click on Plasma off, the relay will release and the Plasma will turn off.
- From the F1 screen go to Torch Height Control and select option 3 (Proma Compact THC controller 150)

Testing the THC signals

Your THC unit should have a test function built in to generate the Arc Ok , UP and DOWN signals needed to control MASSO.

Testing the wiring

- On MASSO go to the F1 screen and look at the 3 inputs. They should all show logic Low. If not highlight the inputs and invert the ones that show High in the idle state.
- Turn on the THC test function. This will be either automatic as with the Proma Compact THC and manual on some other THC units

- Check that as each output on the THC signal is sent the corresponding input on MASSO changes from Low to High
- If all inputs show the correct signals on the F1 screen your setup is correct. If not please check your wiring and retest.

Additional testing

- While looking at the F1 screen trigger the Plasma torch and strike an arc. Make sure you see the Arc Ok input change from Low to High. Please note that you may need to adjust voltage setting within the THC to get the Arc Ok signal on the THC. Your THC should have a light for each signal and if you are wired and setup correctly you should see the Arc light turn on at the THC and the Arc Ok input will go high on MASSO.

Testing the Masso THC function

- Put your THC into Test mode
- Go to the F2 Screen and press the Plasma on button.
- Within 15 seconds the THC must send an Arc ok Signal. For the Proma this is continually sent in test mode. On other THC units you may have to manually select and send the required test signal.
- The signal does not need to be continuous. Once it is received it is not needed again until the plasma is turned on again.
- On receipt of the Arc Ok signal the Plasma on light will immediately turn yellow and there will be no alarm indication.
- Click on the THC button on the screen to turn on the THC. (**Note:** The THC will move at the rapid speed you set for your Z axis so please ensure there is sufficient room for movement.)
- Send an up signal from the THC and the torch will rise
- Send a down signal and the torch will descend.

INFORMATION: On the Proma test function it sends the Arc ok signal continuously and alternate up and down signals automatically switching between Up & Down every second. On other THC units you may have to manually select and send the required test signal.

INFORMATION: If the above tests are successful the THC is correctly wired to MASSO and MASSO is configured right. Please be aware that your Gcode and THC settings will have an effect on how well the setup will work.

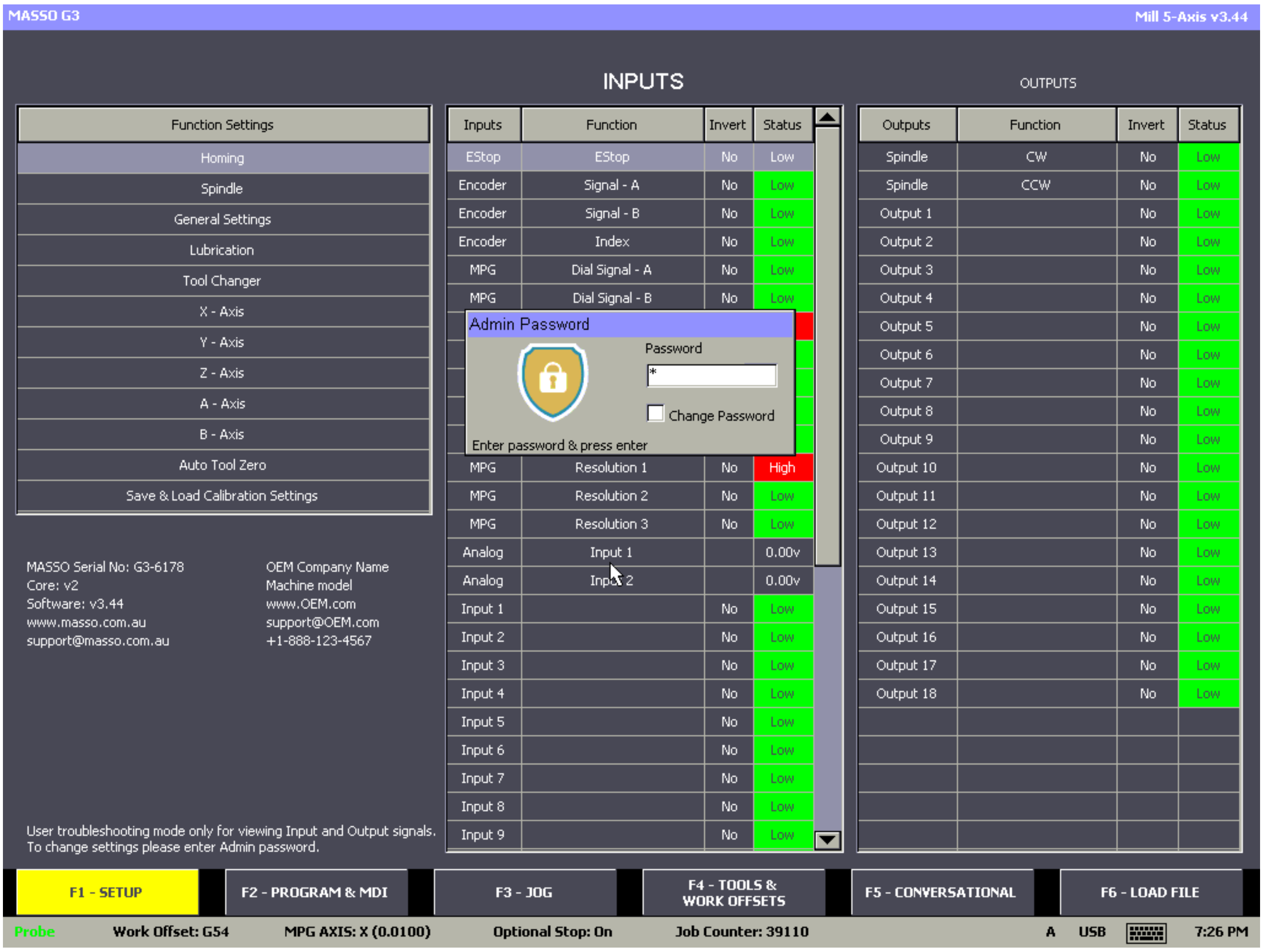
INFORMATION: If while cutting you find that the torch head bounces up and down in an uncontrolled manner you may need to adjust the THC voltage settings or slow down the Z axis feedrate specified in the **M667** command. Eg **M667 F150**

18. OEM Logo & Details

Details such as OEM logo, machine model and contact details can be added to the MASSO startup and F1-Setup screen.

MASSO power up screen with OEM logo

MASSO F1-Setup screen with OEM logo and details



How to integrate your details to MASSO

Please contact us via support@masso.com.au email for integration costs and provide the following details:

1. High quality logo file with transparent background in *PNG format.*
2. Company Name *(Maximum of 31 characters).*
3. Machine Model *(Maximum of 31 characters).*
4. Website Address *(Maximum of 31 characters).*
5. Email ID *(Maximum of 31 characters).*
6. Support Phone Number *(Maximum of 31 characters).*

19. Sherline Mills and Lathes

SHERLINE products are manufacturers of high precision CNC mill and

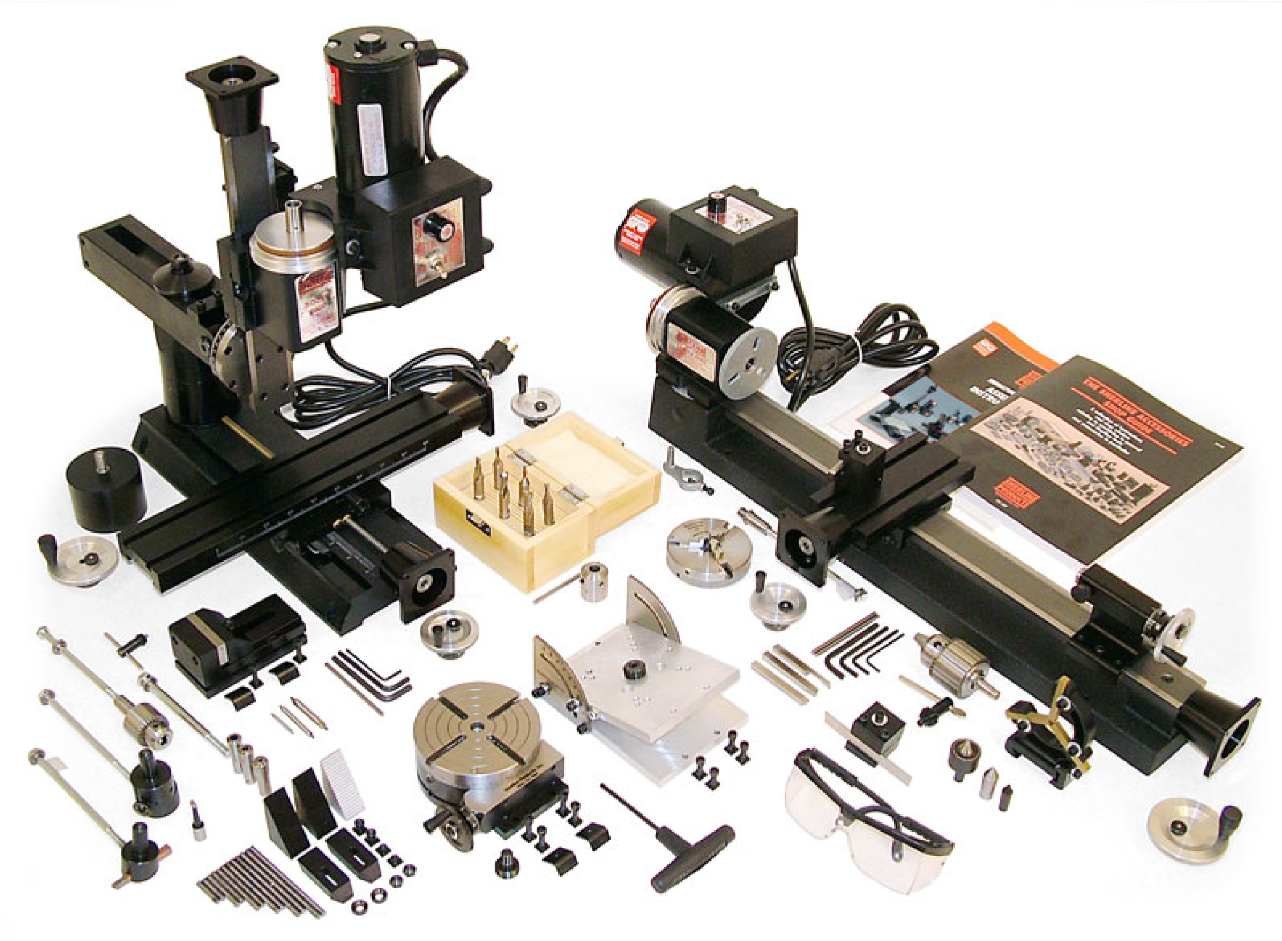
lathes. SHERLINE manufactures all its machines in California, USA.

SHERLINE CNC machines are used in medical, space and many more high precision industries.

To provide high reliblity and ease of machining, SHERLINE provides

machine with MASSO controllers integrated with their machines.

Visit SHERLINE website **www.sherline.com**



19.1. Wiring & Setup

WARNING: Power off the machine and electronics when wiring, unplugging or connecting any connectors or connections.

WARNING: Double check your connections on the **DB9 male** and **DB9 female** connectors as these can be easily mistaken and if connected at the wrong connector can damage the entire controller.

DB9 (MALE) Connector on the control box

Pin No.	Description
1	**P3** of the DC spindle motor drive (+ve of Spindle Drive).
2	**P2** of the DC spindle motor drive (RPM of Spindle Drive).
3	**P1** of the DC spindle motor drive (-ve of Spindle Drive).
4	24v - Only to be used for very low current loads (Type: output).
5	Spindle Encoder A Signal (Type: input).
6	Spindle Encoder B Signal (Type: input).
7	Spindle Encoder Z Signal (Type: input).
8	Spindle CW signal for relay coil (Type: output).
9	24v - For relay coil (Type: output).

DB9 (FEMALE) Connector on the control box

Pin No.	Description
1	**X-axis** Homing Sensor (Type: input, 5 to 24VDC).
2	**Y-axis** Homing Sensor (Type: input, 5 to 24VDC).
3	**Z-axis** Homing Sensor (Type: input, 5 to 24VDC).
4	**A-axis** Homing Sensor (Type: input, 5 to 24VDC).
5	**B-axis** Homing Sensor (Type: input, 5 to 24VDC).
6	Tool Setter Input (for auto tool zero). Has an internal pull-up resistor, ground this input for touch signal. (Type: input).
7	Touch Plate / Probe Input (for probing). Has an internal pull-up resistor, ground this input for touch signal. (Type: input)
8	Optional output for controlling a relay coil (Type: output).
9	24v - For relay coil & homing switch inputs (Type: output).

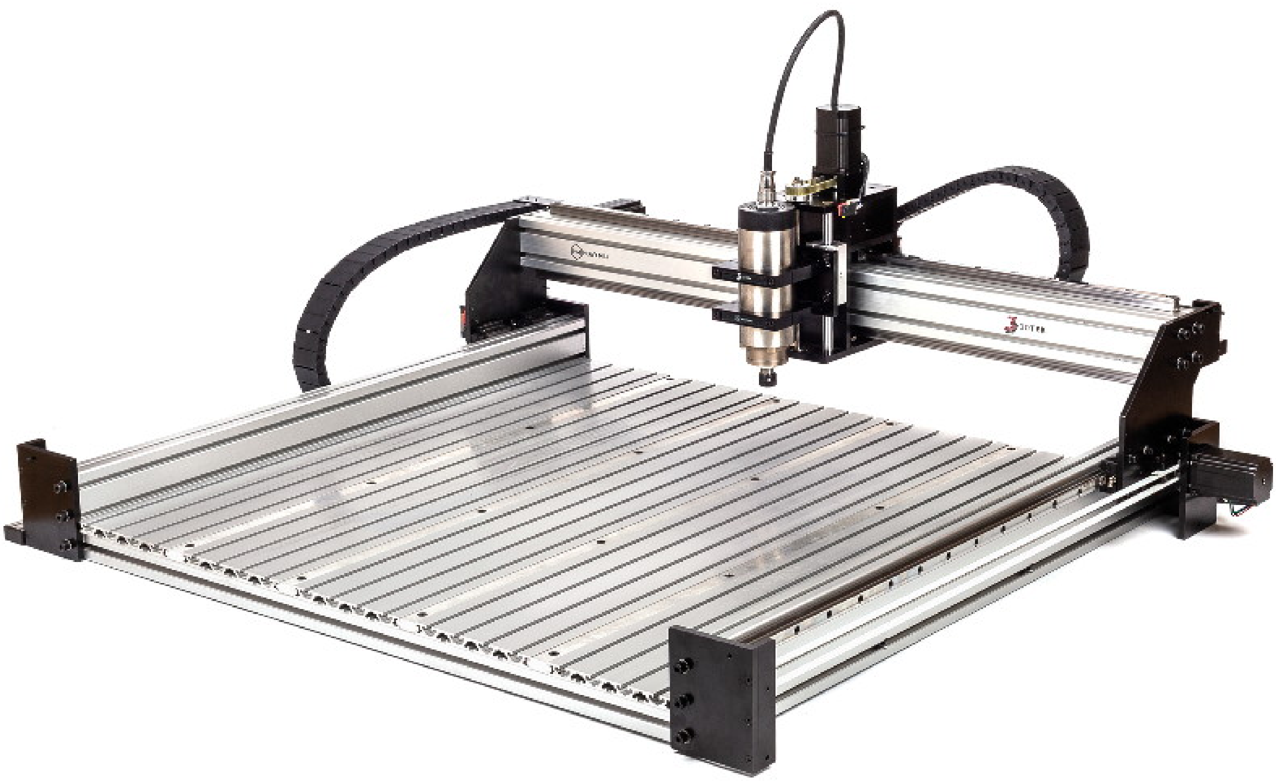
20. 3DTEK Routers

3DTEK manufactures high-quality CNC routers in Australia and United Kingdom.

With high precision linear rails and high-quality aluminum build, the machines provide great cut quality and reliability.

To provide high reliability and ease of machining, 3DTEK provides machines with MASSO controllers integrated with their machines.

Visit 3DTEK website www.3dtek.xyz



v5.25 - 25 Jul,2021

21. CANCAM Routers

CanCam manufacture high-quality CNC routers in Canada.

With high precision linear rails and heavy gantry, the machines provide great cut quality and reliability for different industries.

To provide high reliability and ease of machining, CanCam provides desktop CNC routers with MASSO controllers integrated with their machines.

Visit CanCam website www.cancam.ca

v5.25 - 25 Jul,2021

22. REVO CNC

REVO manufactures high-quality CNC routers in Turkey.

The machines are built on a rigid platform and with high-quality parts that give exceptional cut quality and speed.

Visit REVO's website www.revo.com.tr

23. Forums & Email Support

Forums

Building and operating a CNC machine requires having prior knowledge of electronics, mechanical systems and CAM/CAD softwares. If you're new to building CNC machines, there are plenty of machine builders/users on our forums. **CLICK HERE** to visit MASSO forums.

Email Support

MASSO email support can be contacted on support@masso.com.au.

Please NOTE that due to high volume of basic CNC related questions, its

not possible for us to reply to all emails. In order for us to do this

effectively and fairly for all users, below is a list of what we can and cannot support.

Please read the below points regarding getting support:

Building and operating a CNC machine requires having prior knowledge of electronics, mechanical systems and CAM/CAD softwares. If you're new to building CNC machines, there are plenty of machine builders/users on our forums for great information.

What we can support	What we can't support
Request MASSO software	Selecting/wiring motors and drives – For more info see MASSO Forums/Documentation
Bug Reports	How to use CAD/CAM software – For more info see Google/YouTube
Feature Requests	How to design/machine parts – For more info see MASSO Forums
OEM/Machine Manufacturers	Educating about electronics and wiring – For more info see Google/YouTube/MASSO Forums
Sales/Ordering	Retrofitting MASSO to a particular machine – For more info see MASSO Forums
Request to Add/Edit Documentation	Setting up and Programming Axis & Spindle Drives (VFD) – For more info see MASSO Forums/Documentation
Request to Add/Edit Video Tutorials	Creating/adding features to CAM post-processors – For more info check with your CAM Software Provider

24. Reporting Bugs & Issues

If during operations the system behaves unexpected or any bugs are found then the user should email **SUPPORT** the following information so that we

can have the issue resolved at the earliest:

1. Take a screenshot of the current screen by pressing the **Prt Sc** or **CTRL + P** keys on the keyboard and a **.bmp** image file of the current screen will be saved to the USB FLASH drive.
2. Next email the above generated file to **SUPPORT** and a detailed description of the issue.
3. If the issue is related to a particular G-code file then email the G-code file so that we can replicate the problem at our end.

25. Payment

International Orders (Outside Australia)

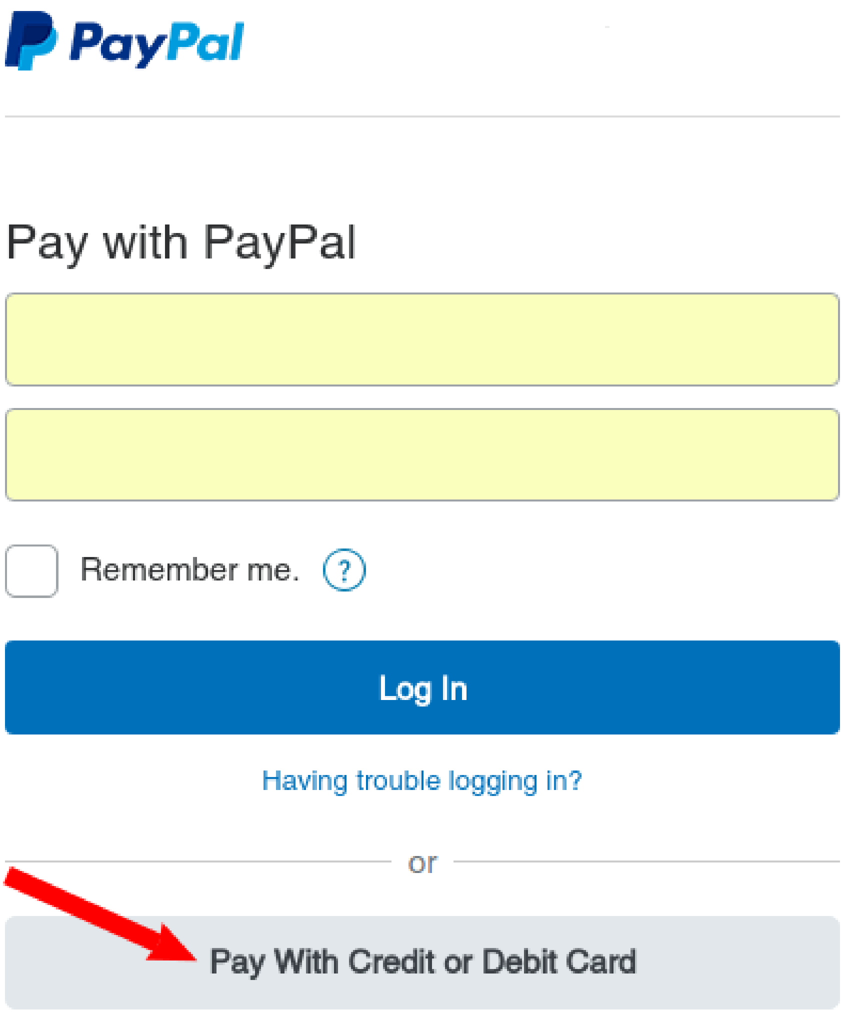
Paying with PayPal

Secure and fast payments can be made via PayPal and all major credit

cards such as Visa, MasterCard, American Express, Discover, JCB, Diner's Club are supported. All payments outside Australia are only accepted in US dollars.

Paying with credit card without PayPal account

If you don't have a PayPal account then you pay directly by entering your credit card details into PayPal. When asked to login to PayPal, simply click the **"Pay With Crebit or Debit Card"**



Domestic Orders (within Australia)

Payments for Australian orders must be done via direct bank transfer. Once you place an order online, you will be displayed with an order confirmation page with banking details and an email notification is also sent with banking details. Orders are only dispatched once we have received the payment in our bank account. To avoid any delays please email us the payment receipt on support@masso.com.au

OEM / Distributors

Payments for OEM's and distributors must be done via direct bank transfer and your MASSO account manager can help you with banking details.

26. Shipping & Delivery

Order processing time

Most of the orders are processed and dispatched the next business day. Orders are not dispatched or delivered on weekends or public holidays. If we are experiencing a high volume of orders, shipments may be delayed by a few days and we will notify via email for any delays.

Shipping rates & delivery estimates

Shipping charges for your order will be calculated and displayed at checkout. If your order contains multiple items that the website is not able to calculate and must be calculated manually, please email us on support@masso.com.au your order list including delivery address for us to provide you the shipping costs.

Worldwide shipping

We have partnered with DHL to provide industry leading door to door service for our clients. DHL Express provides delivery to almost all countries.

Shipment confirmation & order tracking

You will receive a shipment confirmation email with tracking details once your order has been dispatched.

Important information regarding DHL deliveries

Please note that it is the responsibility of the receiver to monitor shipments and reach out to their local DHL customer service team for tracking, delivery, delay in delivery, customs clearance or any other questions or concerns. If your shipment is taking too long then please contact your local DHL number as DHL might be waiting for some additional information from the receiver.

DHL can only hold the shipment for usually two weeks and after that, the shipment will be either returned or destroyed depending on the destination countries rules. If the shipment is returned or destroyed because of no communication by the receiver with the clearance process or delivery address issue then its client responsibility to cover the costs involved to send the shipment again.

Customs, duties and taxes

Depending on the country of import, customs and taxes are calculated.

Each country has its own tax or customs rules and rates, some countries have free trade agreements and do not charge any taxes or customs on some items. For more information about this, please contact your local customs authorities about charges applicable for your country.

All customs and taxes imposed during or after shipping are the responsibility of the customer.

Damages

MASSO is not liable for any products damaged or lost during shipping. If you received your order damaged, please contact the shipment carrier to file a claim. Please save all packaging materials, photos and damaged goods before filing a claim. You can also email us for any support in this matter so that we can assist you in the process.

27. Warranty

All units are warranted to be free from defects in workmanship, material

and are warranted to meet the Company's published specifications, but no other warranty, expressed or implied, is made by the seller unless expressly set forth. Hind Technology warrants its equipment for one (1) year to be free from defects in workmanship and material.

Hind Technology shall have no obligation or liability under this warranty:

1. For special, indirect or consequential personal or property damage arising from the failure of its equipment.
2. If the equipment was not installed, operated or maintained in accordance to Hind Technology's installation instructions.
3. If the equipment was serviced, repaired, altered or modified in any way by a third party other than Hind Technology authorized personnel.

?Hind Technology further reserves the right to the following:

1. The right to repair or replace customers' units at its discretion.
2. The right under this warranty to refuse or reject any and all warranty claims for any reason whatsoever if, based on the Company's estimation, damage to subject equipment was not caused by component or factory workmanship defects.
3. Any unit sent back to Hind Technology for warranty repair must have prior notification and approval for the return or the unit will be refused delivery.
4. All transportation costs, both in-bound and out-bound freight, are the responsibility of the customer.

28. Returns

Return Policy

Definitions

Customer means the person or legal entity identified in the Invoice.

Hind means Hind Technology Australia Pty Ltd

Refund Policy

Our policy lasts 30 days. If 30 days have gone by since your purchase, unfortunately we can't offer you a refund or exchange. We are always here to listen and help our clients and if you think that our products are not as per your expectations or has some issues or missing features that are stopping you from using our products then please email us on support@masso.com.au so that we can work out a solution if possible.

To be eligible for a return, your item must be unused and in the same condition that you received it. It must also be in the original packaging.

PayPal fee

As per the new PayPal policy, the fees charged by PayPal on the purchase of the items will not be refunded. Refund issued by Hind will not include the fees charged by PayPal.

Additional non-returnable items:

- Downloadable software products.
- There are certain situations where only partial refunds are granted: (if applicable).
- Any item not in its original condition, is damaged or missing parts for reasons not due to our error.
- Any item that is returned more than 30 days after deliver

Refunds (if applicable)

If an item has to be returned for refunds, the customer is responsible for paying for return shipping costs. Both shipping costs (Initial shipping cost when the item was purchased & return shipping) paid by the client are non-refundable.

PayPal or any other bank fees charges on the purchase of the items will not be refunded.

Once your return is received and inspected, we will send you an email to notify you that we have received your returned item. We will also notify you of the approval or rejection of your refund.

If you are approved, then your refund will be processed, and a credit will automatically be applied to your credit card or original method of payment, within a certain amount of days.

Return shipping

To return your product, please email on support@masso.com.au first so that a support ticket can be generated including the return address instructions.

The customer is responsible for paying for return shipping costs. Shipping costs are non-refundable.

Depending on where you live, the time it may take for your return products to reach us, may vary.

If you are shipping an item over $75, you should consider using a trackable shipping service or purchasing shipping insurance. We don’t guarantee that we will receive your returned item.