DiamondEdge™ -300 Series Impact Etching Machines

User Manual

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dorokhov72@gmail.com

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Thank you

We would like to thank you for purchasing the DiamondEdge™ Impact Etching Machine!
Our engineering team enjoyed working on it, putting many years of effort and experience into its design. We have taken the best features from previous models, and improved them in every single aspect.

The new line of our etchers is called DiamondEdge™-300 and features multiple improvements over our previous, highly-successful line of Granite™ and DiamondEdge etchers:

- 50 % and more increase in etching speed
- New, improved etching head
- Surface-tracking mechanism that does not require a separate gap sensor
- New and simplified etching tip with magnetic hold
- Wi-Fi access point and Wi-Fi client connectivity
- External keyboard for easier etching head positioning
- More intuitive PC software
- Improved perimeter walk function
- Stone level testing prior to starting the job

Impact Etching technology is revolutionizing Monument Industry by providing monument builders with an affordable and easy-to-use tool for creating etchings.
Impact etching Machines are used by thousands of customers throughout Europe, and are now available in North America.

We are committed to supporting you by providing consultation, spare parts, repair and image editing services.

About this manual

This manual is created for users of the DiamondEdge™-300 brand Impact Etching Machines.

We have made every effort to make this technology as easy to use as possible.
But it still is a technology, and you will need to learn how to use it before starting to use it.

Please begin by reading this manual. We have put much effort and thought into its preparation.

While this manual talks about some image editing techniques, use of raster image editors is not covered.
You can turn to specialized literature on digital image processing techniques applicable to the type and version of image editing software you are using.

Terms and conditions

Parties covered:

- Owner of the Machine (referred to as "Buyer")
- Economical Solutions Corporation, referred to as "Seller"

1. **Warranty**

    a. Seller provides the warranty for 1 year (from the date of purchase) that the Machine will perform its function (Etching of halftone pictures on smooth surfaces that can be marked by diamond). During the warranty period, Seller will provide free of charge, any repairs or parts required to keep Machine working. This warranty covers any break downs caused by regular use of Machine, including any mechanical or electrical break-downs that can be attributed to the design of the Machine. The warranty does not cover replacement diamond tips, which are considered a consumable item.

    b. Warranty does not cover damage or break-downs caused by dropping the Machine, Machine being hit with objects, electrical shocks, chemical spills, or any other kinds of actions that are not included in the expected use of the Machine.

    c. Buyer shall provide regular maintenance by cleaning and lubricating Machine's moving parts. Any damage or break-down caused by lack of such care is not covered by this warranty.

2. **Limitations of Parties liability**

    a. All information regarding the Equipment is from sources deemed reliable, but no warranty or representation is made as to fact, promise, information or the like regarding condition, use or description of the Equipment, unless confirmed explicitly in writing by the Seller in this Agreement.

    b. The Buyer irrevocably and unconditionally waives any claim the Buyer may have against the Seller, Manufacturer(IE Dorokhov) due to any deficiency or lack of conformity of the Equipment or any unit or part thereof, including conformity to government health and safety regulations, certification requirements etc.

    c. The Buyer agrees that it will not hold The Seller or Manufacturer (IE Dorokhov) , their directors, shareholders, or employees responsible for any personal, property, business reputation, or other types of damage that might result from use of Machine. This includes any kind of personal injury, as well as damage to the materials, or any other harm that can directly or indirectly be caused by the Machine.

3. **Intellectual Property Protection**

    a. Certain components of the Machine may be protected by Ukrainian and International patents.

b. Buyer agrees not to engage, or allow 3rd parties to engage in any of the following activities:
    i. Reverse-engineering of mechanical or software components of the Machine, by means of disassembly, tracing the software, or any kind of activities in general that would be aimed at identifying the working principles of the Machine.
    ii. Creating copies of software provided with the Machine.

Where to get help

This manual has been thoughtfully prepared to provide you with comprehensive information required to use the Machine.

For any questions and issues, our support policy requires that you first contact the Reseller you have purchased your Machine from. Should your question require intervention from manufacturer (IE Dorokhov) or North American distributor (Economical Solutions Corp), your Reseller will contact those parties.

1. Personal Safety

You should exercise all usual pre-cautions when working with the Machine:

- Be alert.
- Do not expose your limbs, clothing, jewelry or hair to any moving parts of the Machine.
- Avoid inhaling dust created during etching.
- Wear appropriate hearing and eye protection.

2. Protecting your Machine

Please read this section before starting to use the Machine.
Failure to follow rules covered by this section can damage the Machine and will void your warranty.

02.01. Always use properly grounded electric outlet

Please make sure that your electric outlet is correctly grounded.
You can use the "3-Wire Circuit Analyzer" to confirm that it is.
At the time of writing this manual, such analyzers are available at Home Depot for around $ 20.

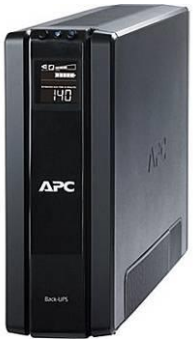
02.02. Ground the Machine frame

We recommend that you ground the Machine's frame, to prevent electric shock. Grounding the Machine frame is a separate measure that does not substitute using of grounded electric outlet. There is a connector for grounding, located on Machine's frame (close to control console for Model Sprinter, and at the bottom of one of the legs for Models Max and Super-Max).

02.03. Use battery back-up (UPS)

We recommend using a battery back-up device with **surge protection** and **voltage stabilization** functions and plugging both your etching Machine and PC into it. Surge Protector will protect Machine's electronic circuits from your local grid's power surges and failures. When both Machine and PC are connected to the battery back-up device, etching process will continue in case power completely goes out.

Battery back-up devices can be purchased at your local computer store. They are rated by the capacity of the battery. We recommend to purchase the UPS with the highest VA rating for your budget. (VA (Volt-Ampere) parameter, which is usually printed on the box and looks like 650, 750, 1000 etc, determines the energy that battery back-up is capable of providing, in case of grid power failure.



02.04. Connect both PC and Machine to the same outlet

Make sure you connect both PC and the Machine to the same power outlet (or, ideally, same battery back-up device).

02.05. Prevent damage to the Machine

Your Machine's etching head is equipped with advanced automatic surface-tracking sensor. This means that Machine will automatically set and maintain constant clearance (gap) between the etching head and stone by moving the needle up and down as necessary in the process of etching. This technology significantly improves quality of etching, but can result in issues if etching needle leaves the surface of the stone during the etching process.

It would typically happen if your picture size is set to be bigger than the surface of the stone. Should the etching needle leave the surface of the stone, the surface tracking algorithm will lower the needle to ensure the correct gap. As a result, the etching head will go down until it reaches its lowest position or finds another surface.

Machine's control software is designed to identify such situations and stop the etching process. In rare cases, this protective measure can fail, or not react fast enough, which can result in the etching head hitting the stone with its side, causing damage to the etching head / sensor, or other parts of the Machine.

Another scenario where this could happen is when you move the etching head in lowered position and it hits the stone with its side, or with the diamond tip.

Situations described above should be avoided. Any damage resulted from hitting the stone on the side with etching head will void your warranty. We will still gladly repair your Machine and provide spare parts, but it will be at the owner's cost.

To prevent such situations, ensure that:

- You measure and correctly enter the size of your etching prior to pushing "start" button
- When positioning the etching head, raise it to its highest position (Z axis) before starting to move along X and Y axes.

02.06. Do not obstruct Machine's moving parts

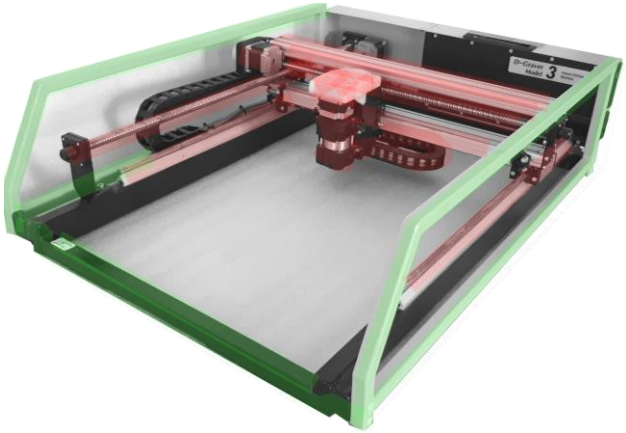
Objects obstructing the movement of Machine's components can damage the Machine.
Never leave any objects in the working field of the Machine, or in the areas that would obstruct flexible electric cable conduits.

02.07. Transporting the Machine (Sprinter model)

The compact (Sprinter) model is designed to be put on top of the stone.
It can also be transported between the work sites. Machine weighs around 62 Pounds, or 28 Kg and can be carried by one or two persons.

Whenever transporting the compact Machine, please follow the rules below:

1. Disconnect power cable from control box prior to transporting
2. When carrying the Machine, do not lift it by the parts of its precision positioning mechanism.
   In below photograph, the parts of the frame that are **ok to lift the machine by** are highlighted in green. Do not lift the machine by the parts highlighted in red (linear drives, screws, rails, cable conduits, step motors).



When putting down the Machine, make sure that you use either of two positions:

- "Normal" position shown in above photographs
- "On the side" position as shown in below photograph

3. What you need to begin etching.

03.01. Components included in delivery

Following components are included in delivery of the Machine:

1. DiamondEdge™-300 etching Machine.
2. USB Flash Drive with DGStudio software installer.
3. 2 spare etching needles (in addition to one installed in the Machine).
4. External keyboard for etching head positioning.
5. Manual (this document).

03.02. Components to be provided by you

In order to start etching, you will need to acquire:

1. Battery back-up device with surge protection function (optional, but highly recommended to ensure uninterrupted etching in case of power failure).
2. Flatbed Scanner (in case you are planning to scan paper photographs).
3. PC to control the Machine and to prepare images for etching.

03.03. Requirements for PC configuration

To control the etching Machine, you will have to install our proprietary software, DGStudio, on a PC running Microsoft Windows.
At present, our software is not compatible with Apple's operating systems, any version of Unix/Linux, or ChromeOS.
We have tested DGStudio software on Windows versions 10 and 11 , so it should work with those operating system versions.
For the best experience of running DGStudio, we recommend that you use a reasonably fast PC, with at least 8GB of RAM. If you are purchasing a new PC for controlling the etcher, we recommend that you buy one with Intel's i3 , i5 or i7 processor.
If you use an existing (older) PC, or consider buying a PC with other CPU, we recommend consulting this web page:
https://www.cpubenchmark.net/cpu_list.php
Locate your CPU model in the list, and check its "Passmark CPU mark" (2nd column). The higher that value, the faster is your PC. We recommend to use PCs with Pass mark score of at least 1500.

4. Important tips for using the machine

04.01 Avoid leaving the etching head without diamond tip inserted

The etching head uses magnetic grip for diamond needles. This means that there's strong magnet embedded at the end of the slot for diamond tip. If you leave that slot open, metallic dust that might be available in your workshop will stick to it. Such dust is very hard to get out of the socket, and might prevent the tip from being firmly held in place as meant by our engineers.

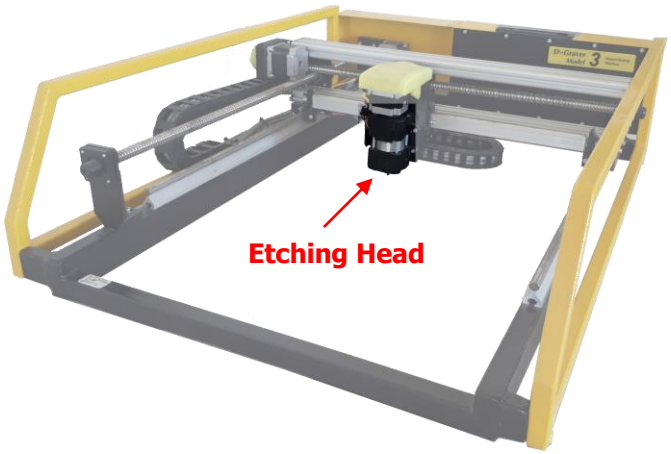
04.02. Use mouse rather than touchpad

We strongly recommend that in case you connect your etcher to a laptop PC, you use the external mouse rather than the touchpad.
The reason for this is that touchpad does not provide enough precision of cursor positioning.
Also, it is very easy to unintentionally press buttons in the software with touchpad by tapping on its surface.
In case you wonder what mouse to get - it does not matter whether mouse is wireless, or "old-school" wired one.
For purposes of using our software, even the most inexpensive mouse is much better than any touchpad.

5. Getting to know your etching Machine

05.01. How does it work

Your Machine is based on the most recent achievements of CNC (Computer Numeric Control) technology.
Its main part is the **etching head** capable of moving in all 3 dimensions. Etching head vibrates in vertical dimension (perpendicular to the material being etched), which results in sharpened-diamond etching needle physically hitting the stone and creating the image.



As already mentioned above, the etching is created by the diamond engraving tip (needle). Diamond tip is a consumable component of the machine, and requires replacement once diamond wears out (becomes dull). There is no exact way to predict how long each diamond tip will last, but the rule of thumb is that every tip should last for approx. 20 to 30 portraits sized 10 x 10 inches. If you are etching larger scenes, you can recalculate usage of diamond needle depending on the size of your scene.

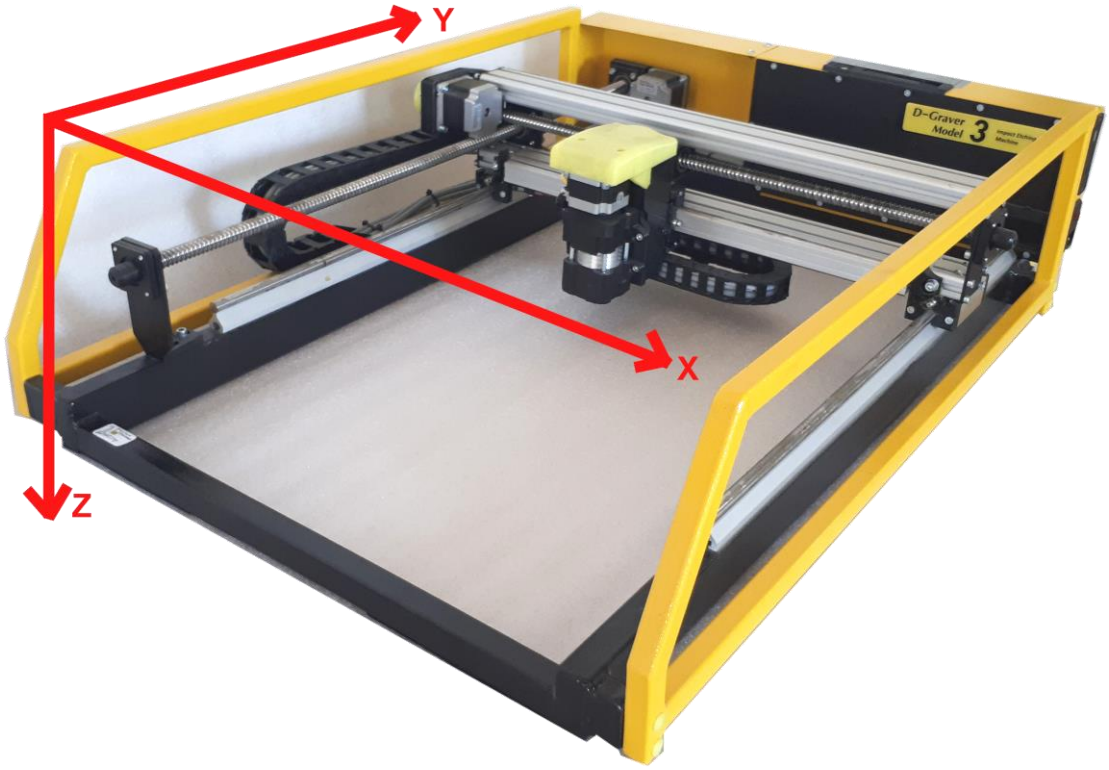
Diamond tip is held in the etching head by a magnet, and can be removed / replaced by simply pulling the tip out with your fingers, or with small pliers (if you use any instrument to pull out the tip, make sure that you are not applying lateral force or trying to rotate the tip, the tip should come out very easily when pulled downwards)

Machine uses an **automatic gap sensor**, which maintains the optimal distance (gap) between the etching head and the material.

05.02. System of coordinates

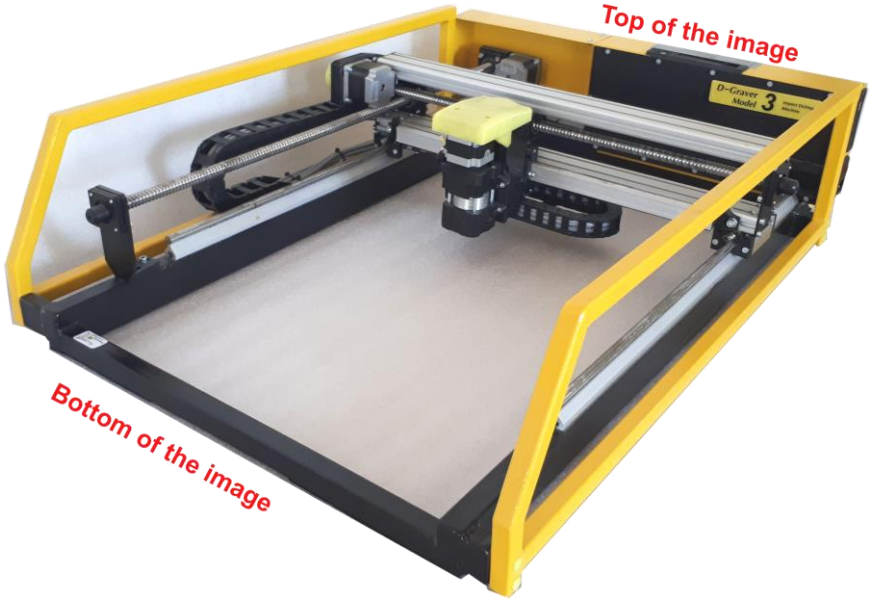
Below picture illustrates Machine's system of coordinates

X axis corresponding to picture's width
Y axis corresponding to picture's height
Z axis corresponding to etching head's up and down movement
On our compact etcher (DiamondEdge Sprinter), axes are oriented as below:



05.03. Image orientation

Image etched by the Machine will be oriented as shown below
(this illustration is meant to help you understand how image oriented in certain way on your PC's screen will appear on the stone)



05.04 External Keyboard

External keyboard provides you with fast and easy way to position your etching head before starting your etching. (Other methods of etching head positioning are : buttons in DGStudio program).
Because keyboard is connected to the Machine using USB cable, you can come closer to the etching head when positioning it for your etching job.

To start using external keyboard, simply plug it into the USB outlet on Machine's control box.
Keyboard allows you to initialize the Machine by pushing and holding the button in the middle of the arrows for 2-3 seconds
Key assignments:

Left and right arrows (buttons 4 and 6)	moving by X axis
Up and down arrows (buttons 8 and 2)	movement by Y axis
Diagonal arrows (buttons 1, 3, 7 and 9)	simultaneous movement of the axes X and Y
Button 5	is a multifunctional button, the assignment fully coincides with the multi-function button of the Machine
Buttons "+" and "-"	raising and lowering the caliper (Z axis)
Buttons "/" and "*"	increase and decrease in speed by four fixed values

Note:
* It is possible to use any standard USB keyboard as a control panel.
** A rare keyboard failure was detected when the machine was turned on. In this case, after loading the machine, briefly connect any other USB device to the machine (flash drive, other keyboard, etc.), then reconnect the external keyboard to the machine.

05.05 How to connect to the machine

Machine's wireless antenna allows you to connect the Machine to your local Wi-Fi network and to control it from the DGStudio.

Please read section "10 Connecting to the etching machine" for more details

6. Assembly instructions for DiamondEdge™ Max and DiamondEdge™ Super-Max machines

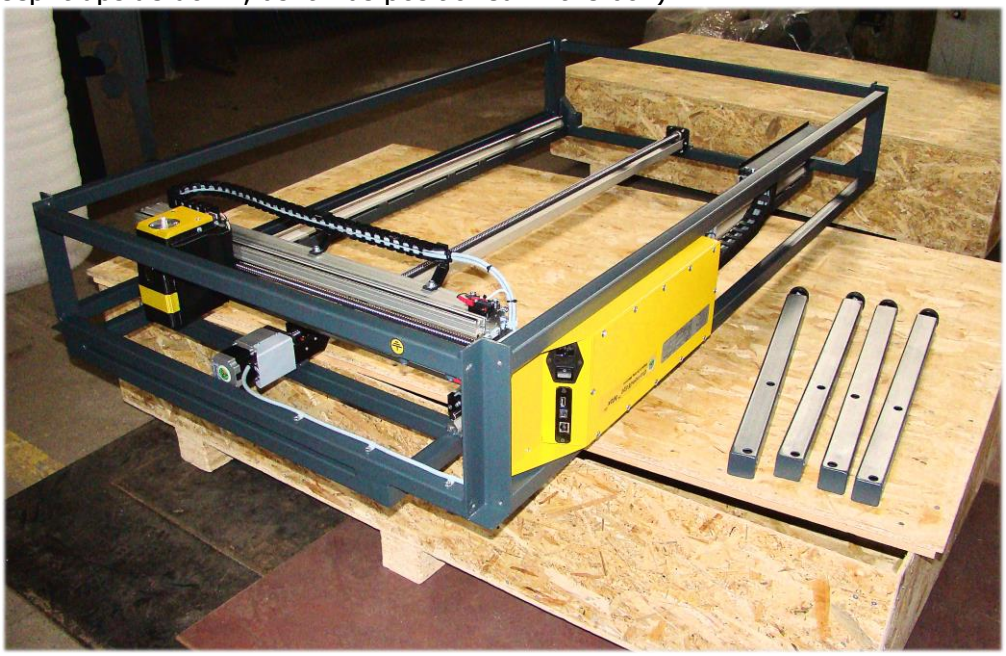
This chapter applies to DiamondEdge™ Mas and Super-Max machines only. Please skip it if you are using Sprinter model

6.1 Detach Machine from the transportation bracket.

Using the hex key, detach the Machine from the bracket. Remove the 2 screws highlighted below.

6.2 Pull Machine from the box and place it upside down on a table.

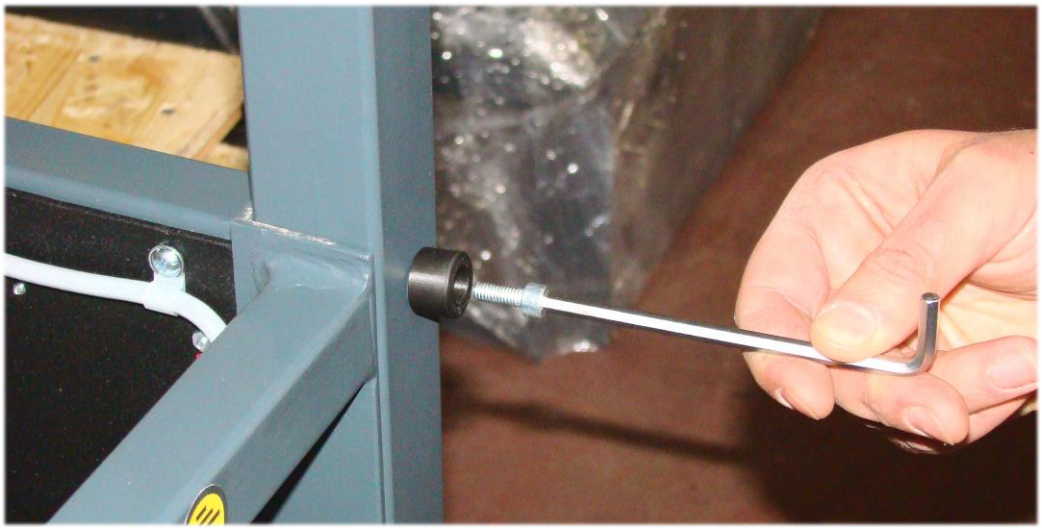
At this point, you will have to use at least 2 persons to remove the Machine from the box. Machine is shipped upside down. Once the transportation bracket is removed, use help of another person to lift the machine from its box and place it on some flat surface (do not flip the machine over yet, keep it upside down, as it was positioned in the box)



6.3 Attach the machine legs

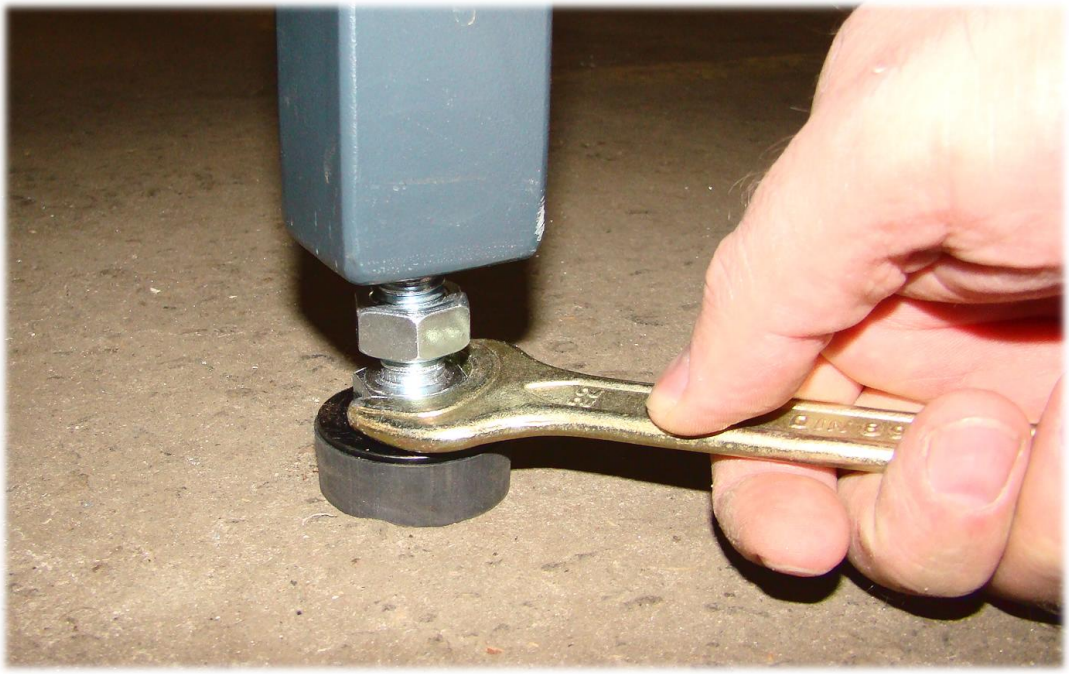
Attach the legs to the frame using bolts provided with the machine, and the special installation tool, shown below.

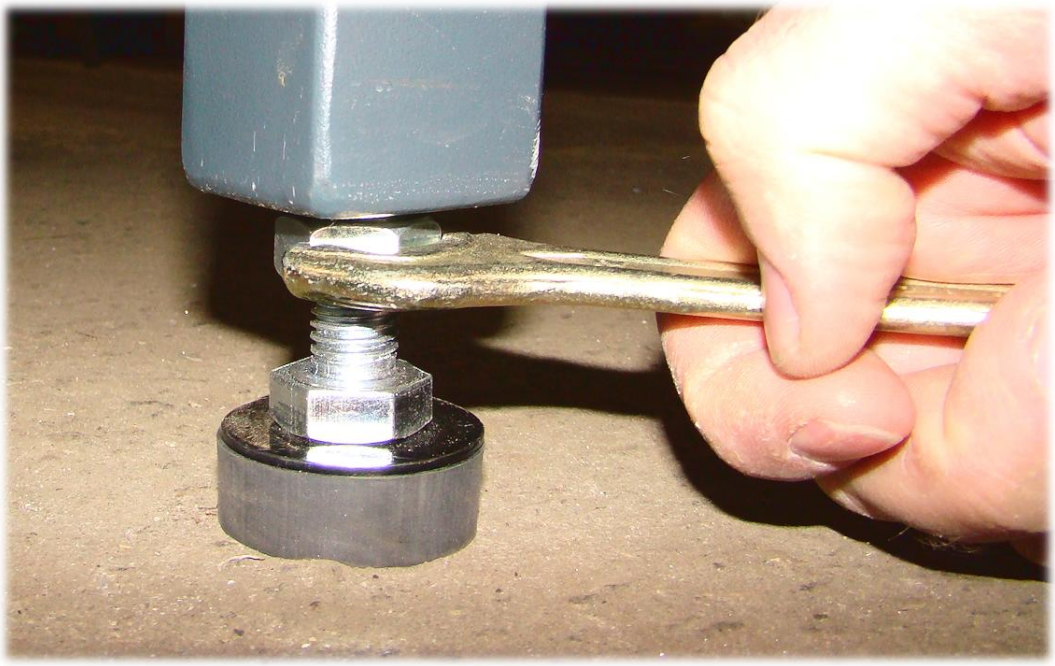
First, insert the installation tool shown above into holes, then use hex key to screw in the bolts. Bolts will go through the tool, allowing you to remove it once you are done. Then, reuse the tool on the next hole. If one of the screws falls inside the cavity of the leg, you can shake it out through the hole in the leg.



6.4 Flip the machine over and adjust the leg tips

Minimum of 2 persons are required for this operation.
Position the machine on firm surface that will not compact or move (ideally, cement floor)
Then, use the wrench provided with the machine to adjust the leg tips, and to make sure that machine does not wobble and the frame is level.
Then, use the second nut to fix the leg tips, so that they do not move due to vibrations etc.





7. Important tips

7.1 Position Machine and stone on firm, solid surface

While your etching machine works, it is important that it does not move vs the stone. The gap between the tip of the diamond needle and the stone is only 0.18mm, or 0.007 inches.
With such high precision of etching head positioning, it does not take a lot of movement to affect your etching.
Therefore, make sure that your Machine is sitting on the firm surface that does not allow it to move or slide. Any kind of soft surface, such as carpet or padding, should not be used to place the Machine on.
For the stationary Machine, the best kind of floor to use is the cement floor.
If you end up placing your Machine on a wooden floor, please be aware that walking around the Machine while it etches might create enough dislocation to affect the quality of your etching.

Likewise, please do not touch Machine's frame, let alone lean on it, while the etching process is ongoing.

7.2 Make sure that stone does not move vs. the Machine

You should make sure that the stone does not move vs the Machine while etching is ongoing.
If you use compact machine to create etchings on larger stone, you would simply put Machine directly on top of the stone, and no problem of relative movement of machine vs stone would exist.
If you, however, are creating proofs, or smaller etchings, by placing smaller piece of granite inside of the Machine's frame, please make sure that your tile would not wobble or slide laterally during the etching job.
To ensure that, try putting 2-3 layers of damp paper towels underneath the stone.
In some cases, particularly for smaller pieces of stone, you might have to come up with creative solutions for making sure the stone does not move, such as using mechanical clamps, 2-sided scotch tape etc.

7.3 Open your files from the local hard drive

If you use cloud storage (dropbox, google docs) or network drive for saving your image files, please make sure that you copy files for etching to your local hard drive and open them from there.
Also, please avoid opening files for etching directly from USB flash drives.
It is ok to use flash drives to transfer files to your PC, just copy them to your local hard drive first, and then open them from your local drive with DGStudio.

7.4 Do not change the "Material Definition" if your calibration image looks good

This rule will save you a lot of effort and frustration. If the calibration image looks good on stone, do not change "Material Definition". For more on this topic, please read chapter "14 How to make sure that your etchings look great".

7.5. Make sure that surface of the stone is within the range of the etching head's vertical movement

Before starting the etching, execute the "Surface-sensing" procedure and make sure that the stone's surface is located within moving range of Z axes (which is approx. 2.5 inches).
Your Machine is equipped with the surface-tracking technology, but the etching head will not be able to track the surface if it goes outside of its control range.
If you use compact machine and put it right on top of the stone, then you should not worry about the surface of the stone being within movement range of Z axis.
In all other cases, it is useful to execute "Surface sensing" procedure in all corners of the stone before starting the etching.
See section "12.5.1 Making sure that surface of material is within the range of Z axis" for more details

7.7 Make sure that the etching you are planning to create will fit on the stone that you have

Measure the size of your etching, and make sure that you select correct starting position for your etching head when launching your etching job. Remember that you have 8 options for positioning your etching head:
4 corners of your future etching, or middle of each side.
See section "12.5.2 Etching head positioning vs. your etching" for explanations and examples.
Also we recommend that you familiarize yourself with the "Perimeter Walk" function covered in chapter "12.6 Perimeter Walk". It will help you visualize the location of your future etching before launching the etching job.

7.8 When preparing images for etching, make sure that unused areas have color # 0

Areas of your image that you do not want to be etched should be filled with black color (color # 0). Machine's software is designed to ignore black areas. This means that etching head will not even move to black areas if they are on the margins of your image, or will quickly run over them, if they are inside of your image.
This will save you the etching time.
Understanding that machine's head will not move to the black areas outside of your image helps you ensure that you can fit your etching on irregularly-shaped monuments without the etching head sliding off the surface of the stone.

7.9 Do not increase your etching resolution unnecessarily

Engraving resolution that you are using for etching is expressed in Dots Per Inch (DPI) and is configured at the "Material Definition" level. It tells your Machine how many "hits" with diamond tip to create per inch of stone surface. Increase in etching resolution will cause machine to put those hits closer together.
If you increase the etching resolution above our recommended range of 90 to 130 DPIs, it will have two effects: (1) you will lose halftones in your etching because image's halftones will become too white ("overexposed"), and (2) the duration of your etching will increase.

Here is some math about relation between etching resolution and etching time:

- If you etch the portrait sized 10 x 10 inches with etching resolution of 100 DPI (dots per inch), then, your machine will have to create: 10" x 100 DPI x 10" x 100 DPI = 1,000,000 hits to complete the image.
- If you then increased your etching resolution by 20%, to 120 DPI, then etching the same 10"x10" portrait will require: 10" x 120 DPI x 10" x 120 DPI = 1,440,000 hits
- Since etching head always vibrates with the same frequency (approx. 300 hits per second), this means that 20% increase of etching resolution will result in 44% increase in etching time (square dependency). Likewise, if you double your etching resolution, etching time will quadruple etc.

7.10 Use Jarvis dithering method as your first choice

(If you are unfamiliar with the term "Dithering", please read chapter "15 Dithering methods")

Using Jarvis as your primary dithering method might be quite a change if you used previous models of our etching machines (Granite™-CP or SX).

For Granite™ machines, we instructed our customers to use Offset as their primary dithering method.

For DiamondEdge™ line of machines, however, due to improvements made to our etching head, we suggest that you use Jarvis as your primary dithering method, with resolutions in range of 92 to 130 DPIs.
The advantage of Jarvis dithering is the brightness of the image and that it looks better on stones with imperfections.

7.11 If your PC has touchpad, do not use it with DGStudio. Use regular PC Mouse instead.

We strongly recommend that you use conventional mouse, either wired or wireless, with your PC and DGStudio software that comes with the etcher.
Touchpads and very unprecise and you can accidentally click the button in DGStudio program by simply placing your finger on the touchpad.

8 Preparing your PC for installation of DGStudio

All steps and recommendations in this section are optional and contain best practices that we collected over the years to ensure that your PC works best with your etching machine. You can skip them for now, and proceed directly to section 8, or come back to these recommendations later. We would still strongly advise that you follow our suggestions from this section.

8.1 Remove bloatware installed on your PC by its manufacturer

"Bloatware" is the term used to describe **some** programs that come preinstalled on your PC. Such programs are usually installed by PC's manufacturer without your consent, and quite often are meant to force–feed you additional services provided by PC's manufacturer, or to sell subscriptions from affiliated companies.

We cannot provide step-by-step instructions for bloatware removal, because different manufacturers install different bloatware on their PCs. "Bloatware" programs are not needed to operate the etcher, but they will slow down your PC , consume its resources and can potentially interfere with functioning of DGStudio.

For example, some anti-viruses and anti-spyware programs might prevent DGStudio from running properly.

We usually recommend the following approach:

- If you will be using some older PC that was used for some other purposes before, "reimage" the PC using the original copy of its operating system (the one it came with). In most modern PCs, the copy of its original image is stored in protected partition on the hard drive and can be recovered at any time if needed.
  Usually, such "re-imaging" is done by pressing certain key when your PC is being booted up. Unfortunately, that key differs by manufacturer. Reimaging will recover PC to its original state, removing all applications that were installed on it during the prior use.
  Below are a couple of useful links to resources talking about reimaging your PC:
  http://www.pcadvisor.co.uk/how-to/laptop/factory-reset-laptop-image-3462995/
  http://windows.microsoft.com/en-CA/windows-8/restore-refresh-reset-pc

- If you have just purchased a new PC for use with the etcher, or "re-imaged" your PC using above steps (which will also recover all standard "Bloatware" !!), go through the list of programs installed on your PC, and uninstall unnecessary ones.
  We recommend that, unless you are planning to use your PC for browsing internet, you also delete all anti-viruses and anti-spyware that your PC comes with. Anti-viruses are usually provided with some 6-12 months of free use, and make you buy a commercial license after that, so their use is limited. They are also prone to starting auto-updates and rebooting your PC when you least expect it.
  Remember that you can always restore your PC to its "virgin" state by reimaging it again.
  Below are a couple of good links to automated tools for bloatware removal:
  Please use with caution
  - https://www.pcdecrapifier.com/
  - http://www.shouldiremoveit.com/index.aspx

9 Setting up DGStudio software

DGStudio if our proprietary software, required to control your DiamondEdge™ Machine.
It is included in delivery of your etching machine as installation file located on the USB Flash Drive or CD.

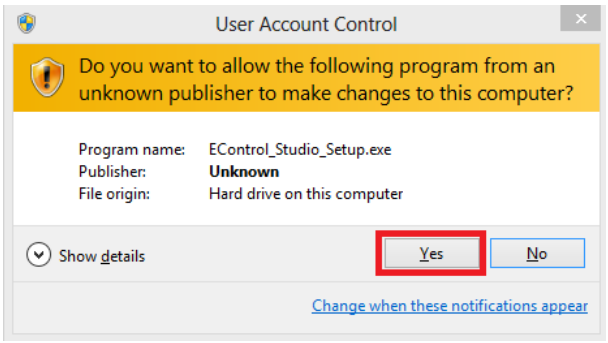
In case you misplaced your copy of the software, please contact us at support@ImpactEtching.com or at the address of your local distributor, and we will send you the download link, for free.

As an extra option for additional cost, some etchers will come with notebook PC that has DGStudio software preconfigured.
If that is the case with your machine, please skip this section. PC that came with your etcher has all required software preconfigured.

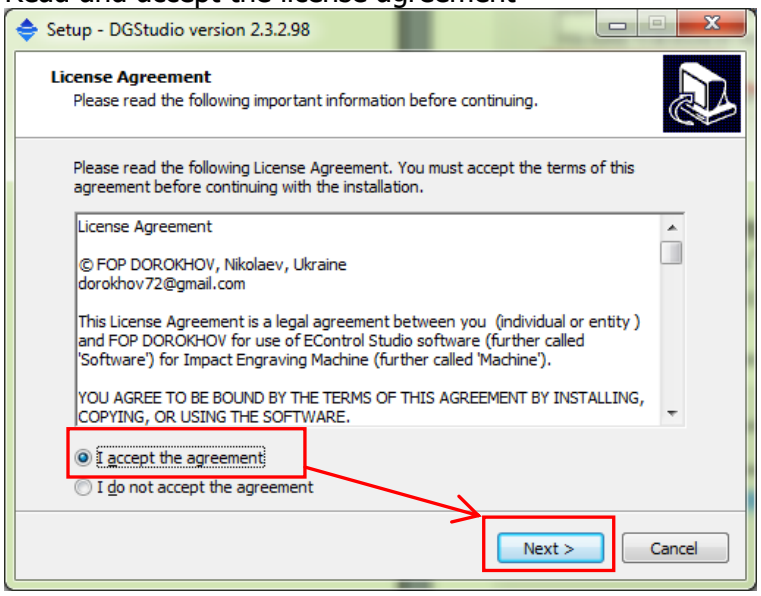
9.1 Install DGStudio

We usually ship DGStudio installation software on USB flash drive
Please plug that USB Flash Drive into your PC, and run file named DGStudio_Setup_xx.xx.xx.xx.exe where xx.xx.xx.xx – version of software such as 2.3.2.85.

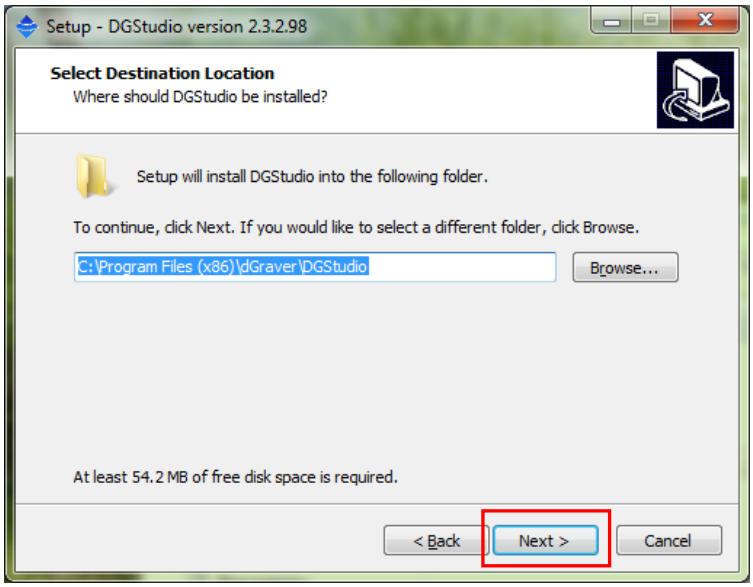
You might be presented with the following or similar warning:
Press "Yes"



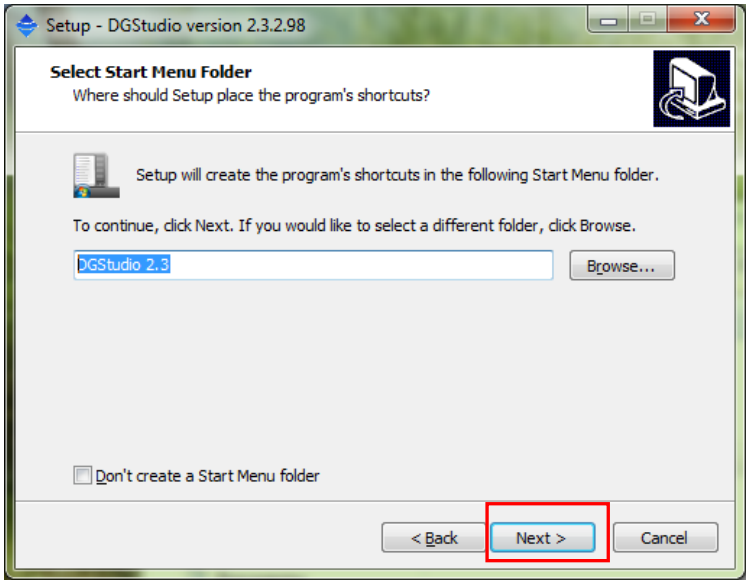
Read and accept the license agreement



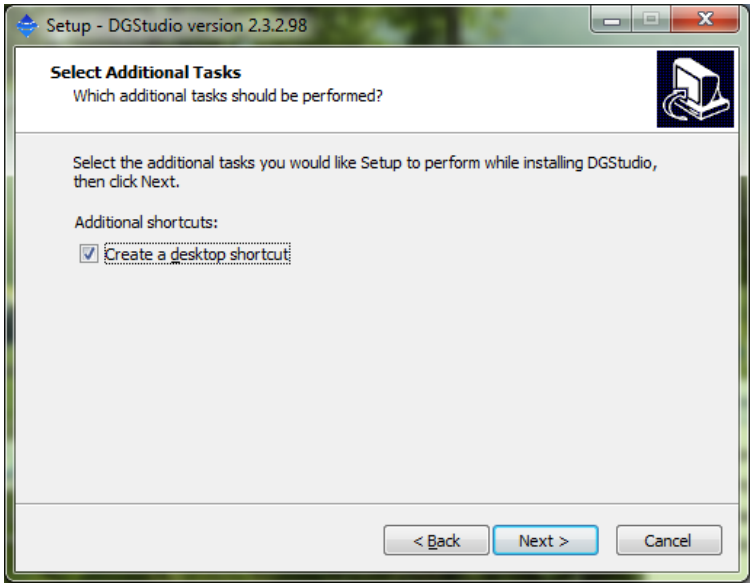
Select the directory into which to install the software. We recommend that you leave the default location here and simply press "Next"



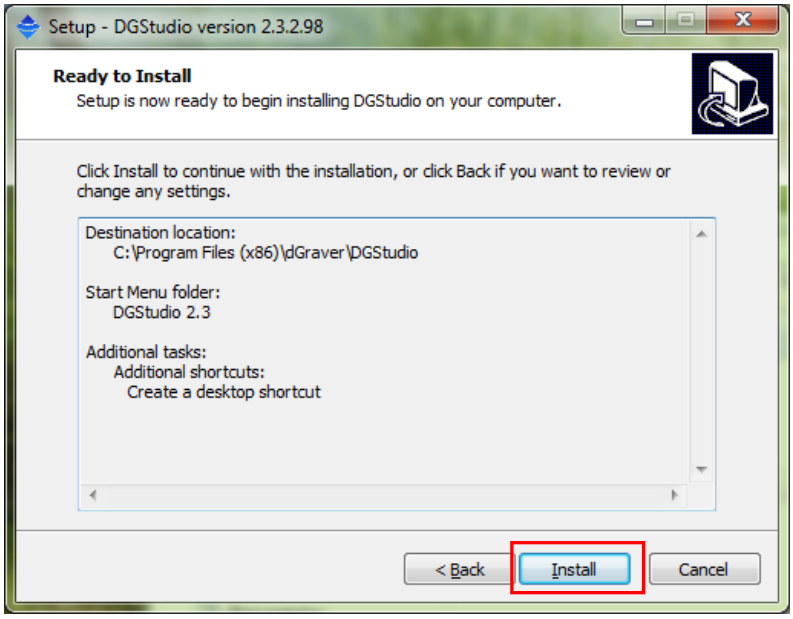
Choose the name of the folder where software will be installd. We recommend to leave it to its default name and to click "next".



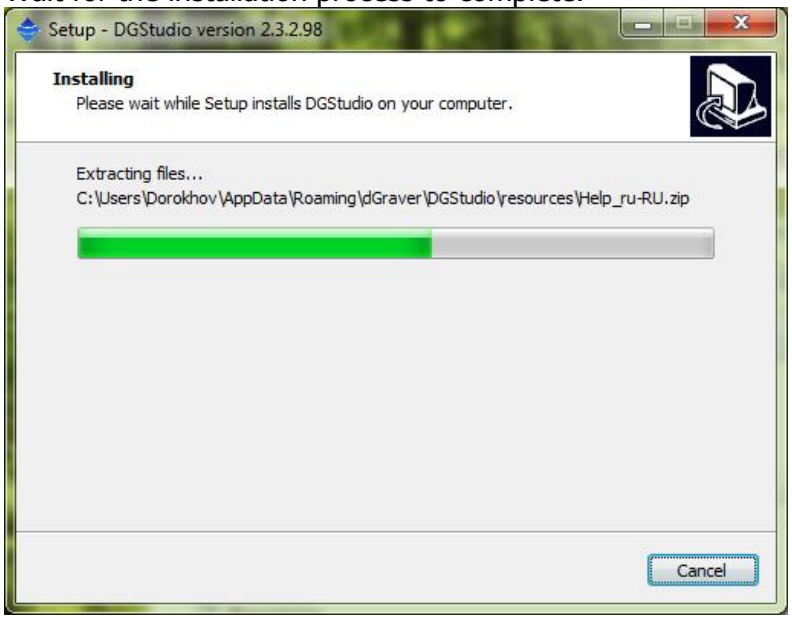
Choose if you want to create desktop icon. We recommend that you do… Will be easier to locate the program.



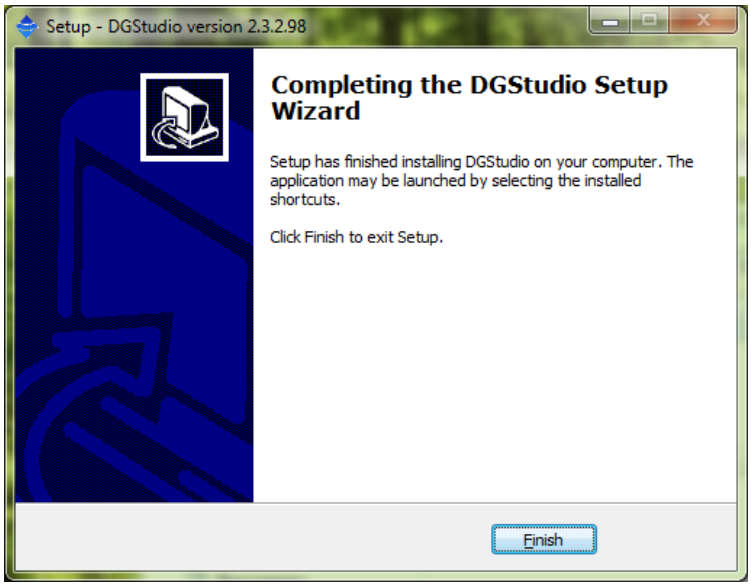
Next screen shows the summary of your selections. Click "Back" if you want to change anything. Click "Next" to start installation.



Wait for the installation process to complete.

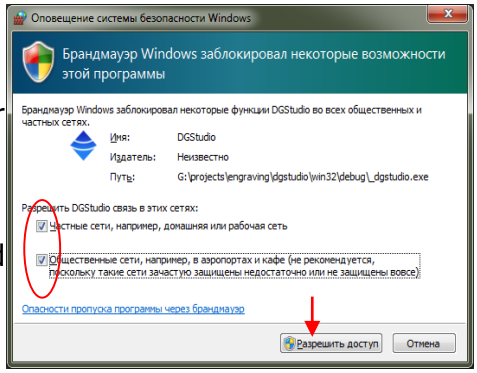


Press “Finish” to complete installation



10. Connecting to the Etching Machine

10.1 Connecting you PC to the Etching Machine



There are four ways to connect to the machine.

Important: The DGStudio must have access your network in order to work correctly.
Windows will ask for permission the first time you start DGStudio (see the screenshot on the right). Allow Full Access.
If you use third-party protection programs, such as anti-viruses and firewalls, add DGStudio to the its list of allowed programs.

Method 1. Direct connection via Wi-Fi

The machine includes Wi-Fi access point.
After it has been booted up, simply connect your PC (one or more) to the machine's WiFi network.

Network name:**MAGNUS-xxxx**, where xxxx are letters and numbers (eg **MAGNUS-SP2101**)

Connection password: **12345678** or printed on the machine's sticker.

Note: Some machines might be shipped with different network name and connection password, in which case they are printed on the **machine's sticker**.

IP address of the machine **192.168.3.1**

- Run the DGStudio control program, the machine will be automatically found and connected
- Open the browser on your PC or mobile device; enter the machine address 192.168.3.1 in the address bar. The machine control page will open.

The obvious disadvantage of this method is that if you use your wi-fi connection to connect to the machine, you cannot at the same time connect to the internet using the same wi-fi connection.
If you do need to be able to access internet and etching machine at the same time, you need to configure your etcher to work in pass-through mode. In pass-through mode, your etcher connects to internet via wi-fi, and you connect to the etcher, also via wi-fi. In this case, internet traffic gets passed through your etcher, and you get to both access internet and control your etcher at the same time.
This pass-through configuration is described below, in Method 3

Method 2. Direct physical cable connection to PC

By default, the machine is configured as a server with the ability to provide IP addresses (DHCP server).

Use the supplied cable by connecting it to the machine and the RJ-45 connector on your PC. If your PC does not have an RJ-45 connector or it is busy, use the supplied USB adapter.

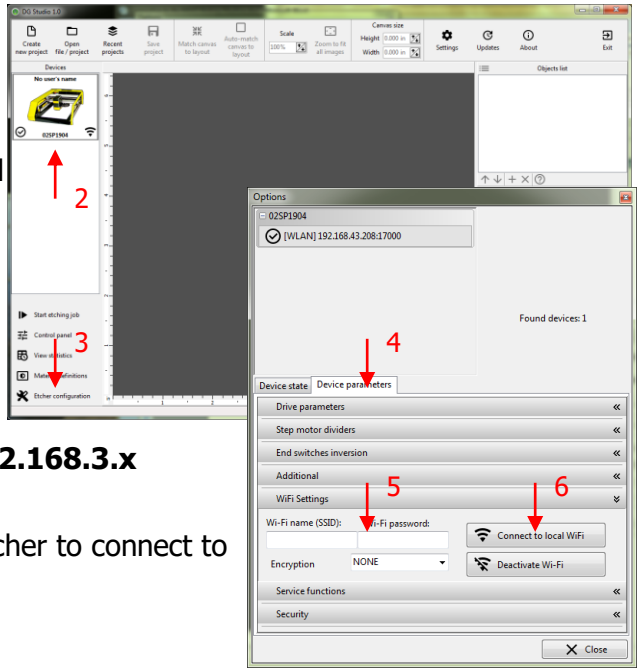
Machine IP address **192.168.100.1**

For a direct cable connection, you can use a cable (cross patch cord) up to 100 meters (300 feets) long.

Method 3. Connection via physical cable to your local network

For a cable connection to your local network, you must first switch the cable network interface of the machine to client mode. Please see "10.2 How to change network mode**".**

Run the DGStudio control program, the machine will be automatically found and connected



Method 4. Pass-Through mode

This is the recommended method of connecting your etcher to your PC.

Important! Your network ip address cannot be **192.168.3.x**

- **<u>Setting up a connection using a Windows PC:</u>**

  After connecting via Method 1 or 2, you tell your etcher to connect to your local WiFi network.
  For this:

  1. Run the DGStudio control program.
  2. Select a machine, see pic below (if there are two or more of them in your network)
  3. Click the "Etcher configuration" button
  4. Go to the "Device Parameters" tab and open the "WiFi Settings" section.
  5. Enter your network name (SSID), network access password (if present) and the type of encryption (WPA2 is usually)
  6. Click the "Set network settings" button.
  7. It can take up to two minutes to switch the network mode. Current connections will be lost.

  No reboot required. If the entered information is correct, the machine will always automatically connect to your local network when switched on.

Note:

** If you are not planning to use the etcher in pass-through mode via wi-fi connection, we recommend to the wi-fi connection by pressing a button "Deactivate Wi-Fi" (see above screenshot). If this is not done, the machine will constantly try to establish a connection to a missing network, which will lead to periodic "freezing" of the machine control

- **<u>Setting up the connection using the machine control web page:</u>**
  After connecting via Method 1 or 2, you tell your etcher to connect to your local WiFi network.
  For this:
    1. In the Main Menu, select Settings > WiFi Settings
    2. In the displayed list, select the required network and click the **Connect** button
    3. Enter the network password if required

The button  will clear the list of saved networks and disconnect the connection to your local network. **The machine access point will continue to work!**
It is **recommended to disable** access to your local network if the local network is disabled or unavailable for the machine.

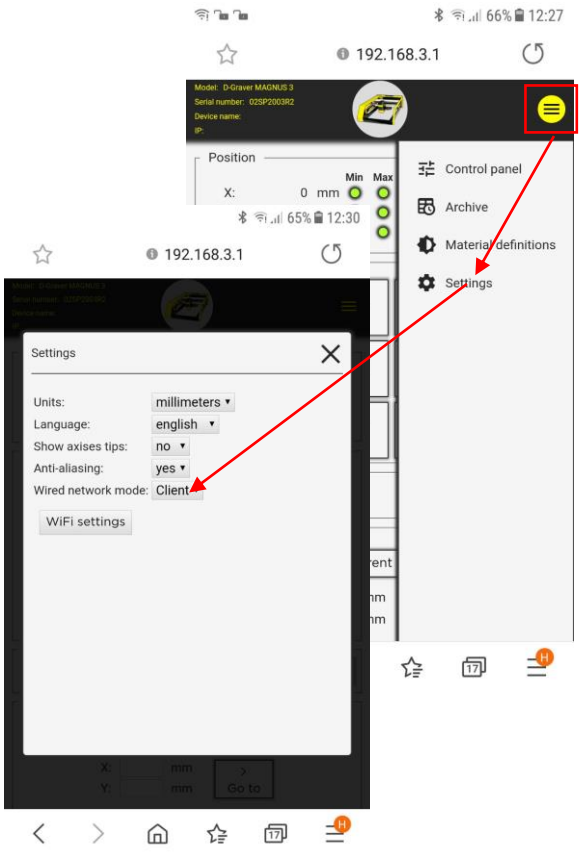
10.2 How to change network mode

After connecting via Method 1 or 2 (described above):

1. Open the machine control web page in any browser on your device that is connected to the machine. The connection address is specified in the description of the method you are using
2. In the Main Menu , select Settings
3. Choose wired network mode "Client" or "Host"

It can take up to two minutes to switch the network mode. Current connections will be lost.

No reboot required.



Note:

- set "**Client**" mode to connect the machine with a cable to the router of your local network
- set "**Host**" mode to directly cable your machine to your PC

11. Creating your first test etching

The best way to learn new technology is to try it.
If you read and followed all previous sections, you are now ready to give it a try.
This section will guide you through the process of creating your first etching, using the default "Material Definition" and test image provided with the Machine.

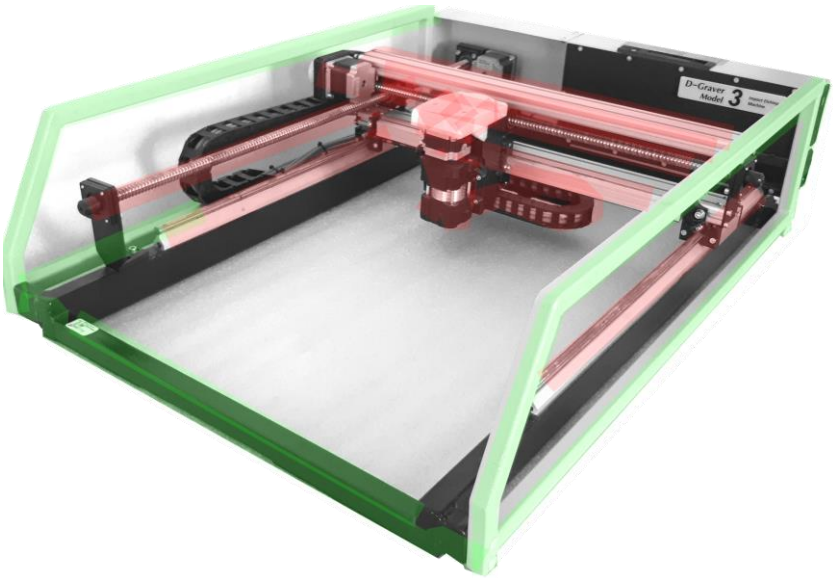
For this first etching, we will not bother with making sure that Machine is configured ideally to work with the type of stone that you will be etching on. "Material Definitions" that Machine ships with was created for generic black granite and will likely produce great result on most black granites.
So, please locate a piece of polished black granite for this lest, and let us start ! We will deal with more detailed topics in subsequent chapters of this manual.

11.01. Unpack the Machine

If you are reading this manual, you have likely figured out how to open the box already.
If your box is still not opened, remove the screws at the base of the box, and pull the lid up.

Mechanical subsystem of your machine is based on high-precision industrial ball screw actuators. It is important that you do not compromise their geometrical integrity while transporting the machine.

So please do not touch, let alone – lift your etcher by the screws, glides, and other surfaces that are parts of machine's actuator subsystem.
Below photograph highlights in green the surfaces that can be used to lift the machine, and in red the ones that you should not touch.



11.02. Position the etching machine on firm, solid surface

As pointed out above in sections 7.1 and 7.2, it is extremely important that machine and stone do not move against each other during the process of etching.
This means that you should not put your machine or material being etched on any surface that will contract (carpet), or move up and down due to vibrations (wooden floor).
If you have a compact machine (Sprinter model), the best place to put it for your first etching is the desk / table made of hard, smooth material. Most office desks, tables, countertops will satisfy this requirement.

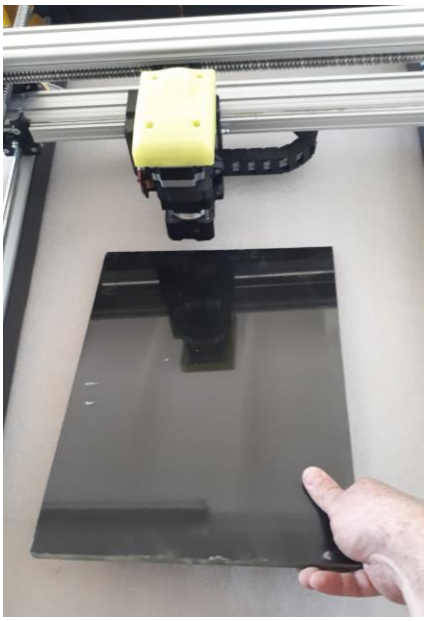
For large etchers (Max and Super-Max), we recommend putting them on the cement floor.
Wooden floors will likely not work because they tend to vibrate as you walk around the machine while it etches.
If all you have at this point is the wooden floor, and you still want to give machine a try, please make sure not to walk around it during the etching job. Also, be aware that any vibrations caused by outside evens (mechanisms located on the same wooden floor, doors slamming etc.) can cause vibrations and lines in etching if your machine is positioned on the wooden floor.

11.03 Position the granite tile for your first test etching

For your first etching, as well as for any proofs that you might want to do when you start using your machine for production jobs, we recommend to use the standard 12" x 12" polished granite tile that can be found in tile stores, or even at Home Depot or Loews.
If you have the compact machine (Sprinter model), simply put the tile inside of your machine's frame. For the stationery machine (Max or Super-Max model), you would have to use some set up to bring the tile inside of the machine frame.

As outlined in section 7.2 above, make sure that piece of stone will not slide horizontally or wobble as your etching progresses.
You can verify that tile is stable by pressing against its corners and making sure that it does not wobble

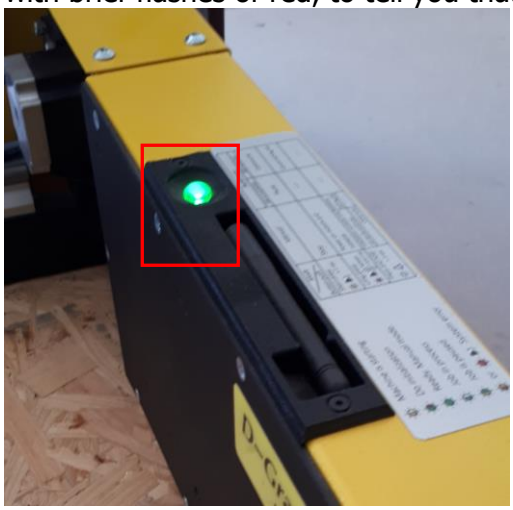
For ensuring that the tile does not slide horizontally during your etching process, we recommend to put a layer or two of damp (almost dripping wet) paper towels underneath it. We have discovered that thin layer of damp tissue or paper towel underneath the tile works best for holding it in place.



11.04 Power on your etcher and wait until it is initialized

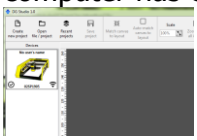
Turn on the etcher using the switch shown below

Wait for the etcher to start. It might take a couple of minutes. The etcher is ready to work when indicator on its control panel is solid green (or in come versions of firmware, it will be solid green with brief flashes of red, to tell you that the etching head is not yet initialized)



11.05 Start DGStudio and connect to the etcher

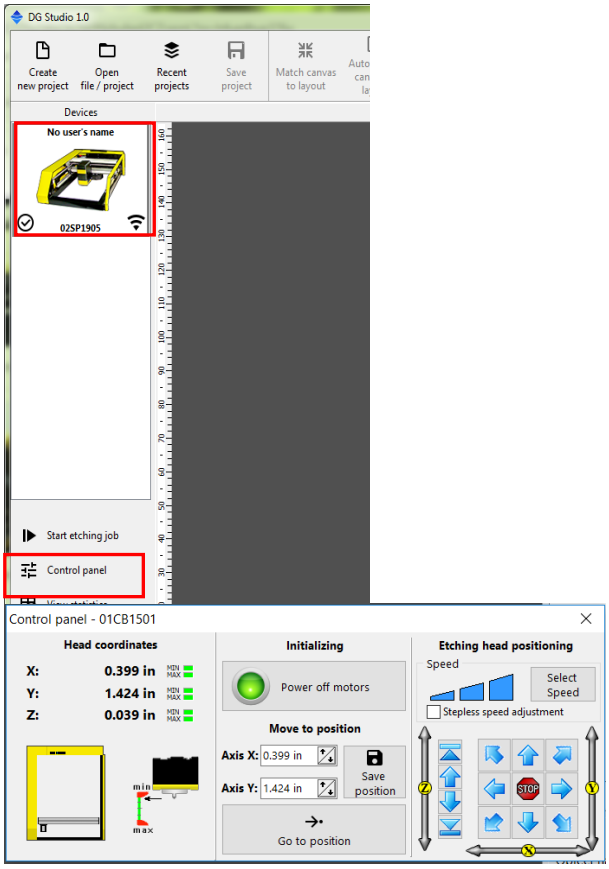
Once you launch DGStudio, it will attempt to find any machine connected to your PC and connect to it automatically.
If after few seconds, the DGStudio screen looks as in the screenshot below, with the etching machine icon displayed on the left, and serial number shown below it, that means that your computer has established connection with the etcher



If you do not see the connection established, please check network access rights as pointed out above in section 10.
If you cannot solve the problem please contact your reseller for help.

11.06 Initialize the etcher and position the etching head

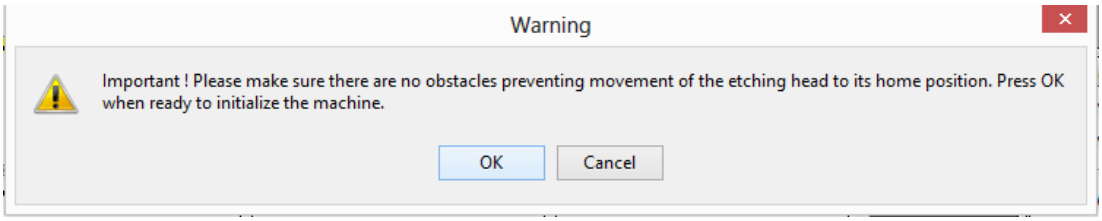
Double-click on etcher icon, or select "Control panel" option to display the "Control panel" window that is responsible for etching head positioning



Initialization process will move the etching head into its "Home" position. Home position is located in the top left corner of Machine's field.
Please make sure that you have left no objects inside of the Machine's frame that would prevent etching head from moving to "home" position

Then, click on "Initialize" button.

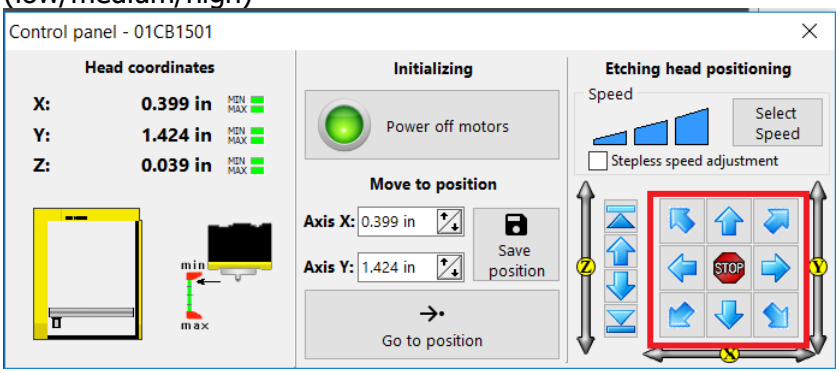
The following warning will be displayed, to remind you that the etching head is about to move. Check once again that no objects will prevent the etching head from moving, and then press ok.



11.07 Position the etching head

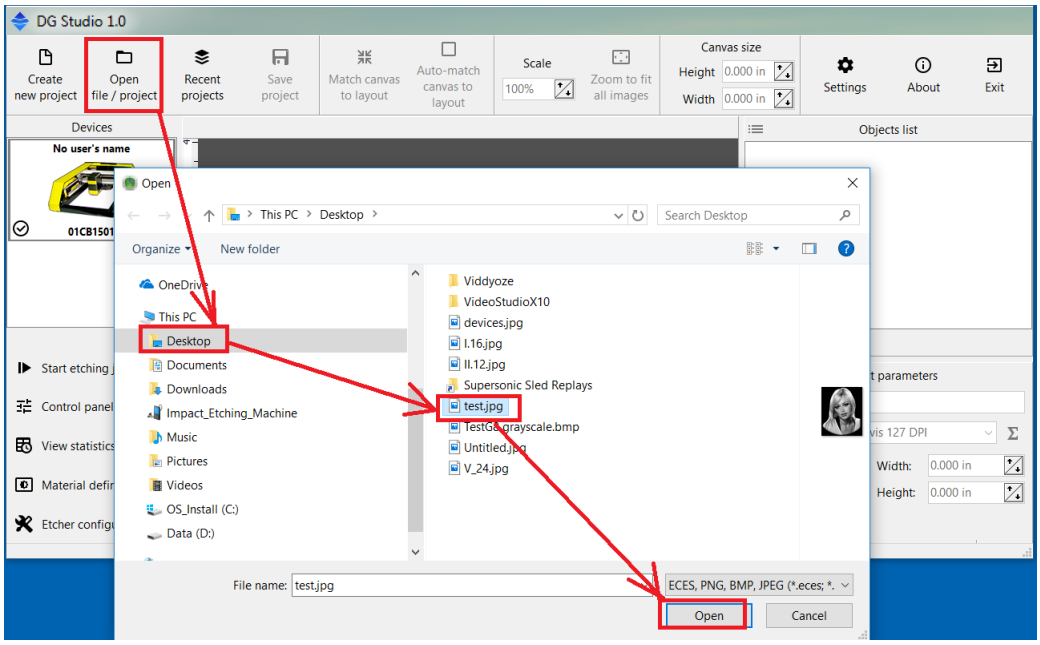
DGStudio allows you to choose any of following 8 starting positions of your etching head: 4 corners of your future etching, or the middle of each side.
For this quick test, we will position etching head in bottom left corner of the area designated for our etching.

Please use buttons on your DGStudio software (highlighted in blue below) to position etching head in the left bottom corner of your tile, approx. ¼ inch form each edge.
Use the slider highlighted in yellow to change the speed of etching head positioning.
Note that you are positioning the end of the etching tip, i.e, projection of the diamond tip over the surface of the stone should be in the place where etching will start. You might want to lower the etching head closer to the material using up/down buttons, to better judge the current location of the etching head. Please always raise the head before moving it.
Use "Select Speed" button located above the arrows to change the positioning speed (low/medium/high)

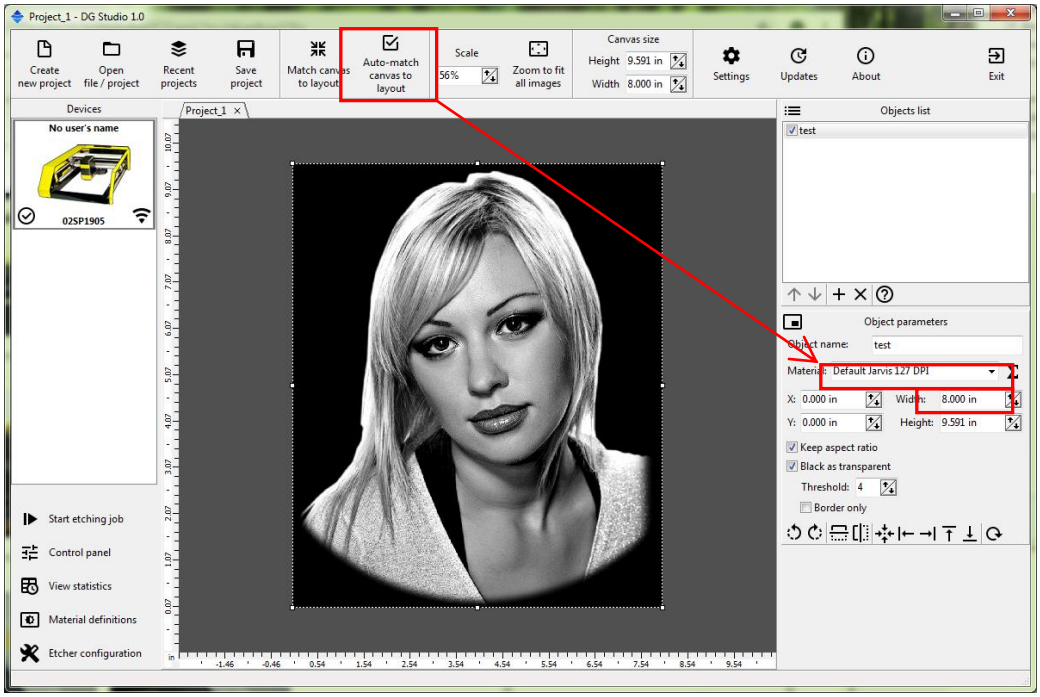


11.08 Open the test image and enter the size of your etching

The installation program has placed the test image called test.jpg on your PC's desktop
Follow the steps below to select that test image for etching.
Choose File / Open from the menu.
Find the file "test.jpg" located on your desktop, and open it

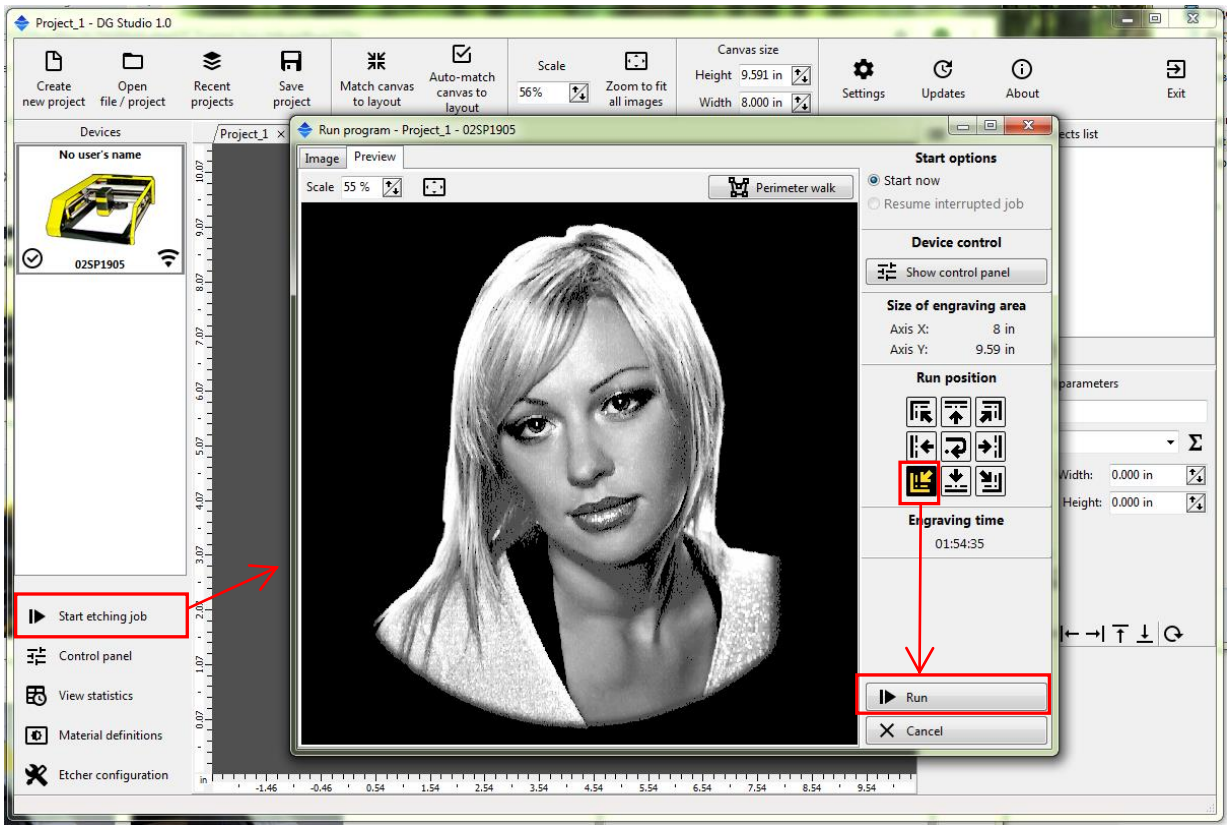


- Make sure that "Auto-match canvas to layout option is selected
- Select "Default Jarvis" Material Definition.
- Enter 8 inches into the "width" field and press "tab" – this will cause height to be recalculated, keeping image's aspect ratio constant.



11.09 Start the etching job

Click the "Start etching job" button highlighted below.
In the next window, check that the size of the etching will fit on your tile, make sure that starting position is chosen as "bottom left corner", then press "Start"



After a brief time required to calculate parameters of the etching job, the etching process will begin.

12 Using DGStudio

We have created training videos to supplement this chapter of the manual.
They are listed below, with direct links and search strings

Video Title	Direct Link	Keyword to use in Youtube search to locate the video
Introduction	https://youtu.be/8G1PTJH9-H8	ESC2017001
User Interface	https://youtu.be/BWWfw7NeCyY	ESC2017002
Perimeter Walk and etching irregular-shaped stones	https://youtu.be/M7VTSgVd6yA	ESC2017003
Starting and resuming etching job	https://youtu.be/8uh3CNgsl-w	ESC2017004

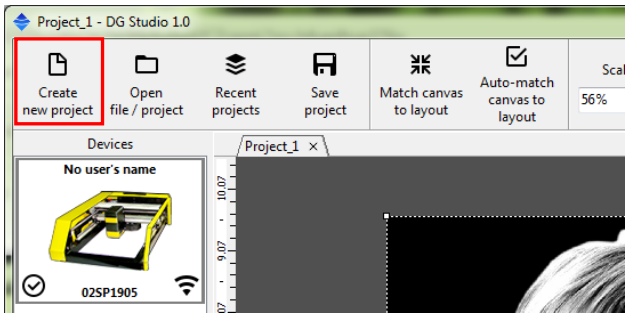
DGStudio is the application included in Machine's delivery and required to control the machine.

DGStudio is proprietary software, designed to work only with DiamondEdge™ line of Impact Etchers.
DGStudio will not work with any other engraving machines or with Granite™ Impact Etchers.
Since DGStudio is part of the DiamondEdge™ Etching Machine delivery, we will always provide all current owners of DiamondEdge™ machine with a free copy of most recent version of DGStudio, should you require it from any reason. Please request your copy by emailing us at support@ImpactEtching.com , and we will send you the download link.

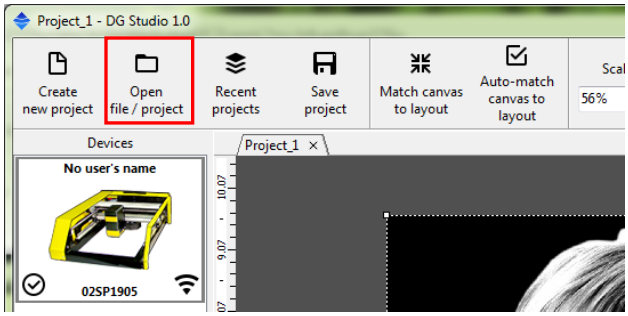
This section is meant to be the complete reference of DGStudio. It covers all features of the application.
You might find reading this section overwhelming at first, because DGStudio has many great features that take time to master. If you have not created any etchings yet, we suggest that you start by following the procedure covered in chapter "8 Creating your first test etching" above.
The steps covered in chapter 8 will be sufficient for majority of your etching jobs that contain one image and do not require creation of complex layouts.
Feel free to skip this section and come back to it when you are more comfortable with the Impact Etcher ad ready to try more advanced functions.

12.1 The concept of “Project”

In DGStudio, “project” is an object that contains all images included in your etching job, along with parameters of those images.
You can either create project **explicitly** by selecting “Create New Project” option from the menu:



Or, **implicitly**, by simply opening any JPG or BMP image from your computer’s hard drive, through “Open File / Project” menu. In this case, DGStudio will automatically create a ”project” for you

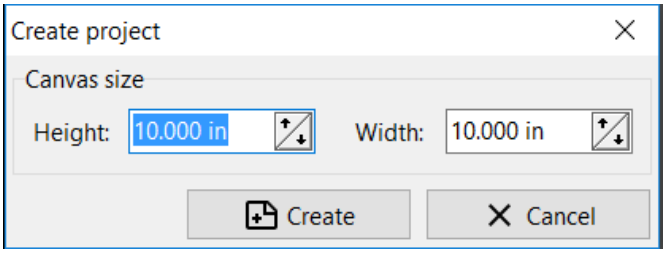


The extension of DGStudio project files is: . EcPrj

By default, DGStudio will save projects to your PC’s desktop, and if you do not provide any name of your project, the auto-generated name.

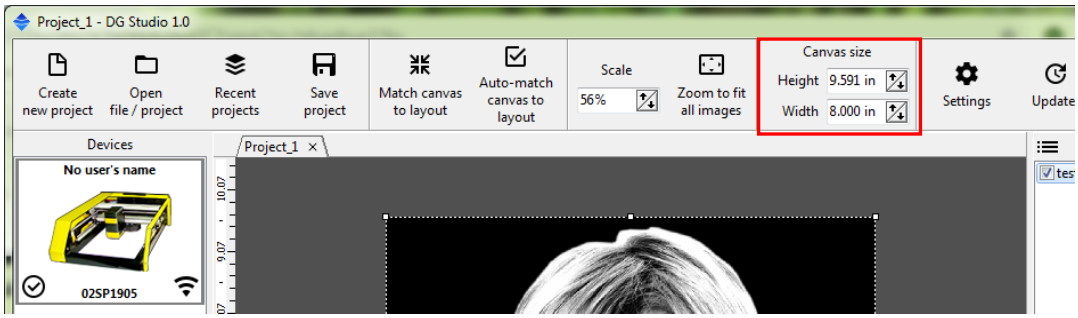
12.2. The concept of “Canvas”

When you create the new project, DGStudo prompts you to enter the size of project canvas.

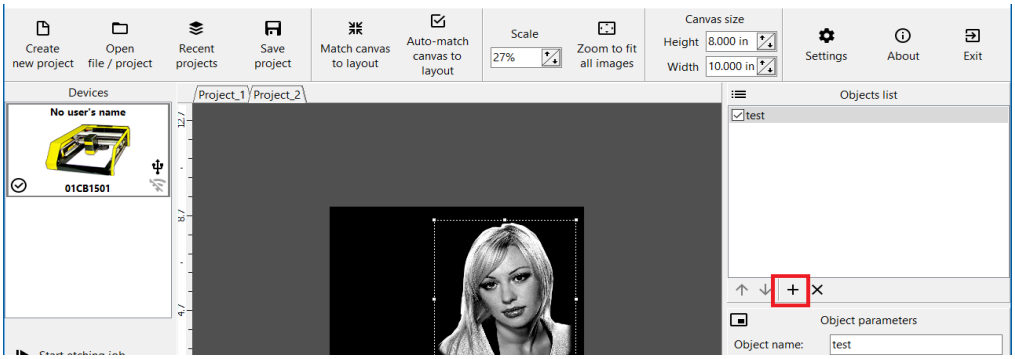


Canvas is best understood as area on the stone that you are working with. Canvas can contain multiple images (elements of your project) which will all be etched in one etching job. Canvas editor that is part of DGStudio allows you to combine those images in one coherent design. Each image has its own settings, and can be etched using its own “Material Definition” and, therefore, different etching resolutions (DPI).

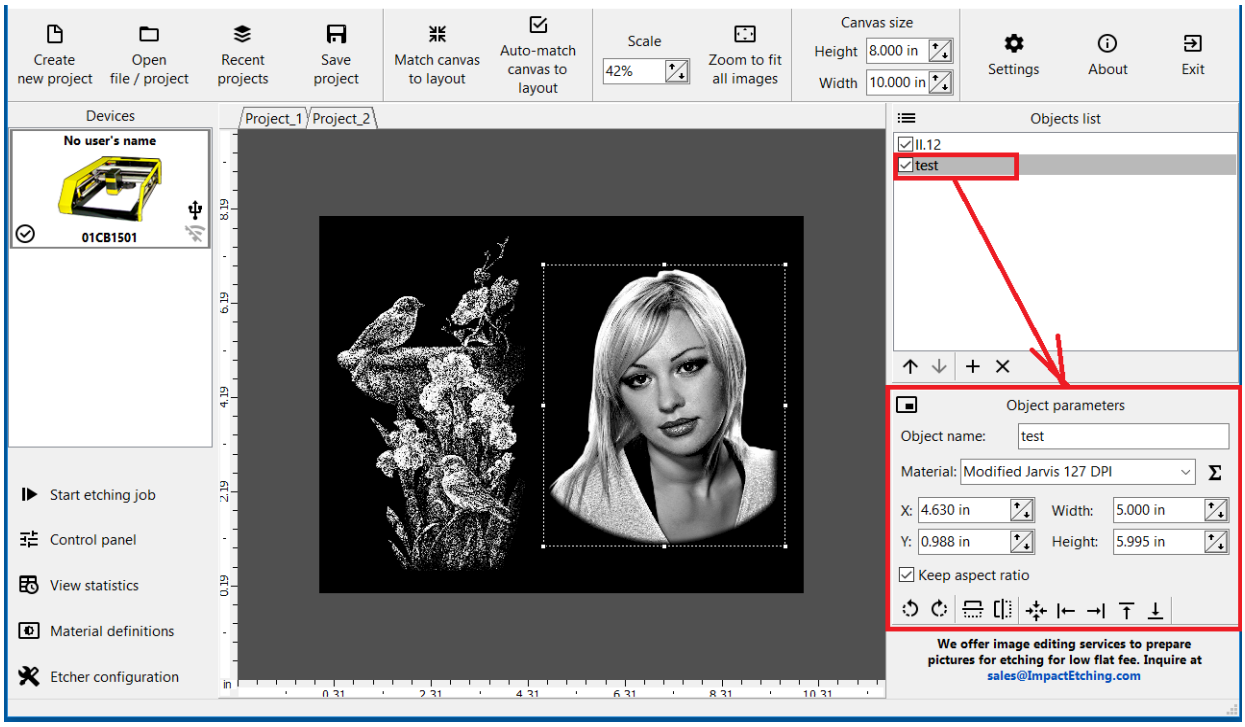
You can always change the canvas size after you created the project.
To change your canvas size, provide new dimensions in the fields highlighted below.



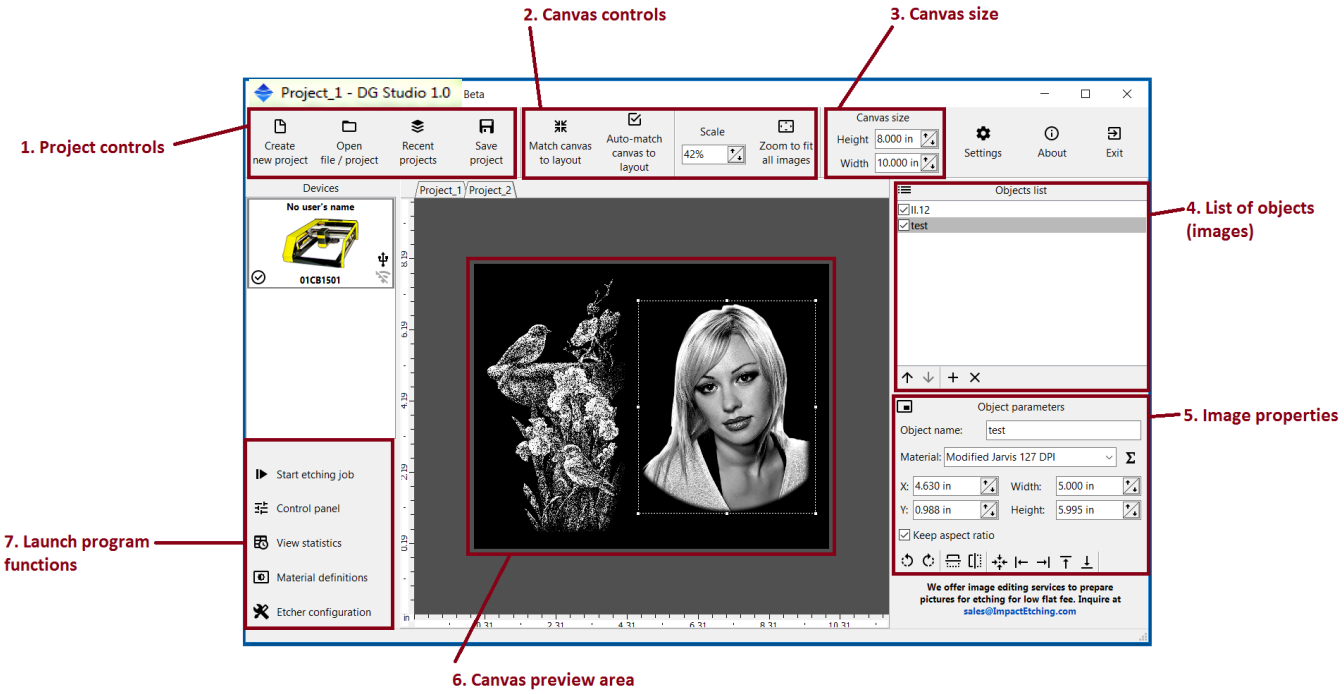
Once you created canvas, you start placing your images on it, using “plus” button highlighted below:



Once you have selected image in "Objects List" area, the area underneath, called "Object Parameters" shows the dimensions that image will have on the stone, and the material settings that it will be etched with.



12.3 Elements of user interface

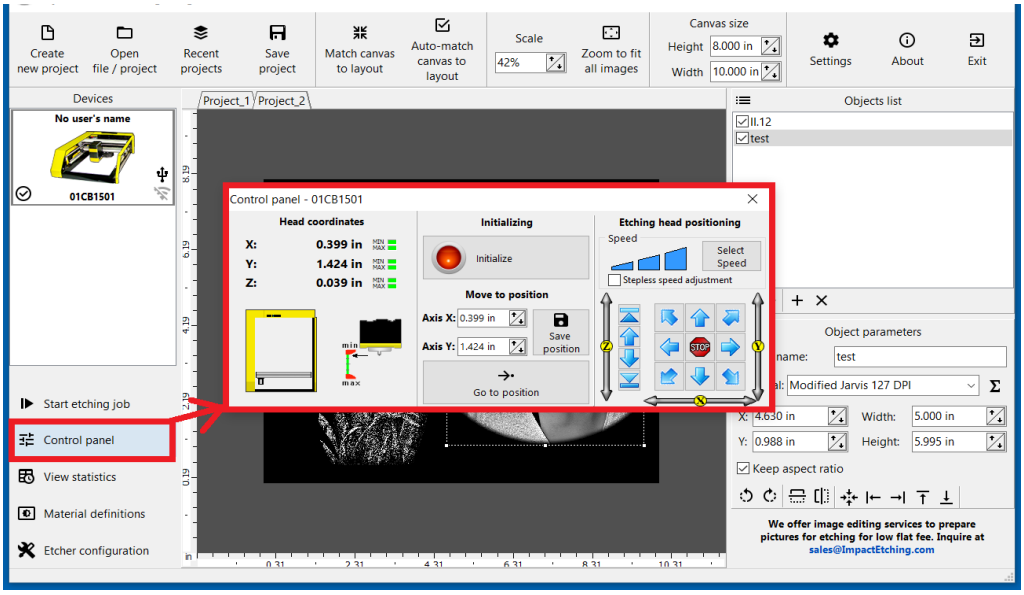


Above screenshot represents typical layout of DGStudio software.

1. Project controls – used to create / open / save projects
2. Canvas controls – controls for canvas behaviors
3. Canvas size – used to display current canvas size, as well as set new canvas dimensions
4. List of objects – this area shows all images that your layout is composed of
5. Image properties – shows the properties of image that is currently selected in the "Objects List" area of the screen. You also use this area to change dimensions of individual image, change their position as well as material definition that they will be etched with
6. Canvas preview – this area shows you the preview of the layout of your canvas
7. Launch program features – this is the area that is responsible for all actions within program, such as starting the etching job, changing material definitions etc.

12.2.1 Control Panel Window

Control panel window is used to initialize the etcher and to position your etching head .

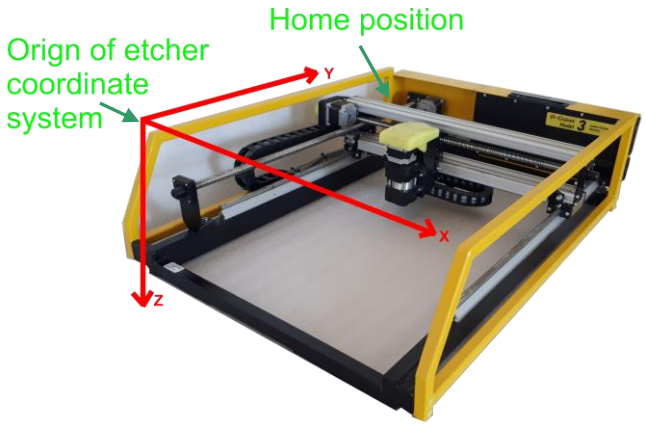


The left area of the Control Panel window, titled "Head Coordinates" shows the current position of your etching head along the axes X, Y, Z.

It also contains pictogram representing vertical position of the etching head vs the control range of Z axes (how far up/down it can physically go).

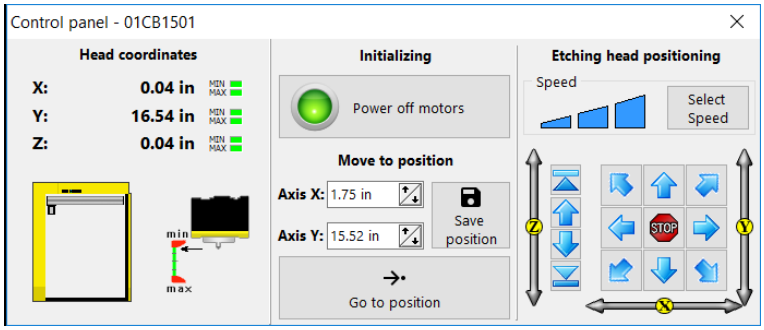
The middle area, "Initializing" is used to initialize your etching machine.

"Initialization" is a procedure required for most CNC machines. It involves etching head going into "Home" position, where it engages (presses) the end switches. Note that the home position does not necessarily match the starting point of machine's system of coordinates. For example, for our Sprinter model, the home position is located in the top left corner, while coordinate system starts in the left bottom corner



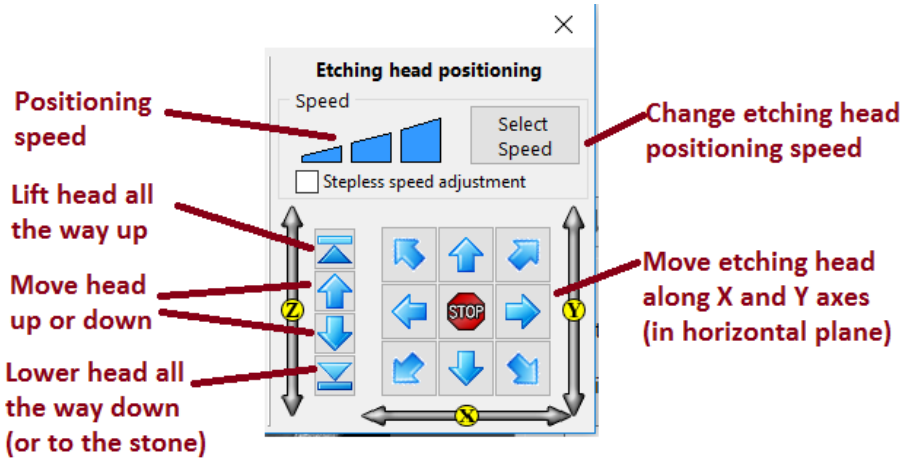
Note that whenever the initialization indicator is red, as in the above screenshot, you must initialize your machine before you can position the etching head. To do that, please press "Initialize" button, and make sure that no objects inside of machine frame would prevent etching head from moving to its "Home" position in the top left corner of the etching field.

This is what the window looks like after machine has been initialized successfully:
Note that color of "light" located on the button has changed to green.



Below initialization button, there's set of controls used to position etching head into the pre-saved position.

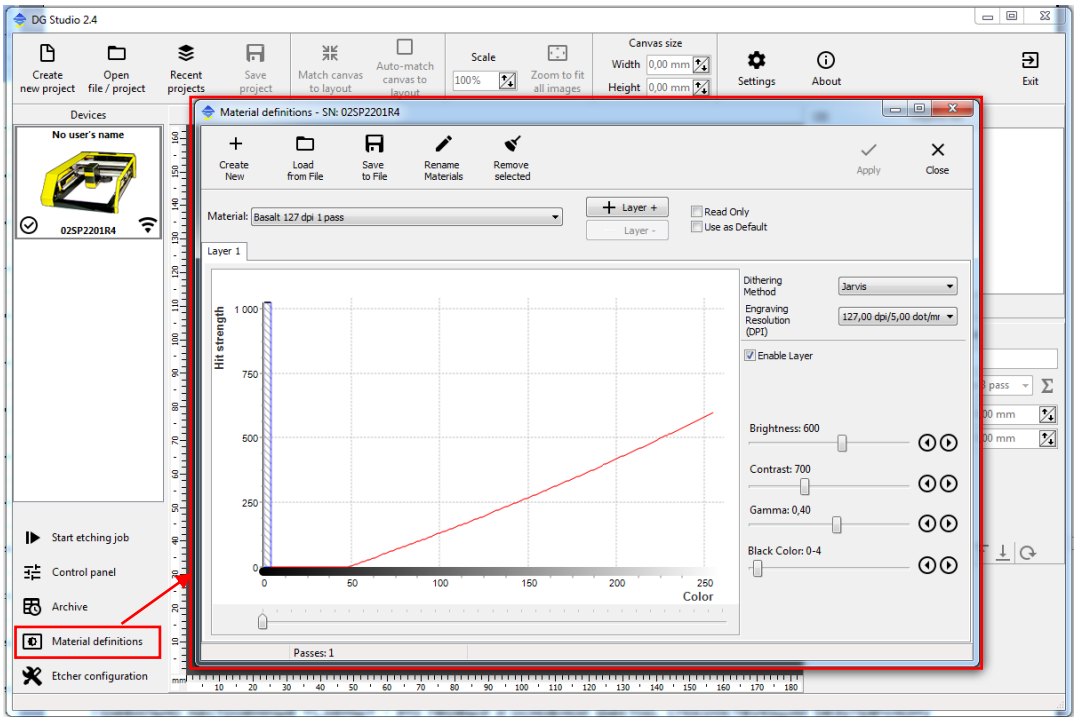
The right side of "Control Panel" window contains buttons used to position the etching head.



Just a reminder:
Machine **always** starts etching from the bottom of the picture, but you can choose to position the etching head in any of the following 8 points relative to your project's canvas:

- any corner of the etching area (4 options)
- middle point on any side of the etching area (4 options)

12.3.1 Material Definitions window



Material Definitions window is where you create "Material Definitions"

"Material Definition" tells the etcher how to hit the stone for each of 256 colors of the greyscale that it works with.

Properly configured "Material Definition" is the 1st major contributor to the perfectly looking etchings (2nd contributor being properly prepared image, see section "14 How to make sure that your etchings look great" for more)

Conceptually, the idea of "Material Definition" is very simple and can be explained in a few bullet points:

- The image you are about to etch will contain all colors from perfect black (color #0) to perfect white (color # 255).
- The purpose of "Material Definition" is to make sure that colors of image on your screen, when transferred to the stone by the process of etching, remain the same, namely:
    - Perfect black in your image ends up being black on the stone
    - Perfect white in your image looks like perfect white on the stone
    - And the colors between 0 and 255 (shades of gray) look as halftones on the stone
- When your white colors in the upper end of the 0 to 255 color palette look bright on the stone, this ensures the high visibility of your etching
- When grey colors on your image look as such on the stone, this ensures "the depth" of the image

In practical terms, to test that "Material Definition" is set up correctly for a given type of stone, we use the test image containing all colors from 0 to 255 color palette. As a reminder, 0 is perfect black and 255 is perfect white.
That test image is named "Test_Line.bmp" and is placed on your PC's desktop by DGStudio installation.

Here is what it looks like:

Notice that this image has white markers running along the top edge. They represent the lines of colors. A total of 11 colors are presented in this test: from perfectly white (square 1) to perfectly black (square 11)

The idea of setting up "Material Definition" is to etch above test image, adjusting strength of hit for different colors, until desired results are achieved on the stone (white is white, black is black, and you can see smooth change of color in-between).

Test Image created with the ideal "Material Definition" should look approximately like this:
(this is the photo of actual etching on the stone)

The correct configuration is highlighted with a red border.
The first square is as white as possible. The bottom square is as black as possible. The intermediate squares show a smooth transition of halftones without sudden changes in brightness.

Nearby test images have defects: the first squares are overexposed or darkened, there are sharp changes in brightness between the squares, insufficient brightness in the middle tones, etc.

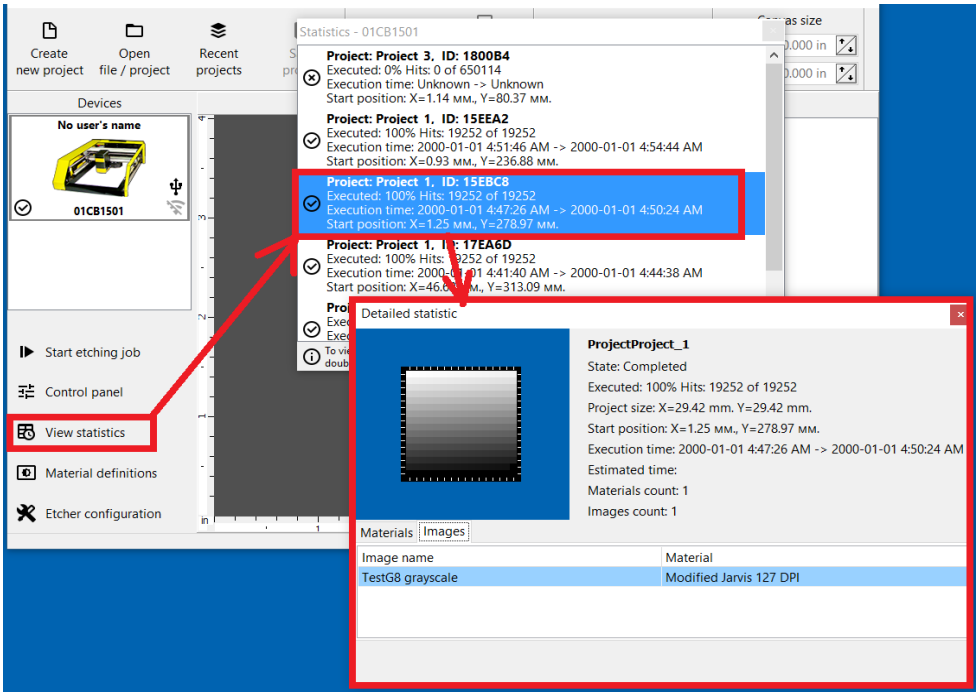
Your machine comes with pre-configured "Material Definition".

The type of stone and density are briefly indicated in the name of the "Material Definition".

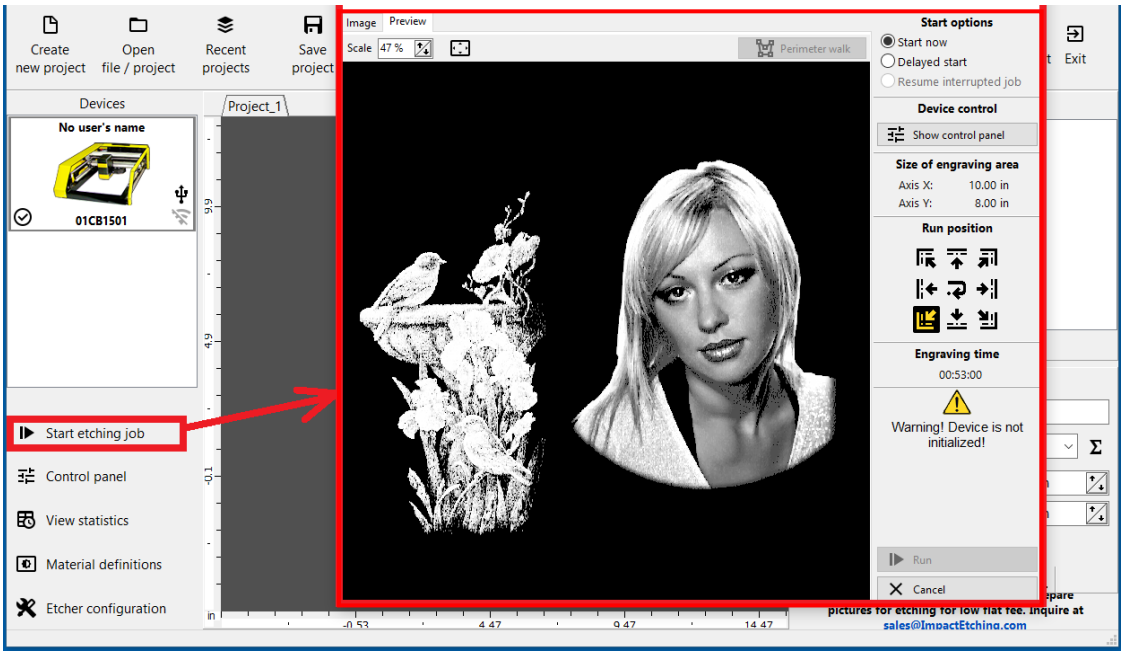
If you ever want to adjust "Material Definition", or create your own, please turn to chapter "15 Configuring Material Definitions" that we dedicated to the process of creating your own "Material Definitions".

12.3.2 Statistics Window

Statistics window shows history of your etching jobs.
If you double-click on a particular job, you will be able to see more details



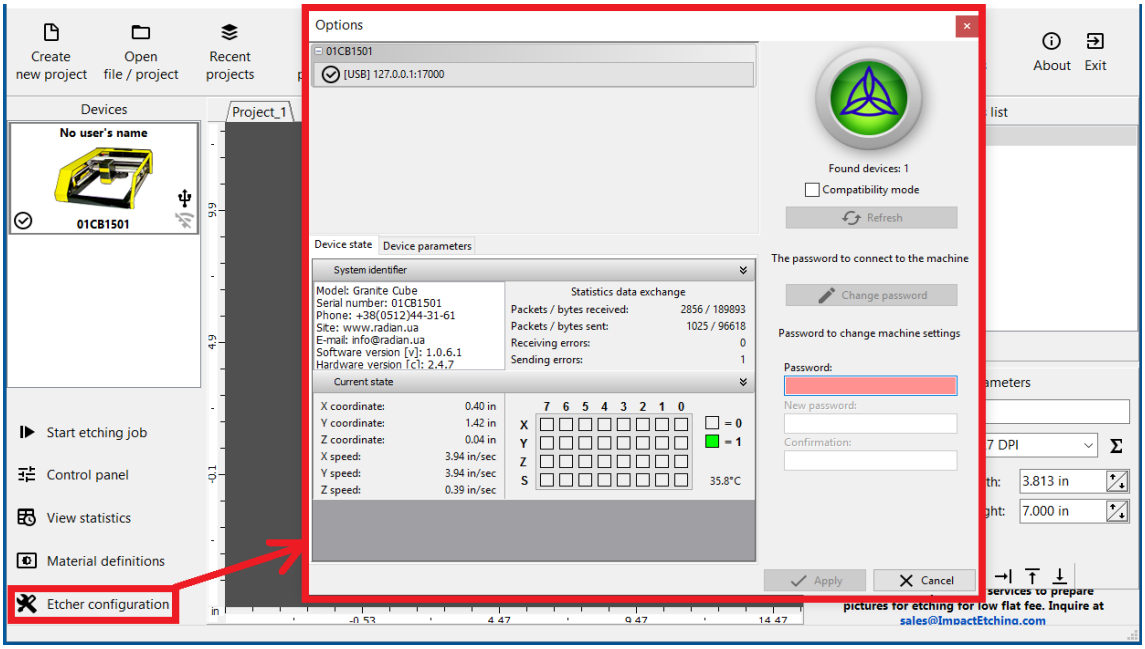
12.3.3 Etching job parameters window



This is the window where you select the position of your etching head relative to the project canvas, and launch the etching job.

12.3.4 Etcher Configuration window

"Etcher Configuration" button brings up the "Options" window that contains parameters used for initial configuration of your etcher at the factory, or for troubleshooting issues.
During the normal use of your etcher, there are no scenarios that would require modifying of those options. We will not, therefore, spend time on this screen in this manual.
Should you require to change any parameter in this window for machine troubleshooting reasons, we will provide you with detailed instructions for doing so.



12.3.5 Canvas and images: composing layout of your etching

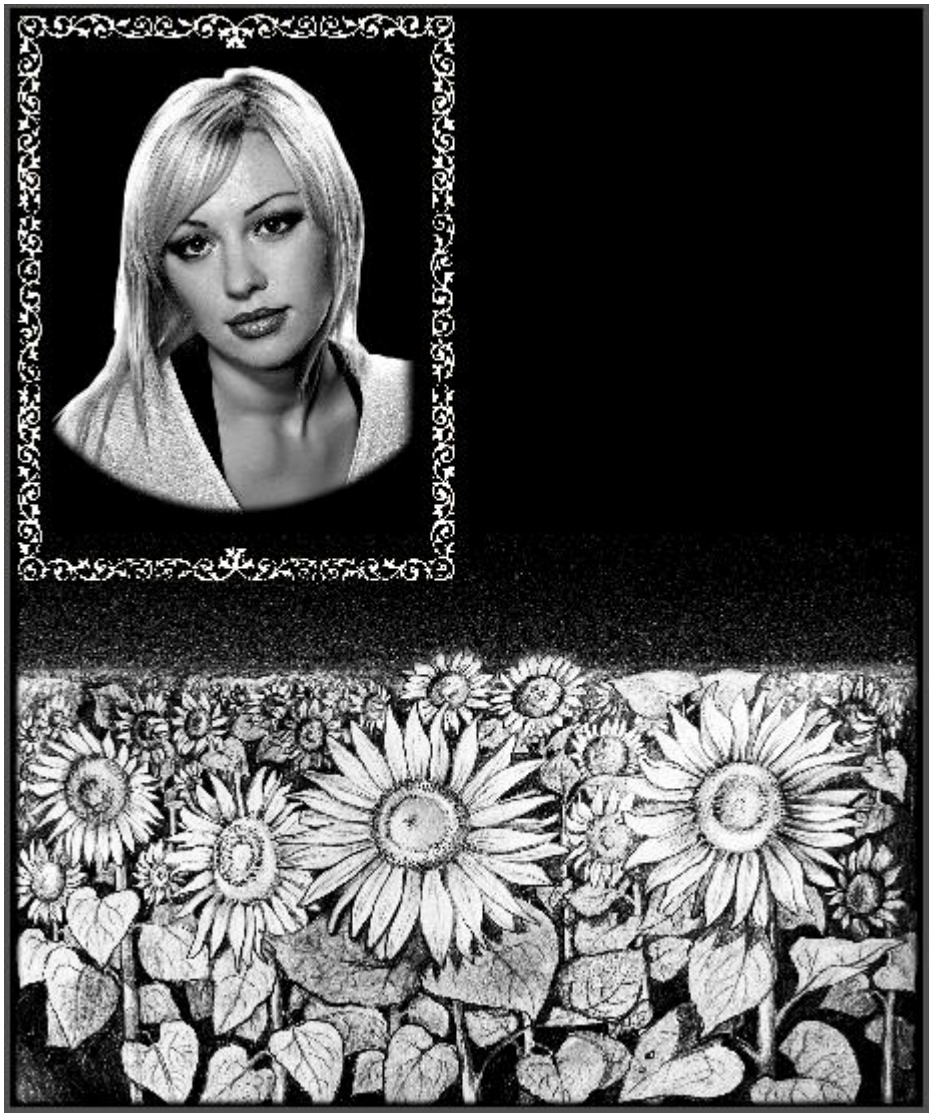
If your typical etching consists of just one image, and you are not planning to compose your etching of multiple different images, then we recommend that you follow "Simplified" procedure covered in the next chapter, "9.4 Simplified procedure for etching just one file"

This chapter will describe the procedure of using DGStudio to compose multiple elements into a single etching

Let us assume that we have area of 12 x 14 inches (width x height) to work with, and we would like to compose our etching of 3 different components:

1. Portrait
2. Frame around portrait
3. Flowery ornament underneath

The layout of the final etching would look like this:



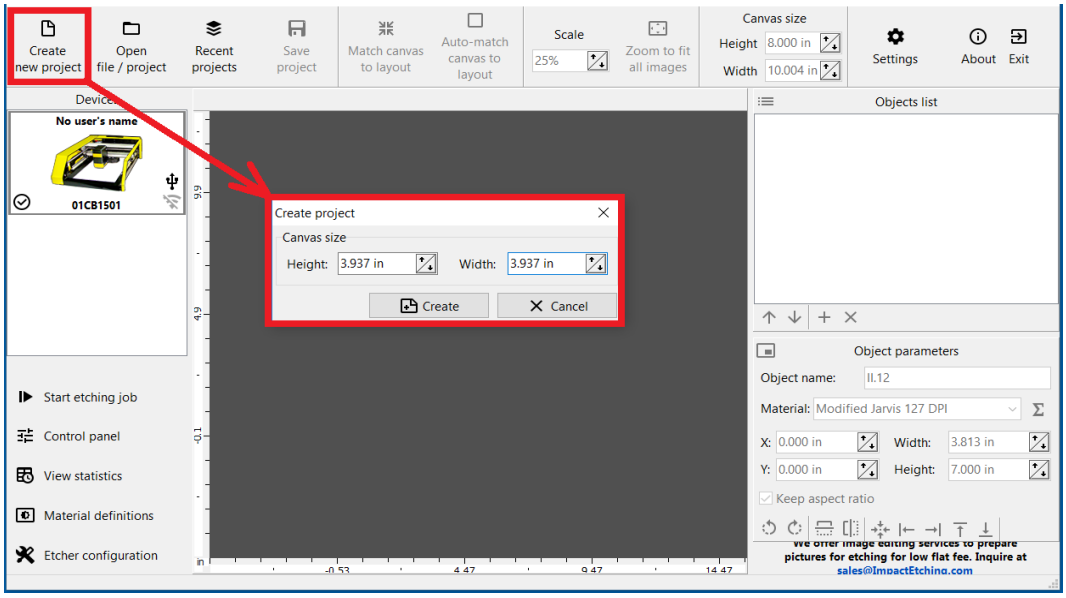
In this chapter, we will guide you through steps for creating above layout. We also provided the files required for these steps, in directory located on your PC's desktop. Please note that frame and sunflower images provided for this exercise are copyright© (intellectual property) of Economical Solutions Corporation, licensed to you for your personal use only. You are not allowed to distribute those images, but can use them in your business.

Step 01. Create new project with desired canvas size

Start DGStudio and make sure that you are connected to your etching machine.

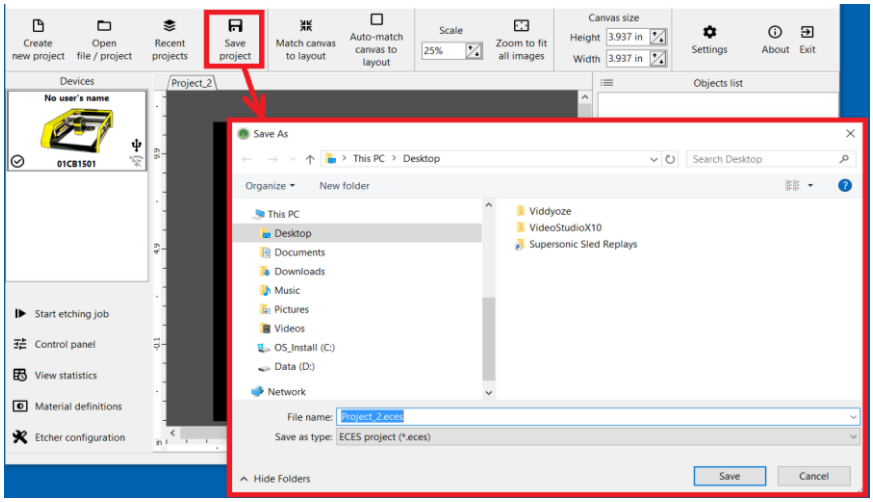
Then, select "Create new project" from the menu.

In the next screen, enter the canvas size for your project, **11 inches wide by 14 inches high.** Then, click "Create"



By default, your project will be given some system-generated name.

We suggest that you save it with the name you like into the location you prefer. To do that , press the Save project" button .



In the next screen, you will be asked for location of your project file. Feel free to save it into any directory you like, and provide any name that will help you remember it. In this example, we saved it on the desktop, and named project "Test_Canvas_Layout_001".

Step 02. Add images to your project

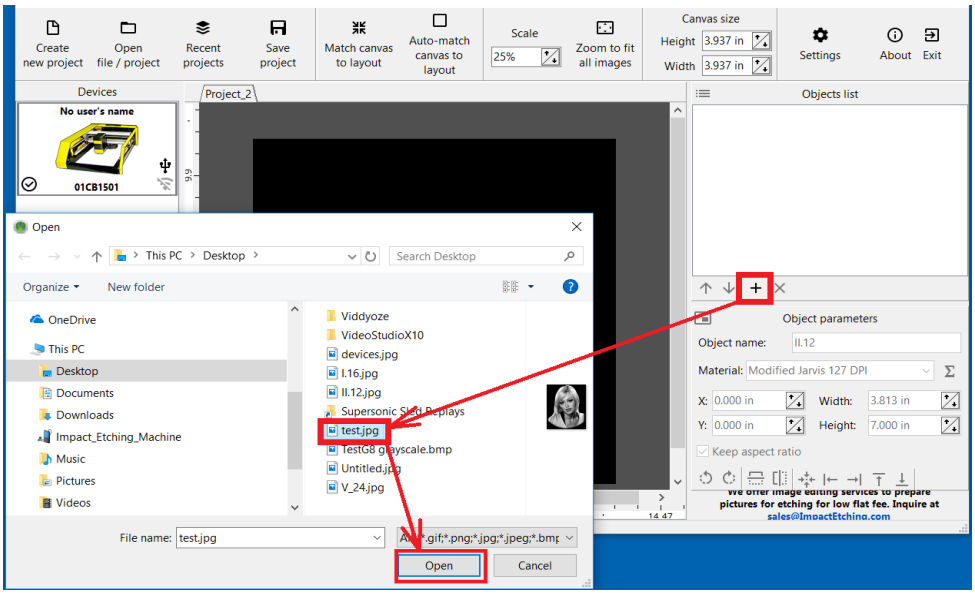
The images required for this exercise are provided with installation of DGStudio and located in directory on your PC's desktop.

You will have to use the following 3 images:

- Test.jpg – our standard test image located on your PC's desktop
- V_24.jpg – the frame
- i.16.jpg – the sunflowers image

Let us open all 3 images first, and then arrange them on the canvas .

To add image to your canvas, select "Plus" button:

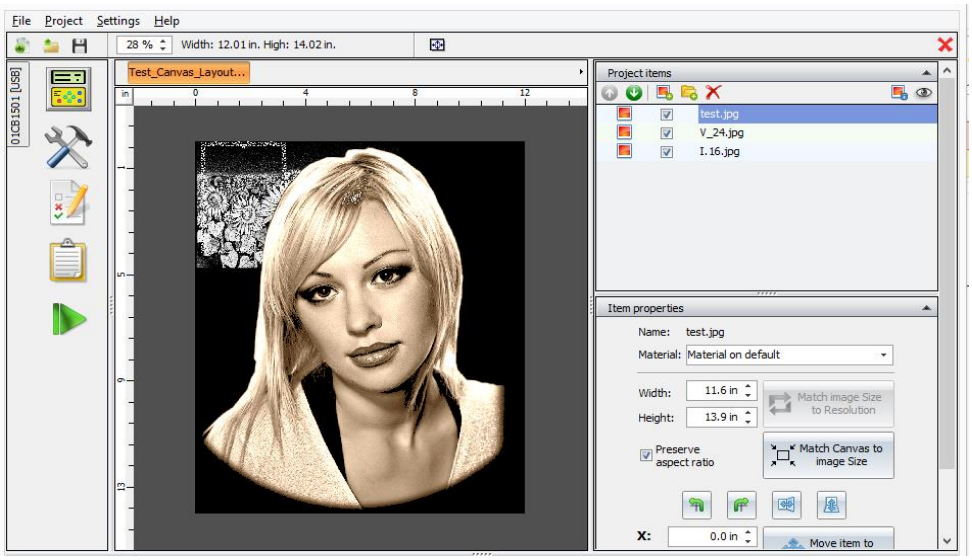


Then, using the same steps, select the "Sunflower" image, i.16.jpg.

You will see that image added to the canvas and to the list of images in the "Project Items" frame.

Likewise, add other 2 images - V_24.jpg and Test.jpg.

The resulting layout will look as below:

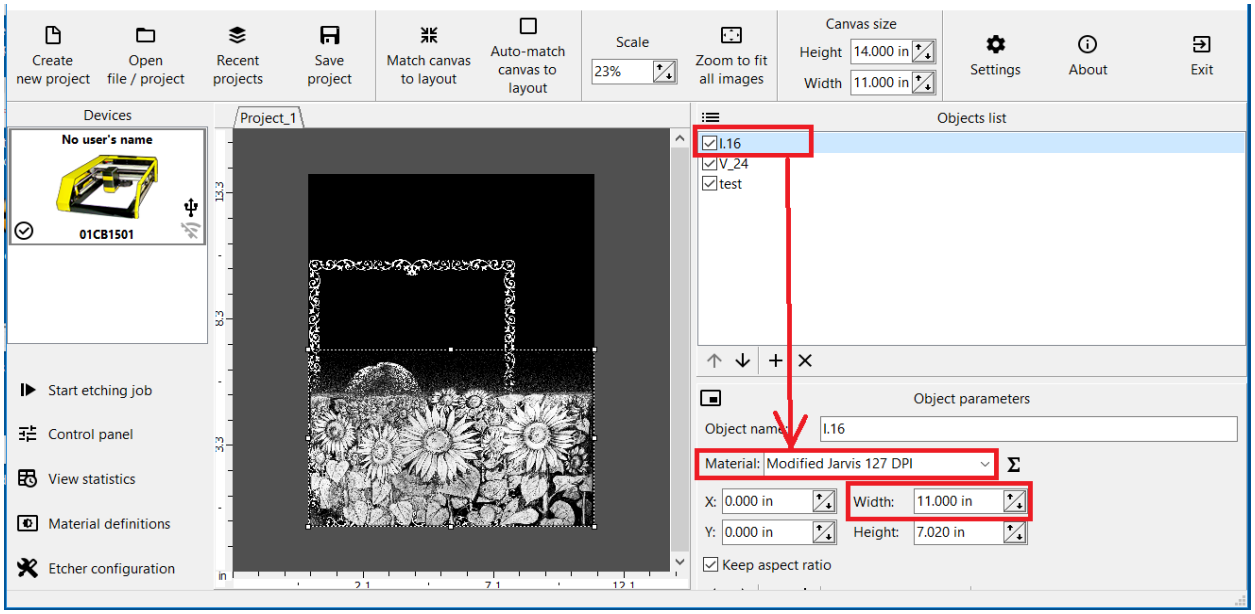

File
Project
Settings
Help
28 %
Width: 12.01 in. High: 14.02 in.
Test_Canvas_Layout...
Project items
test.jpg
V_24.jpg
I.16.jpg
Item properties
Name: test.jpg
Material: Material on default
Width: 11.6 in
Height: 13.9 in
Match image Size to Resolution
Preserve aspect ratio
Match Canvas to image Size
X: 0.0 in
Move item to

Step 03. Change image properties

The image that you select in the "Project Items" list becomes active, and you can change its properties in "Item Properties" window.

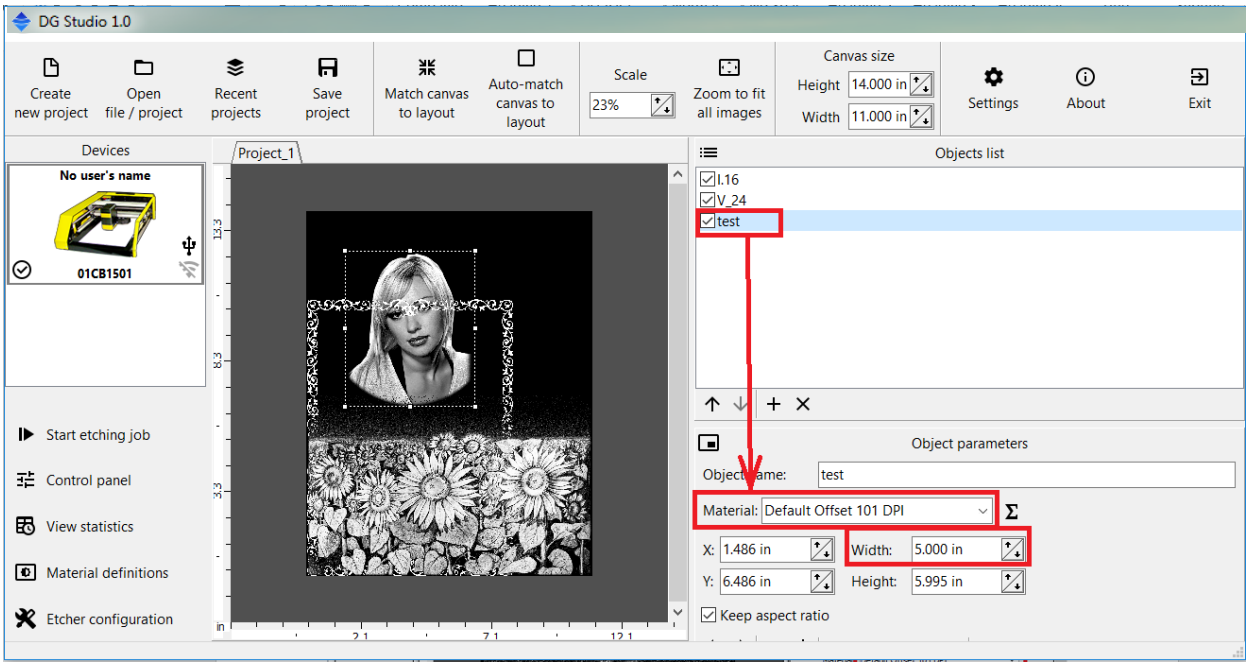
Select the image i_16.jpg and make following changes:

- Select "Default Jarvis 127 DPI" for material.
- Change its width to 11, then press Tab. The height of the image will be recalculated automatically, to maintain its aspect ratio (proportion of width to height).
- Select that image with the mouse and move it down on canvas.



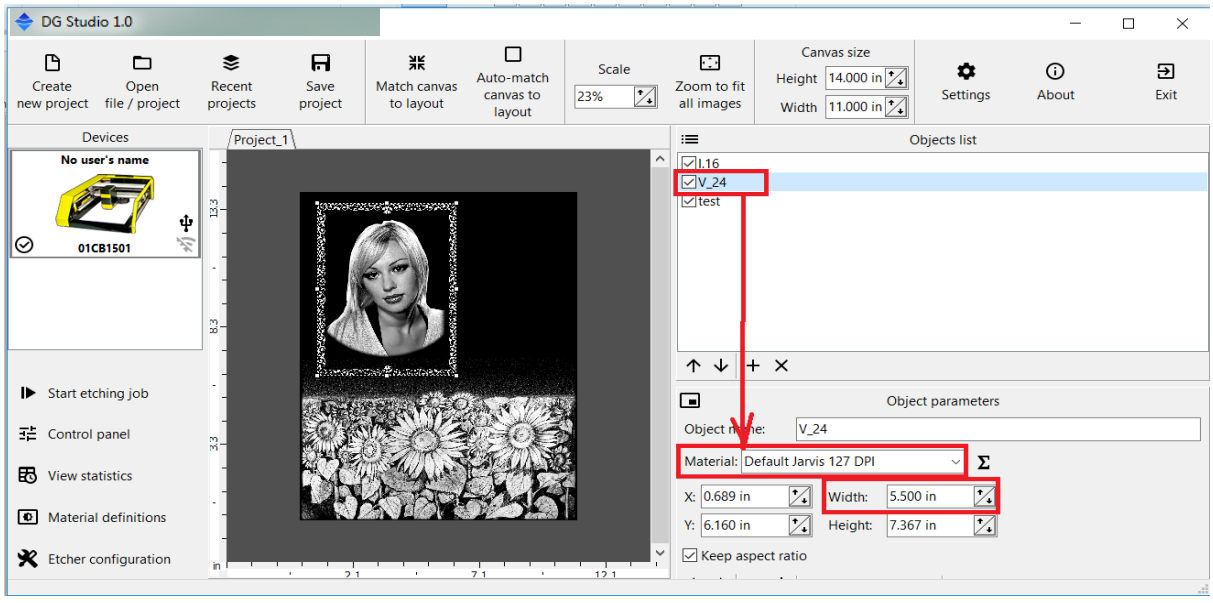
Now select image test.jpg

- Change “Material” to “Default offset 101 DPI”
- Change width to 5 and press “Tab”. The height will be recalculated automatically
- Move the image on canvas to the top left corner of your layout



Select image of a frame (v_24.jpg)

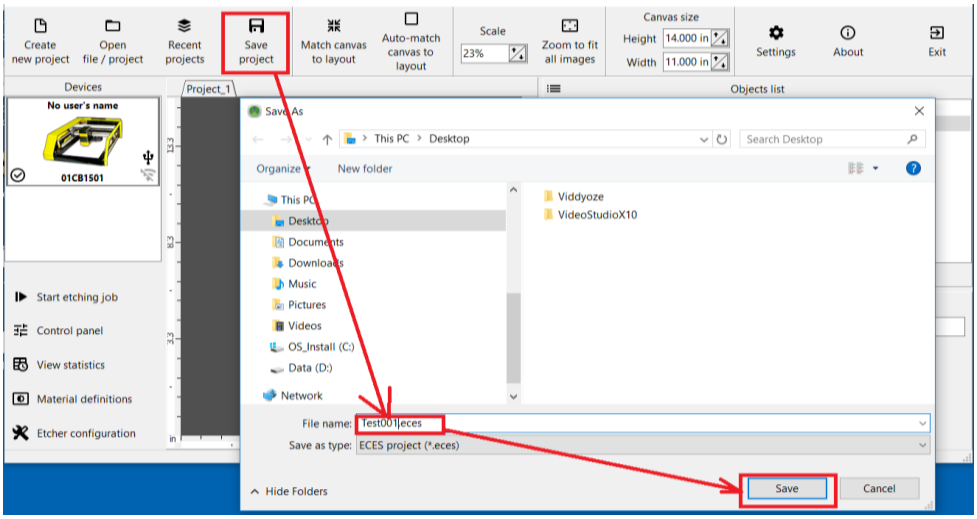
- Make sure that the material is “Default offset 101 DPI”.
- Disable “Preserve Aspect Ratio” checkbox.
- Enter width of 5.5 and press Tab



Now try to move images around to achieve the best layout. You can try the one that is similar to one in above screenshot

Step 04. Save the project

Save the project once completed, by selecting "Save project" from the menu



12.4 Simplified procedure for etching just one file

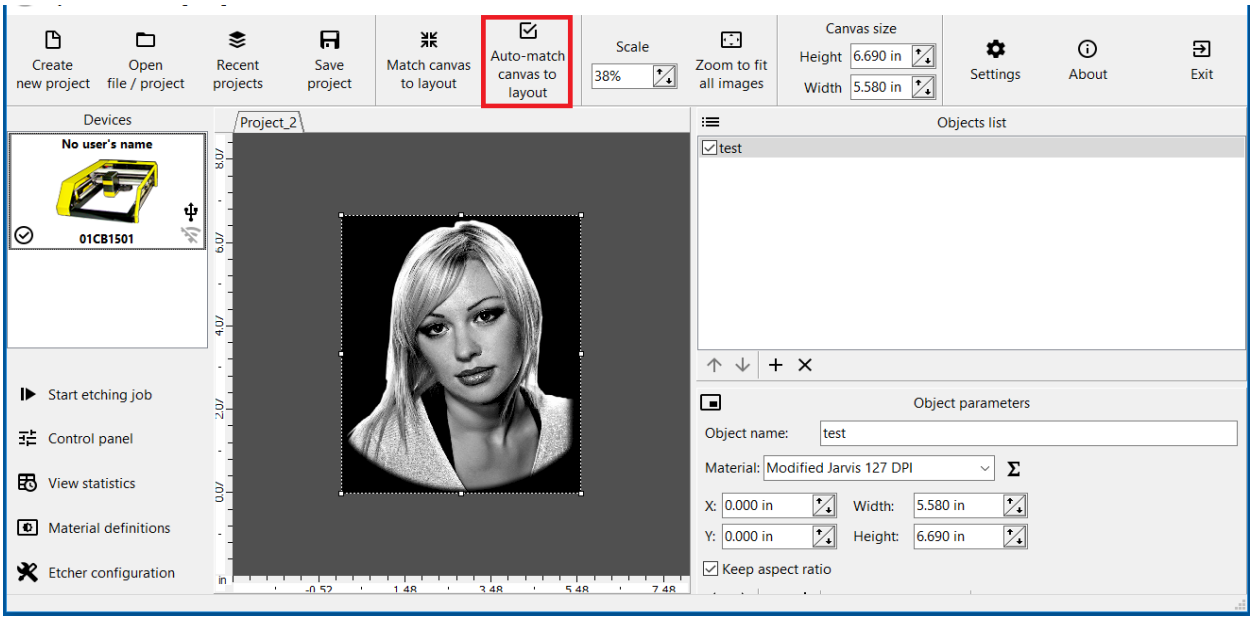
If you are **not** going to combine multiple images for your etching, and planning to etch just one image file , you can use simplified procedure that bypasses most of the complexity of dealing with using canvas.

In such case, please follow procedure covered in sections 11.08 and 11.09

The idea is to open the image file directly, and have project and canvas created automatically in the background

Then, you select the material to be used with your file, and enter the dimensions for that particular file. This will result in your file becoming smaller or bigger than the canvas that DGStudio auto-created when it opened the file.

You would have to select the option "Auto-match Canvas to Layout" (shown below) to make sure that canvas dimensions are always automatically matched to the image size. Then, you can go ahead and start your etching .



12.5 Starting your etching job

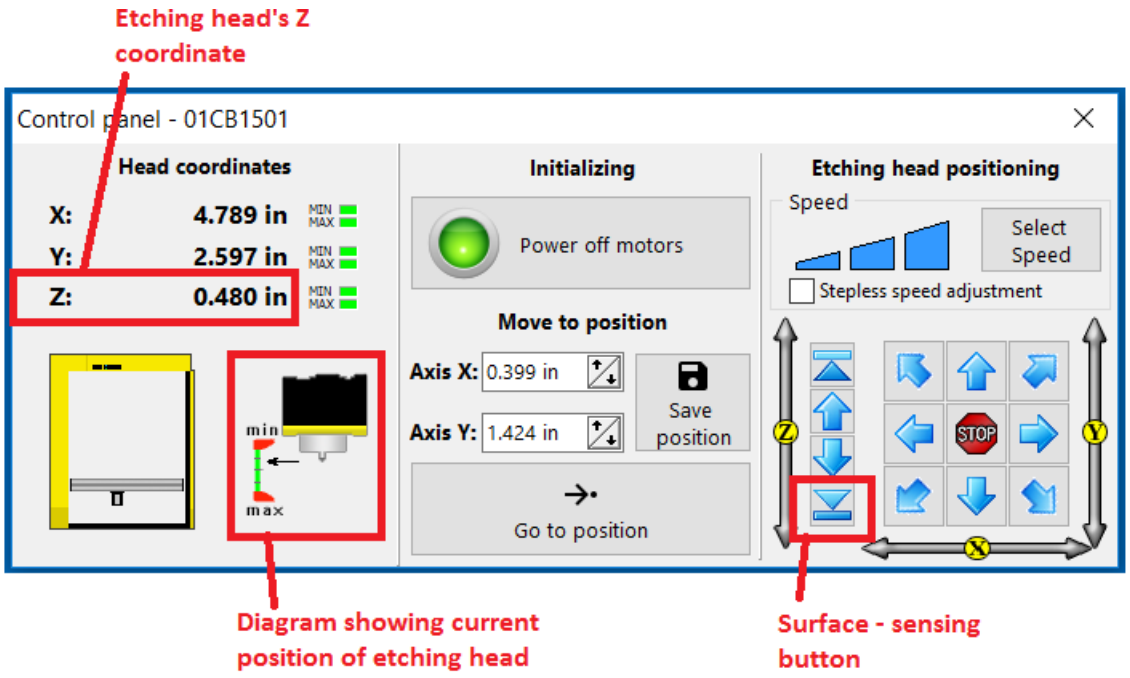
12.5.1 Making sure that surface of material is within the range of Z axis movement

Your DiamondEdge™ machine is equipped with surface-tracking technology.
This means that etching head will move up and down as required to "track" the surface of the stone. However, etching head will not be able to track the surface if it comes outside of its control range (which is approx. 1.77 inches high).
If you use compact machine and put it right on top of the stone, then you should not worry and can skip this step.
In all other cases, before starting your etching, execute the "Surface-sensing" procedure and make sure that the stone's surface is located within the moving range of Z axes.

For larger etchings, we recommend that you do the "Surface sensing" in every corner of your future etching. The idea is that if all 4 corners are within the control range of Z axis, then the entire surface of your future etching within them will be too.

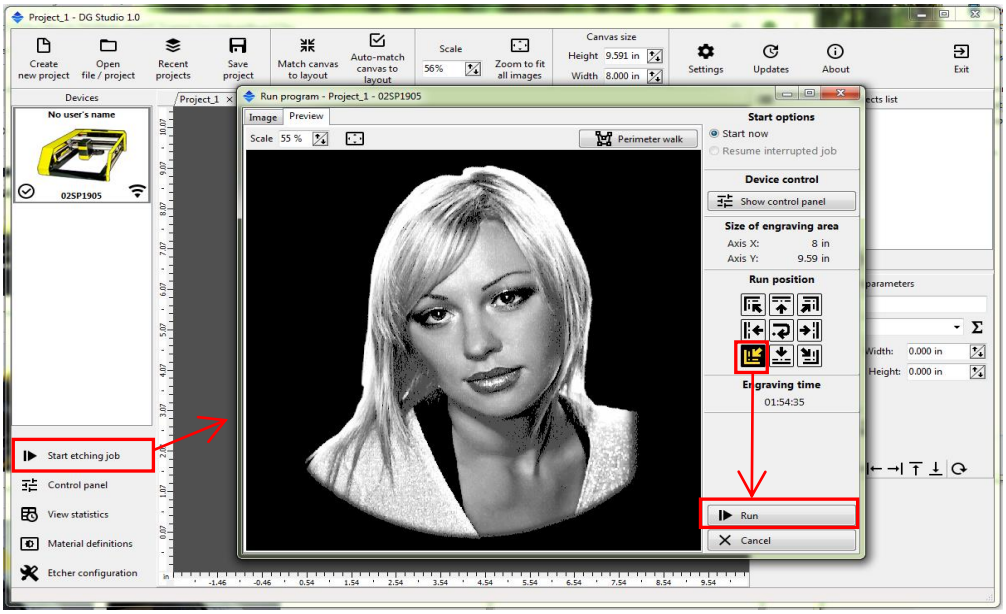
Here is how to do surface-sensing:

- Position your etching head in desired place above the surface of the stone.
- Click the "Surface Sensing" button highlighted in below screenshot.
- Wait for the etching head to move down, touch the surface and stop moving.
- Check the graphical representation of head position (highlighted below), or absolute value of Z coordinate.
- If you are looking at the value of Z axis coordinate, please be aware that it can change from 0 to 1.77 inches, or from 0 to 45 mm. If after the surface sensing procedure you see that value of Z is too close to either end of the range, move your stone up or down relative to the machine
- Please remember to always lift your etching head after the surface-sensing procedure before moving it to another place.



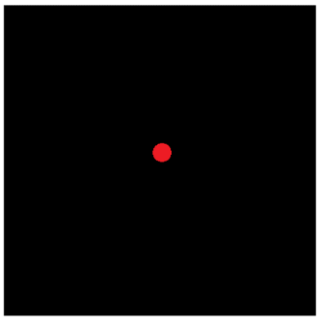
12.5.2 Etching head positioning vs. your etching

This chapter explains how to understand options for etching head positioning
Just before launching your etching job, you will have to choose the position of your etching head vs your future etching. This parameter is critical for making sure that your etching comes out correctly and that the etching head does not leave the surface of the stone.

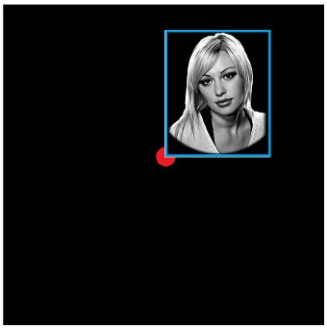


Obviously, by the time you position your etching head you should already know what option you will choose for starting point.

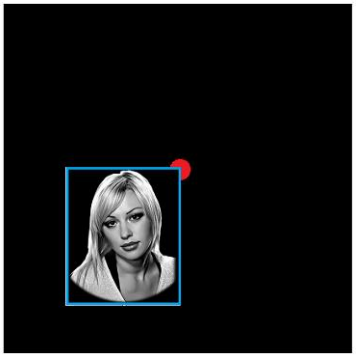
Here are some use cases that will help you choose starting point of your etching
Let us assume that we have a 16" x 16" stone tile and are planning to etch the image that is 6 inches wide and 4 inches tall.
Let us assume that our etching head is positioned right the middle of the tile, as shown by the red dot:



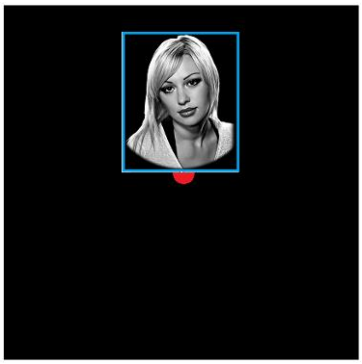
If, when launching our etching job, we selected "**bottom left corner**" as starting point for our etching, then the etching will look as follows: (the border of the image is highlighted with blue color, for clarity)



If, without changing the etching head position (it is still in the middle of the stone), you now choose "**right top corner**" as "starting position" of your etching, then the same portrait will be etched as shown below:



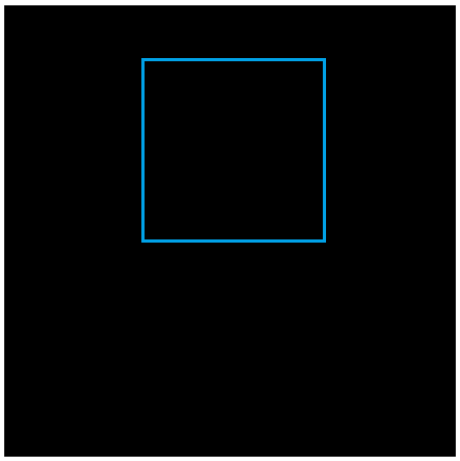
Another example: what will happen if you chose "**bottom center**" as the starting point?
It will position the image accordingly:



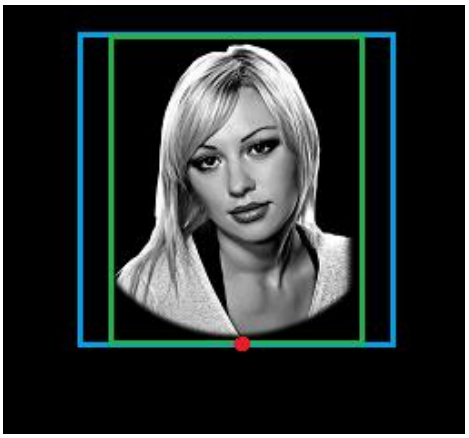
We hope this illustrations will help you figure out how to understand the "start position" parameter.

There is one more use case that we wanted to provide, to explain the value of starting your etching "in the middle of the side"

Let us assume that you have a certain area on the stone designated for your etching.
That area ended up being a square sized 10 by 10 inches. The aspect ratio (ratio of width to height) of this area is 1:1.



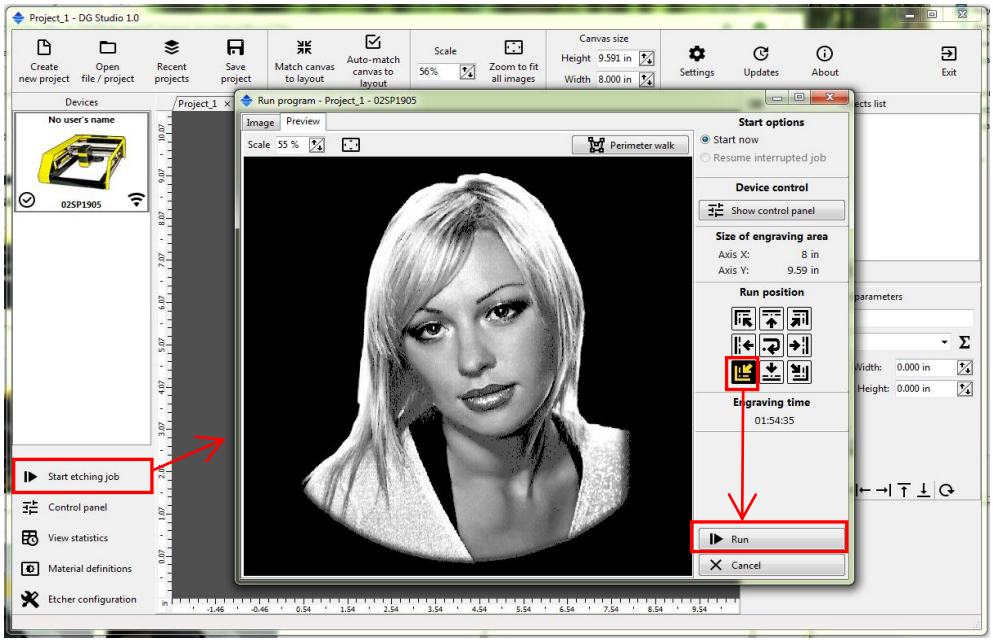
Yet the portrait that you are planning to etch has the aspect ratio of 10:12 (or 8.3:10).
(Remember, aspect ratio is relation of width to height.)
So, while entering the size of your image in DGStudio, when you enter height as 10 inches, the width gets recalculated as 8.3.
Now you need to center that vertically-elongated rectangular image within your square area.
There is a very easy way to do this. Simply position your etching head in the middle of bottom side of your etching area (highlighted with red dot below), and select "bottom center" as starting position of your etching. The image will be perfectly centered in your square etching area:
(borders of the image are highlighted in green)



12.5.3 Starting the etching

Press the button with the green arrow, select the starting point of your etching (depending on where you positioned your etching head), and press "Start".

After taking a couple of minutes to process the image, etching process will start.

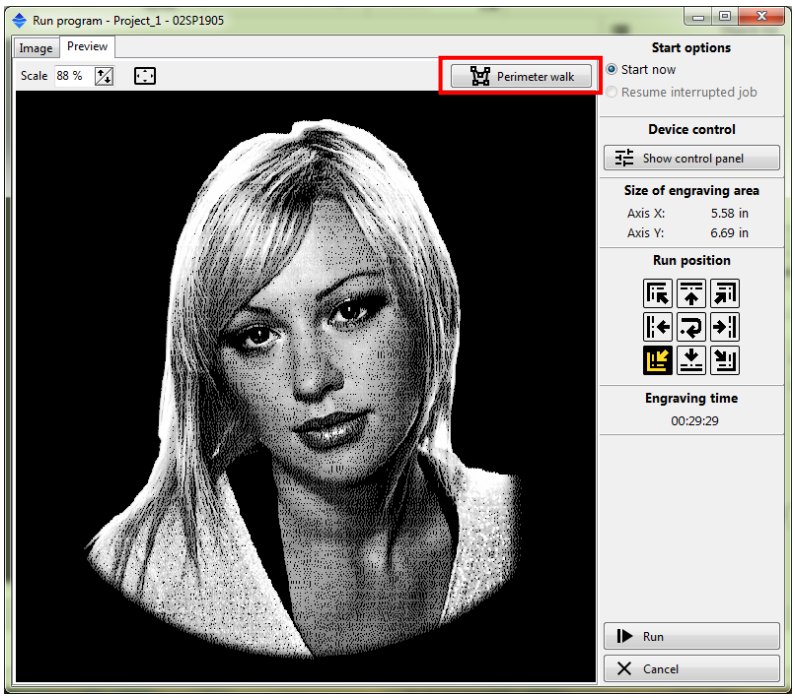


12.6 Perimeter walk

Perimeter walk is the function we are very proud of, and confident that our customers will LOVE it. Perimeter walk functionality is possible, because, unlike many laser machines, our etchers provide constant and 2-way connection between PC and the etcher.
Using perimeter walk, you can see with 100% confidence where the image will be positioned on the stone before launching the etching job.

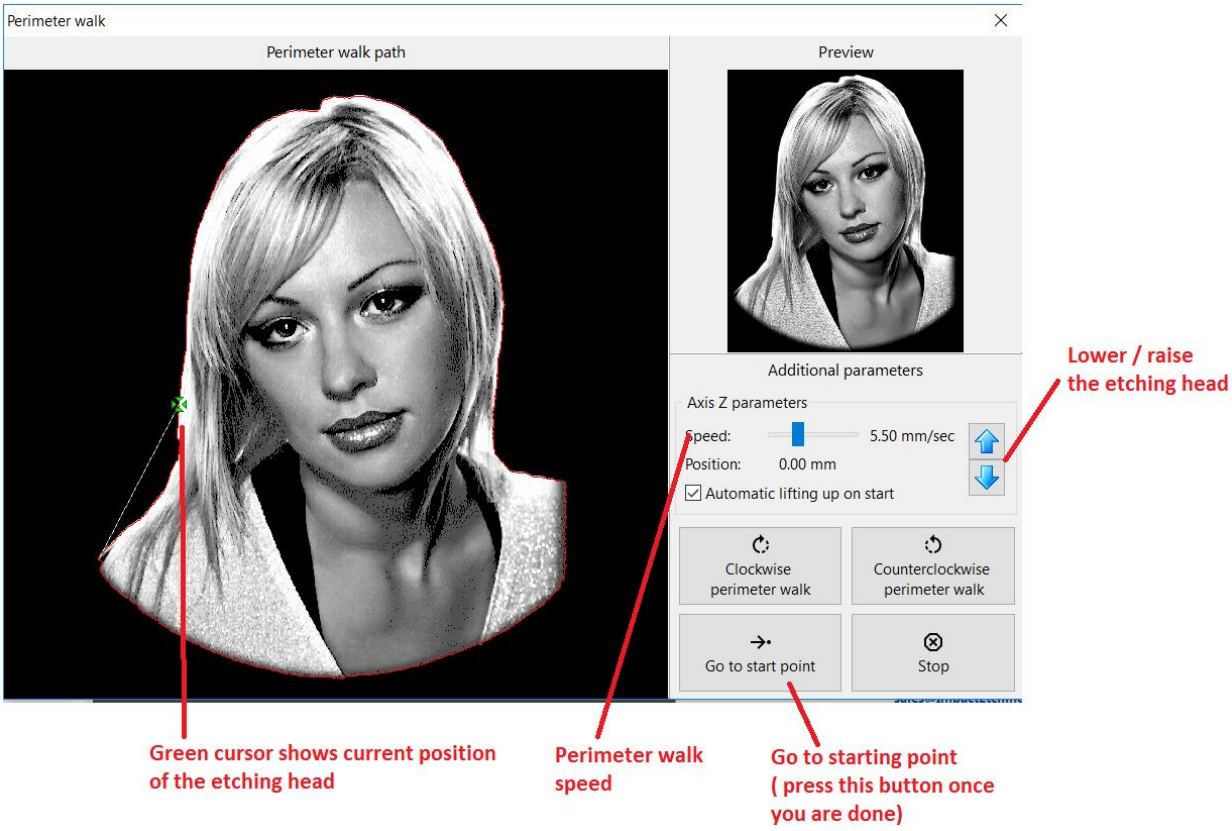
Here is how to use perimeter walk:

- Once you positioned your etching head and entered the screen where you normally launch the etching job from (by pressing button with the green arrow), click "Perimeter walk" button



- In the next screen, choose the speed of your perimeter walk, and click "Start clockwise" or "Start counter-clockwise" button.
    - The etching head will move along the external edge of your future etching, ignoring any areas with perfect black color (color number 0).
    - While the etching head is moving, its current position will be highlighted with the green cursor on your image's perimeter (see below screenshot).
    - At any time during the perimeter walk, you can stop the process and lower the etching head closer to the stone, to be able to better judge where that particular point will be located on the stone.

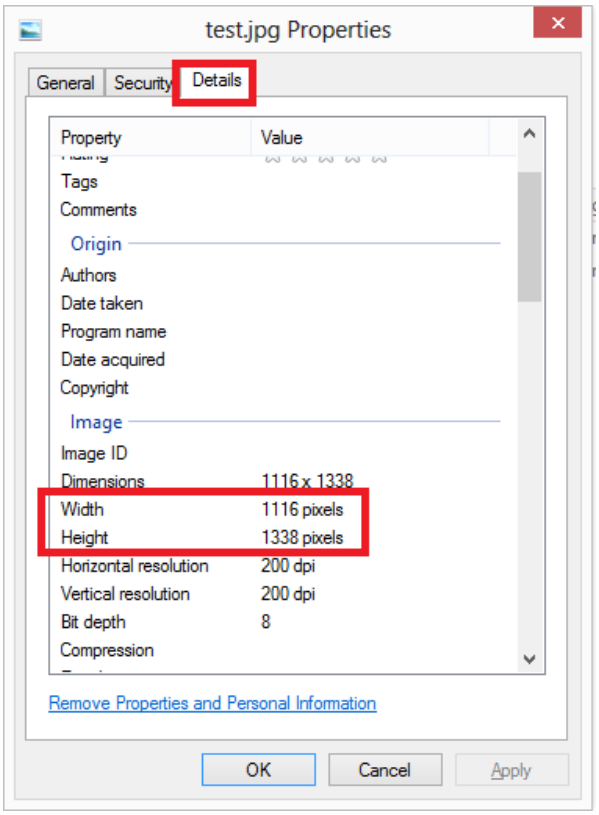
- Once you are done with your perimeter walk, click "Go to start point" button to return the etching head to its starting position. Then, you can close the window.
- If you are satisfied with results of the perimeter walk, simply start your etching job. If any adjustment to image starting position or canvas size is required, do the change and repeat the perimeter walk until you are 100% confident that your image will be positioned correctly on the stone.



13 How to deal with DPIs, pixels etc. when preparing images for etching.

Our customers often ask us questions like "what DPIs should I prepare my image at"?
This chapter is meant to answer such questions and prevent any confusion about DPI, image sizes etc.
DPI is not the best measure for the image size. DPIs are device- specific and often misleading. Besides, the DPI measure alone does not help in answering the question "does the image have enough pixels / resolution to look good on stone ? "

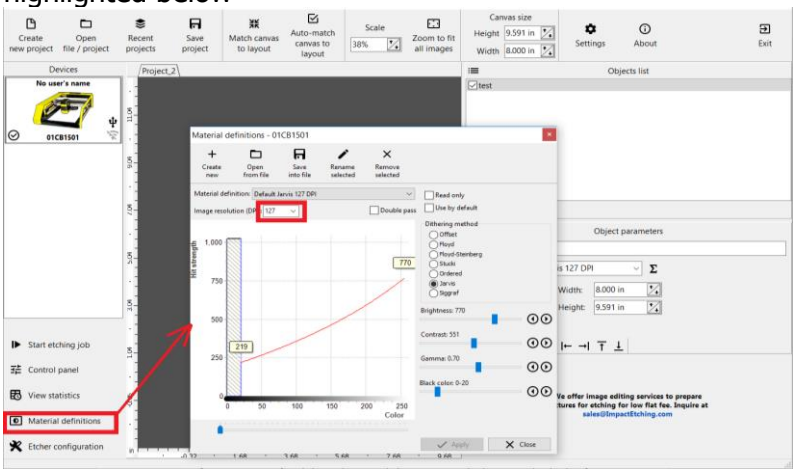
We prefer to use vertical and horizontal pixels count as measure of image size and resolution.
Pixel represents a "dot" of a given image, smallest unit of its graphical information
The size of any image in pixels can easily be found out by right-clicking on the file and selecting "Properties".
Then, go to "Details" tab and scroll it down



Unlike for some laser machines, your image does not have to be specific size in pixels to achieve desired dimension of your etching. DGStudio will scale your image up or down as required, based on the size of your etching (canvas) that you selected.

The question still remains – what is the optimal size of image in pixels ? If the size in pixels is less-than-optimal, your etched image will miss details and look pixelated. If the size is too big, DGStudio will take longer time to process image and you will put unnecessary load on your computer's resources.
Here is how we like to think about such questions:

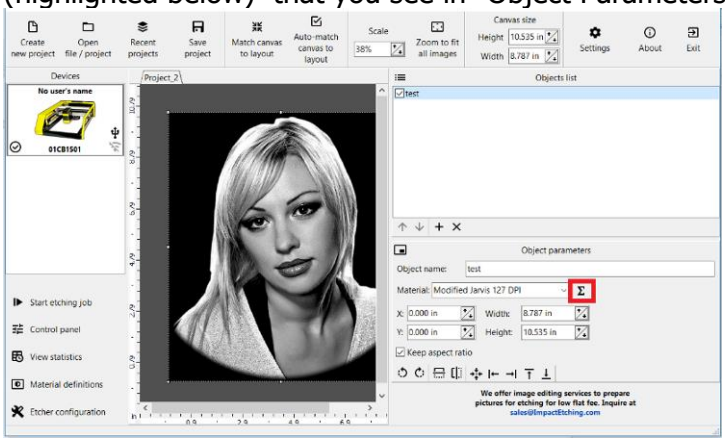
1. The typical resolution that your image will be etched with is usually within the range of 100 to 150 DPIs (Dots Per Inch) – that is how many "dots", or hits with the diamond tip, will machine create per inch of stone surface.
2. If you know what "Material Definition" you are planning to use for etching, you can find out exact value of etching DPIs. It is shown in the "Material Definitions" window, the field highlighted below



3. Now that you know your etching resolution (for the purpose of this discussion, let's assume that it is 100 DPI), find out the size of your etching on the stone. For example, you are etching the portrait that will be 12 inches high by 9 inches wide.
   Because etching resolution is 100 DPIs, per one inch of portrait's dimension, the machine would have to create 100 hits with the diamond tip, so the ideal size of your image in pixels will be 12"" times 100 DPI by 9" times 100 DPI, or 1200 by 900 pixels.
   That is the size of your image in pixels that , when etched with material configured at 100 DPI and with the etching size of 12" by 9", will not require that DGStudio scales your image up or down.
   If your image's size in pixels is significantly lower than the one you get using above formula, then DGStudio will scale your image up, which might cause pixilation.
   If image size is significantly larger that optimal, then you are just loading DGStudio with a lot of computational tasks, for no benefit, because it will end up scaling your image down by removing redundant pixels anyway.

   This does not mean that you must make your image size in pixels match "ideal" dimensions obtained by above formula. DGStudio can scale images up and down rather well, and in most cases you will not notice significant difference in quality of etching if your image size deviates from "ideal" size.

4. Now is the good time to explain the meaning of "match image size to resolution" button (highlighted below) that you see in "Object Parameters" area.



What that button does is recalculating the size of the image to match its resolution to DPIs 1 to 1, i.e, calculating the size where one pixel on the image will match one dot in "DPI", without scaling up or down.
Naturally, result of that operation depends on the "Material Definition" selected for that particular image, because that is where DPI measure comes from.
For example, if material selected for a given image has resolution of 127 DPIs, and the image has size of 500 by 400 pixels (width x height) , then pressing "Match image to resolution" button will cause image size to be recalculated to :
Width: 500 pixels / 127 DPIs = 3.94 inches
Height: 400 pixels / 127 DPIs = 3.15 inches

Recalculating the image size while keeping canvas size unchanged will cause your image to become bigger or smaller than canvas. That is why, if you want to etch image in its original size, you usually have to press button "Match canvas to image size" after you did "Match Image Size to Resolution". That is the reason we put these buttons next to each other. They are usually used together.

14 How to make sure that your etchings look great

This chapter contains the "secret" of creating perfectly – looking etchings.
It is based on years of our experience of helping customers and configuring etching machines.

14.1 Five Rules

As you will see, there is no magic to creating perfect etchings, it all can be summarized in just 5 bullet points.

5 Rules for creating perfect etchings

- Rule # 1: Configure your "Material Definition" to make sure that "the Line" looks good on stone.
- Rule # 2: As long as "the Line" looks good on stone, never change "Material Definition".
- Rule # 3: Edit your images to make sure they contain correct dynamic range of colors, ranging from perfect black (color # 0) to perfect white (255)
- Rule # 4: If "the Line" looks good on stone, but your etching does not come out satisfactory, make sure that your image is edited correctly, with enough contrast, and satisfies the rule # 3
- Rule # 5: If you ever want to change your "Material Definition", see rule #2

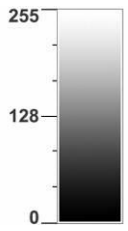
Above rules introduce some new terms that will be explained now.

14.2 "Test_Line"

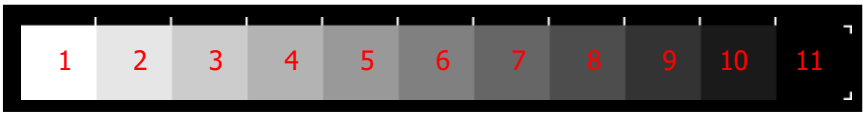
Let is try to understand what happens when Machine transfers your images to the stone.

All images that Machine works with are ultimately converted to 1-byte greyscale palette, meaning that your images are interpreted as having 256 colors, ranging from perfect black to perfect white

Perfect black color has number 0 (zero), and perfect while has number 255
Here is what greyscale palette looks like, with color numbers:



The color palette we use for configuring our machines is named: “Test_Line.bmp” and is put on your PC’s desktop by the installation procedure of DGStudio.
We often call that image “**the Line**”. Here is how it looks :



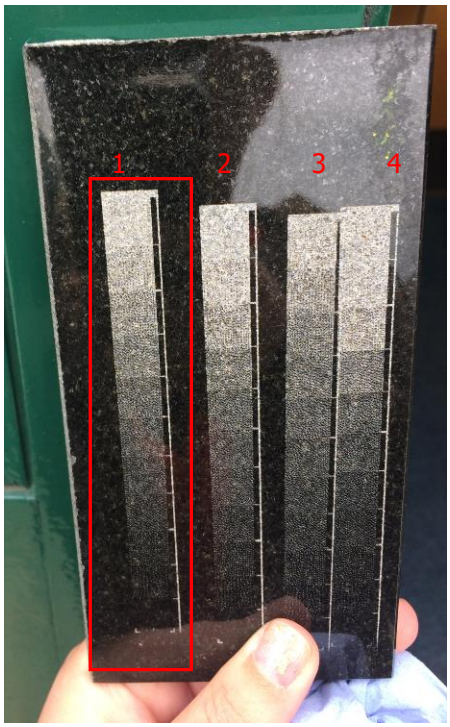
"The Line" is based on the same idea as the palette shown above, only contains 11 colors from the entire palette in one line. Square numbers are shown in red and are missing from the test image. These numbers are used for explanation below.

The reason we only use a line with 11 colors is because it makes it easy to see the difference between two adjacent colors and the line overlaps the full range of colors that any image can contain. Missing colors will always appear as a smooth color transition between colors in Lines. We configure material, etching the “the Line” and changing contrast, brightness, resolution and other parameters in the “Material Definition”, until following 3 conditions are satisfied:

We adjust the engraving quality by changing the contrast, brightness, resolution and other parameters in the engraving “Material Definition” until the following conditions are met:

- Square 1 should be as bright as possible
- Square 11 always remains perfectly black, square 10 should be engraved and at the same time be as dark as possible
- Between each adjacent squares there must be a visible border of color change
- The color change between the squares must be uniform with no visible sharp border between any squares.

This is how the test "Line" should look on the stone when engraved with the correct “Material Definition”. This is a real photo of the stone. Correct setting at line # 1.



Adjustment defects along the rest of the lines:

2: has little distinguishable squares 1 and 2. There is also a sharp color difference between squares 3 and 4

3: the white color in square 1 is insufficient and, accordingly, the entire line is darkened

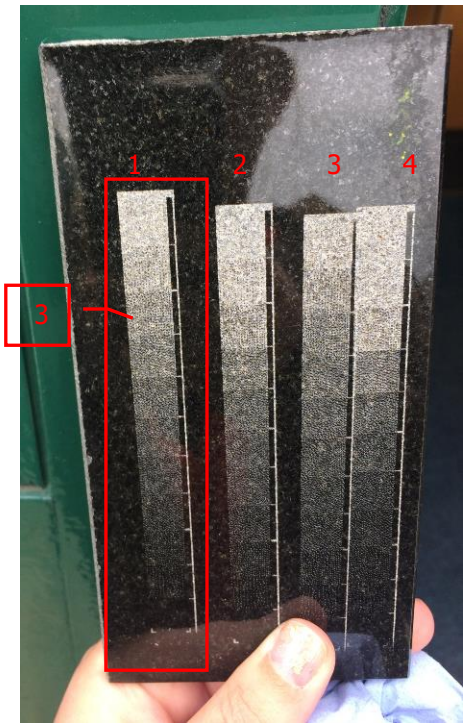
No. 4: the setting is sharply contrasting, squares 1, 2 and 3 are solid white, a sharp color transition on squares 4 and 5, then an excessively dark area

14.3 Color-balancing your image

If you set up the engraving "Pattern" correctly, and the test "The Line" looks correct, you only guarantee that the whites of the image (# 255) will look white on stone, black (# 0) will look black on stone and midtones as well. Will have a smooth color gradient.

But this is only half of the puzzle.

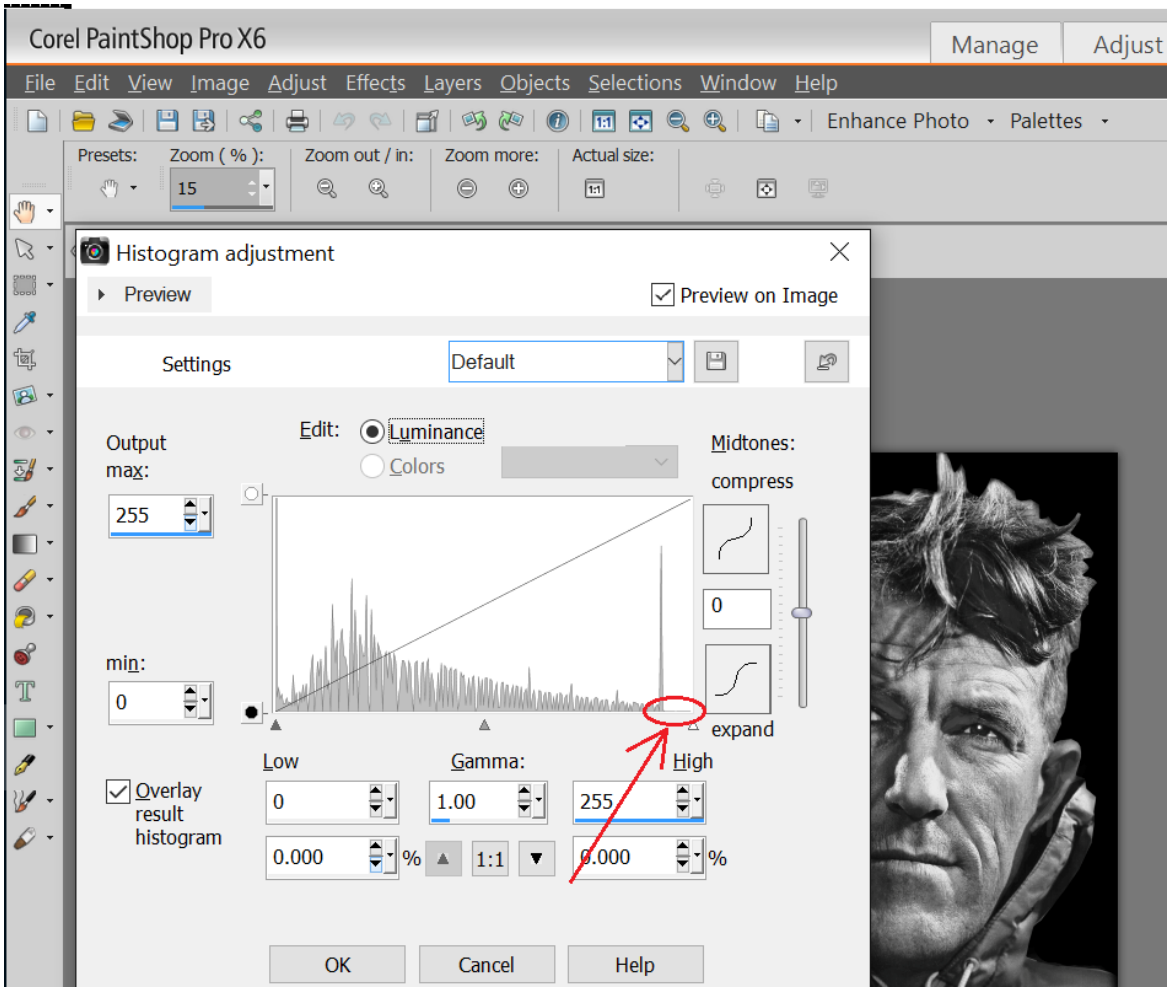
What if the image you intend to engrave does not initially contain the correct range of colors?
What if all (or nearly all) of the points in your image are in the range 0 to 190, not 0 to 255? This will result in your engraving not being as bright as square 1. At best, like square **3**. Your engraving will lose all bright colors.



So, how to make sure that your image is correctly color-balanced ?

Make sure to adjust the dynamic range of your image using tools such as Histogram Adjustment, available in advanced raster editing programs, such as Adobe Photoshop and Corel PhotoPaint.

Below screenshot illustrates one such image, in need of adjustment.



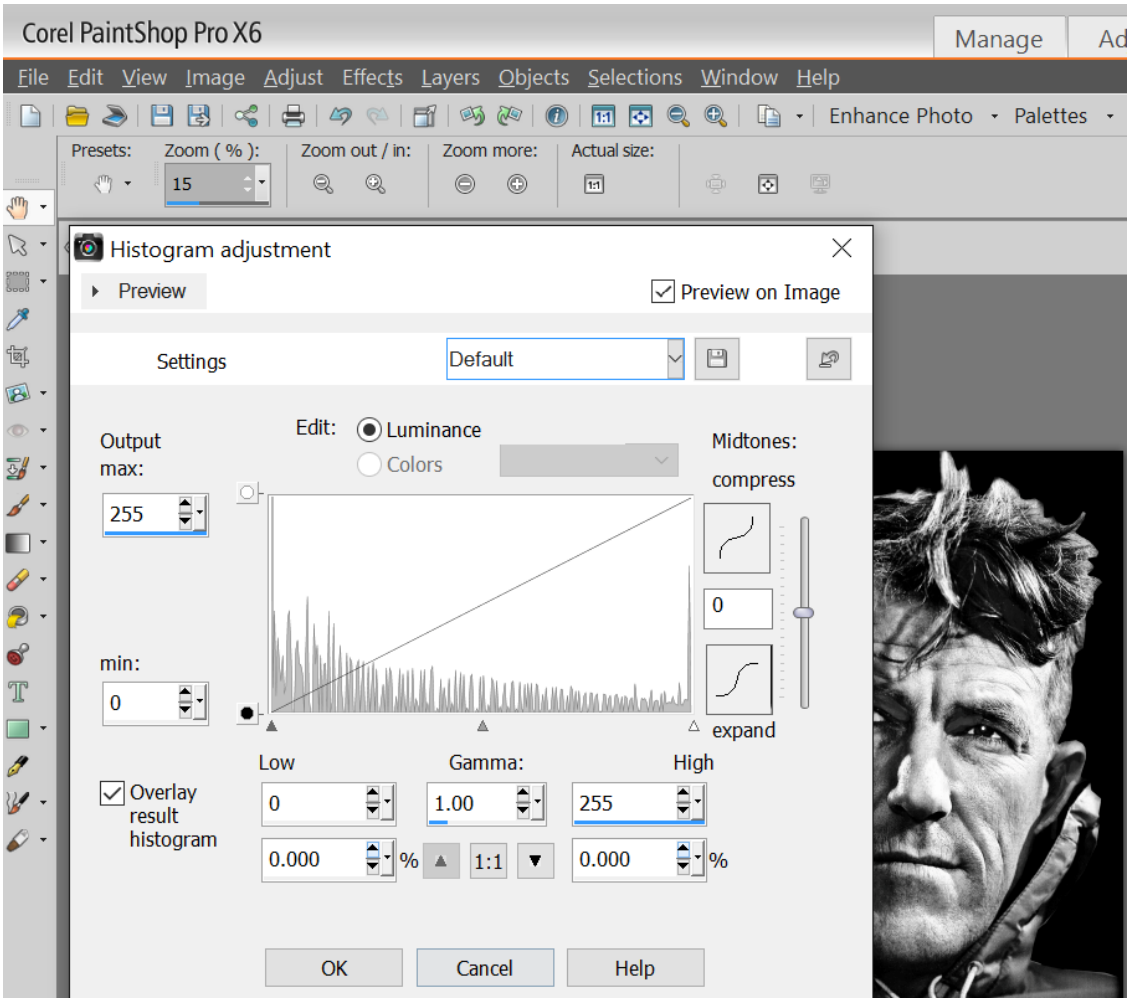
Check the color histogram in above screenshot, and area highlighted on it.

This histogram represents greyscale colors on horizontal axes (from perfect black, #0 , on the left, to perfect white, or #255, on the right), while vertical axes shows the number of pixels having that color.

As you can see from highlighted area that includes colors from approximately 230 to 255, there are no pixels at all that are brighter than color # 230.

This histogram is a good example of image in need of color correction

By applying "histogram adjustment" tool, we distribute colors more evenly:


Corel PaintShop Pro X6
Manage
File Edit View Image Adjust Effects Layers Objects Selections Window Help
Enhance Photo
Palettes
Presets:
Zoom (%):
15
Zoom out / in:
Zoom more:
Actual size:
Histogram adjustment
Preview
Preview on Image
Settings
Default
Output max:
255
min:
0
Edit:
Luminance
Colors
Midtones:
compress
0
expand
Low
Gamma:
High
0
1.00
255
0.000
%
1:1
0.000
%
Overlay result histogram
OK
Cancel
Help

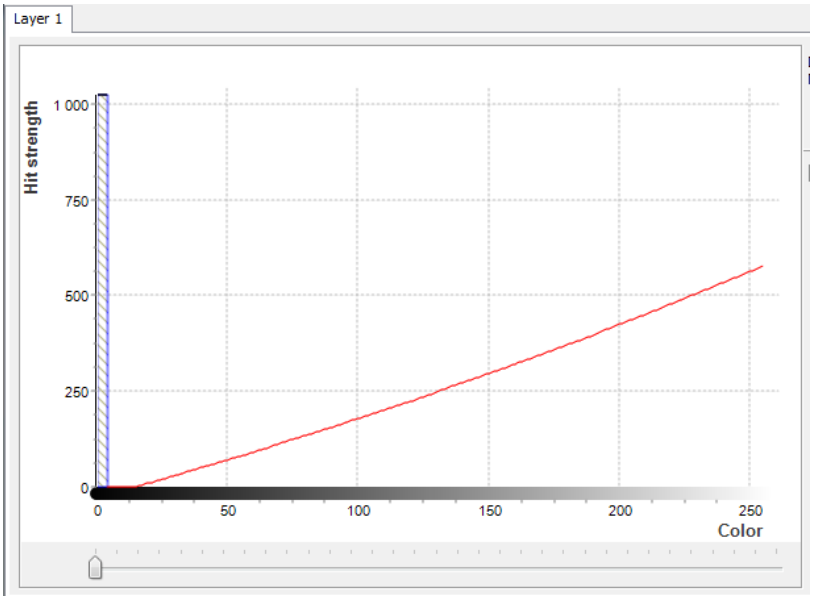
15 Configuring material definition

15.1 What is “Material Definition”

We hope that by now you have read the chapter 14, “How to make sure that your etching looks great”, and in particular, the section called “14.2 “Test_Line”.

“Material Definition” is responsible for making sure that “the Line” looks good when etched on the stone. In other words, “Material Definition” is one-half of the job required for successful etching (the other half being properly edited image).

“Material Definition” tells the etching machine how to hit the stone for each of 256 colors that is present in the image being etched.
In other words, “Material Definition” is nothing but the way to tell the Machine the strength of hit for each color. Its configuration is best illustrated by the graph that is part of “Material Definitions” window and shows the colors on horizontal scale, and strength of hit on the vertical scale:



“Material Definitions” are stored in your etcher’s memory card and are read from the etcher every time you connect to it via DGStudio. That is why you should not worry about backing up your “Material Definitions” when changing the PC that runs DSStudio. Your “Material Definitions” will not get lost, because they are not stored on your PC.

15.2 Why we cannot provide you with ideal “Material Definition” for every stone type.

Our etching heads are complex systems, incorporating multiple mechanical and electric components, as well as sensors. Due to natural variability of those components, each etching head has it unique characteristics. That is why brightness and contract settings that work fine for one machine / etching head are not necessarily applicable to the other machine. The only criteria that

"Material Definition" is configured correctly is when "the Square" looks good on the stone. Because all etching heads are unique, correct configuration of "Material Definition" can be achieved at different settings for different machines.

15.3 When to create new "Material Definition"

You will have to create the new "Material Definition" whenever either of following 3 components changes:

- Etching resolution (how many hits with diamond should machine create per inch of stone – measured in DPI, Dots Per Inch).
- Dithering method (Offset, Jarvis) – see chapter "15 Dithering Methods" for more on dithering methods.
- The type of stone (e.g, if you switch from "Jet Black" granite to more colored types , such as "Blue Perl" or "India Red").

15.4 How many "Material Definitions" do you need?

We recommend that, while you are starting to use your etcher, you stick to just a few "Material Definitions".

The machine comes with several pre-configured "Material Definitions" of engraving.

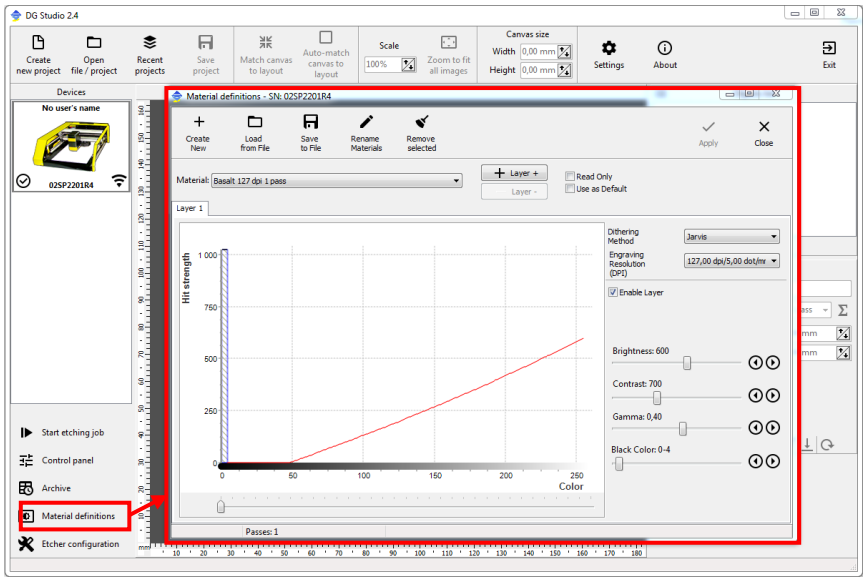
These "Material Definitions" have been pre-configured by the manufacturer for your specific engraving head and will likely work well with any type of black or near-black granite.

Perhaps the suggested "Material Definitions" of engraving will not give good results for the stone you are using. Use the "Material Definitions" that gives the closest to the required result and correct it. Perhaps for one type of stone you want to set up more than one "Material Definitions" of engraving, for example with different engraving resolutions.

So, with 2 "Material Definitions" that come pre-configured with the Machine, and 2-3 more that you will create for colored stones, you will likely not need more than 5 "Material Definitions" to create any type of etching.

15.5 How to configure new “Material Definition”

This chapter will guide you through steps of creating new “Material Definition”



Let us assume that you have a new type of stone, and, after trying the “Material Definitions” that came standard with the machine, decided that you need to create a new one for that type of stone.

When setting up "Material Definitions", keep in mind that by increasing the engraving density, you can get more detail and a better image.
This is limited by 2 reasons: the lead time and the ability of the particular material to transmit a high impact density.
The execution time increases in the square of the increase in the density of the engraving. For example: increasing the density of engraving by 2 times, the execution time will increase by 4 times.

The ability of a material to convey high density depends on its grain size. Each blow removes a few grains from the stone. If the stone is coarse, then the impact can leave only a large mark, which means that the distance between adjacent impacts must be increased (and the density, accordingly, decreased).

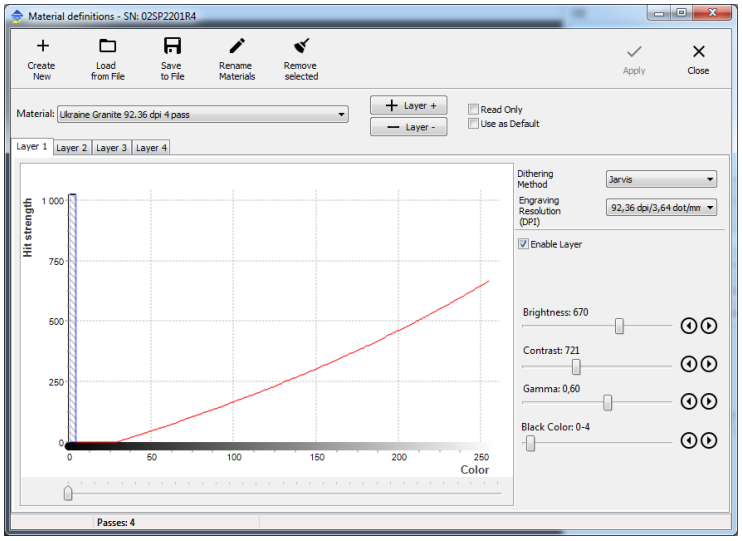
On stones with a large number of inclusions ("dirty", heterogeneous materials), it is possible to obtain an acceptable quality of engraving only by applying multi-pass engraving with a low impact force.

Step 01 Create new “Material Definition” by copying from existing one

Open the existing “Material Definition” that is closest to your desired settings, and click “Create New” button. New “Material Definition” will be created by copying all parameters from the one that is currently open.

You will be asked for a name of your new “Material Definition”. We recommend that your name includes stone type, dithering type and etching resolution. For example: “Granite 92.36 dpi 4 pass”

Step 02 Set dithering method, resolution, number of passes.



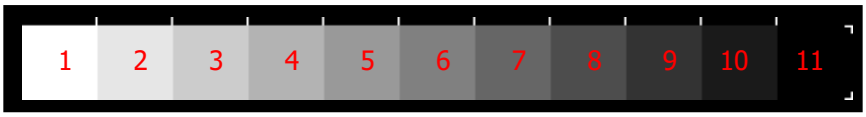
Press the "Layer +" / "Layer -" buttons to set the number of passes. Probably for a "dirty" stone you will need at least 4 passes.
On the "Layer 1" tab, select the dithering method and resolution. These parameters will be applied to all passes. The term "Layer" is used for the reason that with some settings the system will be able to merge layers and perform two or more layers in one pass. For more details see p. "15.6 Advanced options for setting of “Material Definition”.

Step 03 Using your new “Material Definition” make a test "Test_Line.bmp".

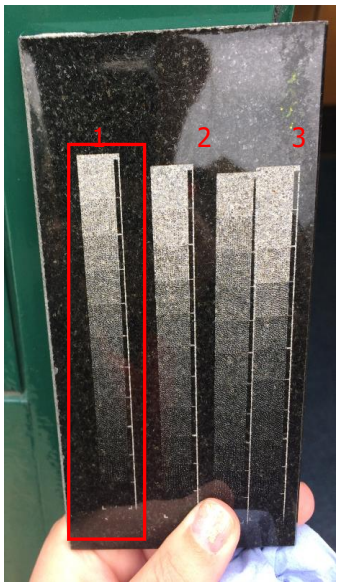
Given that the “Material Definition” are specific to a specific type of stone, you should always use the type of stone for which this “Material Definition” is intended. If you have an idea of whether the machine should hit the stone harder or weaker on the new material, increase / decrease the "brightness" parameter by 50-100 units before the first test.

Step 04 Analyze results of your test, adjust “Material Definition” parameters, repeat the test etching.

As a reminder:



- Square 1 should be as bright as possible
- Square 11 always remains perfectly black, square 10 should be engraved and at the same time be as dark as possible
- Between each adjacent squares there must be a visible border of color change
- The color change between the squares must be uniform with no visible sharp border between any squares.



- **Set required Brightness:**
  If you think that square 1 is not white enough (like on line # 3), increase the brightness by 20 - 50 units. In this case, the force of the blow will increase along the entire line. If you don't want to increase the brightness of the dark squares, then increase the contrast by the same amount.

- Possible defect excessive brightness (lines # 2 and # 4). A sign of this is: two or more first squares visually identical in brightness. Often there is a sharp color transition along the line (line No. 4, a sharp border between squares 3, 4, 5). If these defects are found, it is necessary to reduce the brightness.

- **Configure "Contrast"**
  By changing the contrast, you control the smoothness of the color change along the line and the brightness of the darkest tones. Usually the contrast value is close to the brightness value. If the contrast is insufficient, the impact force in dark tones will be overestimated, which will "light up" the dark part of the line. If there is excessive contrast, the mid tones will fade quickly (as on line # 4) and will not differ much from the dark tones.

- **"Gamma"**
  By changing this parameter, you can brighten or darken the midtones. It is recommended to adjust this parameter after finding the brightness / contrast values.

- **"Black color" parameter**
  Black Color sets the range of the darkest shades that will not be engraved by the machine. As a result, colors between 1 and the value you specified for "black" will appear as black on the stone. We recommend that you set Black to a range of 4-12 units.

After making changes to the "Material Definition", it is necessary to engrave the test line and, if necessary, make additional changes to "Material Definition".

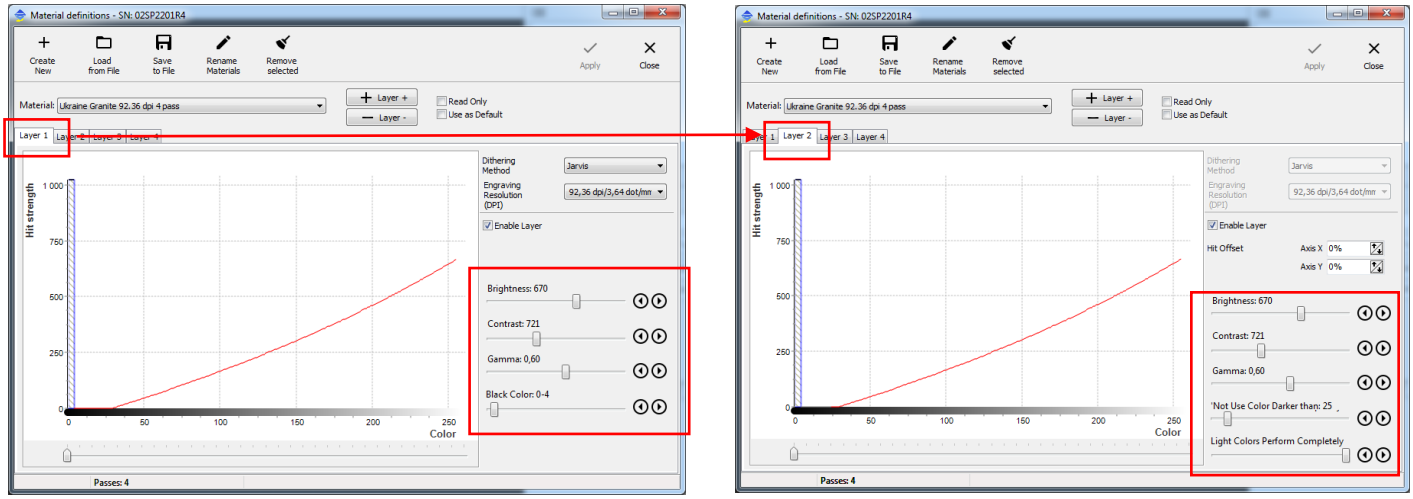
15.6 Advanced options for setting of "Material Definition".

The unique ability to customize the engraving is:

- the ability to adjust the force of impact for each layer;
- for the second and subsequent layers it is possible to restrict the execution of dark or light tones
- for the second and subsequent layers it is possible to indicate the displacement of the impact relative to the original place
- the ability to temporarily disable the execution of the layer, including the first

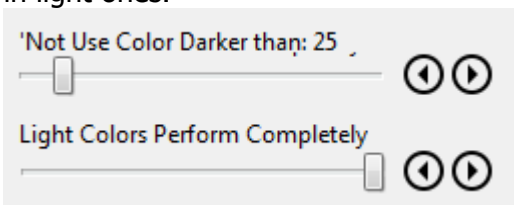
15.6.1 Setting the force of impact on layers.

If your "Material Definition" has more than one layer, you can specify your own parameters individually for the each layer. This allows for more subtle adjustments, such as highlighting light tones in an engraving.



15.6.2 Restricting the performance of dark and / or light colors.

In the second and subsequent layers, you can tell the system not to perform in this layer colors that are darker or lighter than the specified ones. Most often, the execution of dark tones is limited, so that the machine would make fewer repeated strokes in dark places of engraving than in light ones.



15.6.3 Offset settings.

By default, on the second and subsequent passes, the machine will hit exactly the same place as the first layer. Sometimes, for example, on a particularly hard stone, it helps to offset the positioning of second layer over the first one. Offset during repeated passes allows the strike to be performed slightly away from the original, which increases the impact mark.
Offset can be specified both along the X-axis and along the Y-axis.
The offset is indicated as a percentage of the pitch of your chosen engraving density. For example, if you specify an offset of 50% on the X-axis, the hit will be executed exactly halfway between the hits of the first layer.

15.6.4 Disable layer execution.

You can turn off any layer, including the first, for example, in order to re-engrave previously completed work, when you do not need to perform all layers.

16 Image preparation for etching

In most of cases, unsatisfactory etching results are caused by poor image preparation.

We encourage our clients to try editing of pictures themselves, but you might find it more economical to outsource editing to us. We will help you achieve the desired results for a single flat fee, which will include any number of changes to the picture, until you and your customer are satisfied with the result. Please contact us at sales@ImpactEtchig.com to be set up with our Image Editing Service.

See chapter "16 Using Image Editing Service" for more details.

16.01 What this chapter is about

This chapter is meant to accomplish two goals.
First, we want to explain why it is absolutely required to edit pictures before you etch them, and second, we would like to cover some basic editing steps that you might find useful in your work.

16.02 What this chapter is not about

This chapter is not meant to teach you the use of raster editing editors.
First, there are many books on this subject, and trying to repeat that information here would go beyond the scope of this manual.
Second, we would have to base out tutorial on a specific type and version of the program, or restrict you to the software of our liking, neither of which is good.
Third, there are multiple ways to arrive at the same result, and putting some kind of definite manual would simply not be possible.

16.03 Why editing is necessary

Any image, no matter how perfect, requires editing to prepare it for etching.

Major steps in such preparation are:

- Adjust brightness and contrast of the picture
- Highlight transitions and contours
- Darken areas that are too white and brighten areas that are too dark
- Add / remove "sparkles" in the eyes.

Let us review an example of image editing.
Here is the scanned photograph as provided by the Client who wanted to etch it on the monument:

This portrait has following deficiencies that need to be corrected with editing

- The picture is somewhat blurred and lacks focus
- Face lacks contrast
- The jacket is too dark and will not be visible on the stone
- The eyes are not expressed enough to look good on the stone
- Paper that photograph is printed on has wrinkles that become visible in scanned image

If this picture was to be loaded into DGStudio program without any editing (except cropping the background), the etching on the stone it would look as below:

After the editing has been performed, improved portrait looks like this:

And the image etched on the stone will look like this:

As you can see, there is a stunning improvement of quality that results from proper image preparation.
That is why preparing images for etching is a major contributor to successful use of any etching Machine.

16.04 What well-prepared image should look like

Please review below images, the original, likely scanned from some very small passport photograph, next to edited image done by professional

The comparison reveals the most important components of well-prepared image:

- **Removed background, replaced by ideal black color (number 0).**
  Unless background contains some valuable information or your customer requests to leave it, background should be removed and filled with black color. Machine's algorithm is designed to not etch black areas, and etching head will not even move into outside areas filled with black color, this saving you the etching time
- **Halo around the head.**
  With background removed, the dark hear will not be visible unless you create a small halo around the person's head.
- **Highlighted facial features.**
  If you look closer into the completed image on the right, you will notice that lip lines, eye lids, eyebrows were amplified manually by the artist (by highlighting the corresponding facial features)
  Manual highlighting of facial features is not always required. Sometimes, application of automated filters can achieve the same effect. In some complicated case, manual work is the only way to get decent results if source image is of low quality.
- **Color-balanced image**
  Source image is dark and lacks contrast. Edited image is color balanced to ensure that it contains full range of halftones, from ideal black (#0) to ideal white (#255). See section 14.3 of this document on why this is very important

- **The unnecessary margins removed.**
  The portrait does not have any unnecessary "empty" margins along its left, right, upper or bottom sides. This will simplify the etching by ensuring that image size entered when launching the etching jib will match the size of portrait you get on the stone.

16.05 Image editing for different types of stones

The less "perfect" the stone, the more bright and contrast should the picture be.

By "perfect" we mean ideal black stone without any imperfections or "sparkles".

The image produced by the Machine can have up to 255 gradations of white color.
On a "perfect" stone, you will be able to see all gradations. On a stone with imperfections, our eye will mostly recognize the difference between dark color of polished stone and while color of the etching. For less perfect stone, the color schema of the entire image should be shifted towards more bright white colors, and contract should be higher.

16.06 Software to use for editing

You can use any commercial (licensed), shareware or freeware raster editor.
We recommend using the editor that supports layers. While layers are not a mandatory requirement, it makes editing of pictures much easier and will in the end save you a lot of time and frustration.

Currently, there are two commercial Raster Editors that have all the functionality that you will need to edit your pictures.

- Adobe PhotoShop (any version)
- Corel PaintShop Pro (any version)

On the value-for-money bases, we recommend that you use "Corel Paint Shop Pro". At the time of writing this manual, it can be purchased for a one-time fee of $60.
http://www.paintshoppro.com/en/products/paintshop-pro/

There are number of shareware and freeware raster editors, some of them with layers support. Our experience has been that it is better to avoid such programs. They seem to work when all you want to do is some basic image editing steps, but in most case such programs "drop the ball" when you require advanced editing. We have tried most freeware and shareware programs available today, and still recommend using commercial product from Adobe or Corel.

If you do want to try free software, we recommend to use paint.net, which seems to be the most stable of the freeware bunch. It is available here:
http://www.getpaint.net/index.html

16.07 Optimal hardware for editing

- If you are using older, less-memory-hungry operating systems, such as Windows XP or Windows 7, you will need a computer with at least 1 Gigabyte of memory (2 Gigabytes or more recommended)
  For older PCs, we recommend using PC with "discrete" graphic card (not integrated with PC's chip set).
  PCs with integrated graphics processors (IGPs) use computer's own memory for image processing, which sacrifices performance because computer's own memory has lower speed vs. memory that comes with the more advanced graphic processors.
- If you are using PC running Windows 8 or 10, you will likely need at least 4GP of RAM, and processor with decent performance. Find the CPU of the PC that you are planning to use, and check its resource:
  https://www.cpubenchmark.net/cpu_list.php
  Locate your CPU model in the list, and check its "Passmark CPU mark" (2nd column). The higher that value, the faster is your PC. We recommend to use PCs with Pass mark score of at least 1500.

16.08 Using proofs

Before you etch the picture on the monument, we recommend etching the image on a smaller size or less expensive stone (create a proof etching)

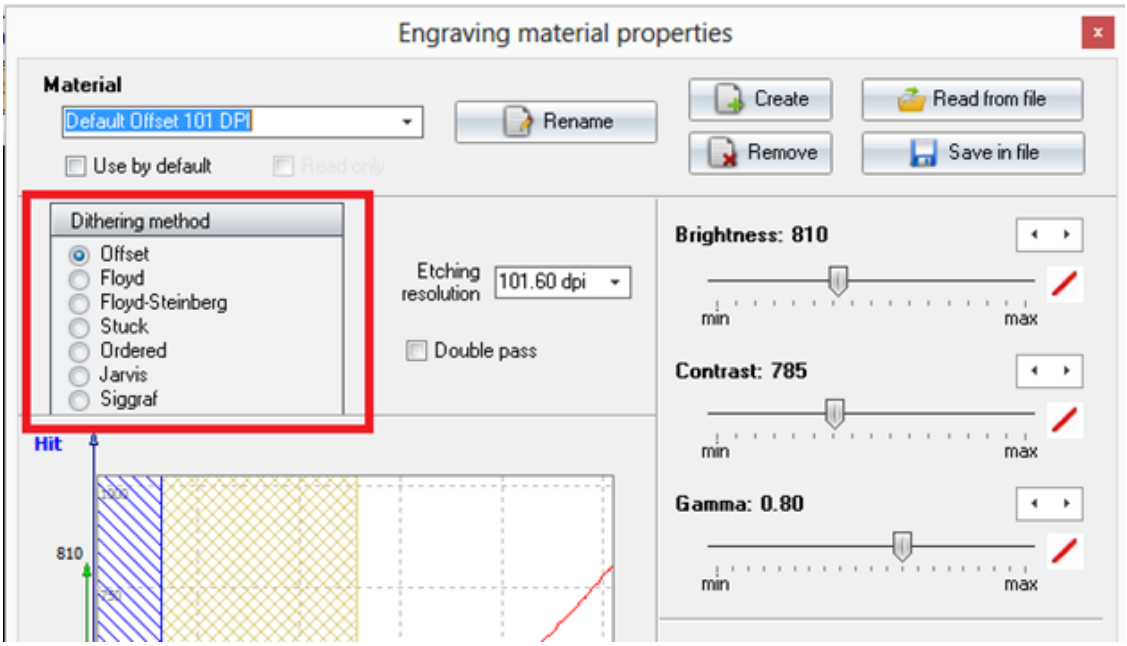
Proof can help you with the following:

1. Ensure that the image to be etched has satisfactory quality.
2. Demonstrate the image to the customer, to make sure that he/she is happy with the result.

You can use granite tiles, available for purchase from most tile and flooring stores. Select the granite that is comparable in texture to your monument. This will help prevent any surprises with the final etching.

17 Dithering methods

The term "Dithering" refers to approach of representing image with media that has limited capacity of reproducing colors, such as the stone.
Dithering method is an important part of "Material Definition". Below image represents screenshot from "Material Definitions" screen, area where dithering method selection highlighted.



DGStudio offers you 7 choices of dithering methods, but they all can be grouped as follows:
Group 1: Offset
Group 2: the rest of methods

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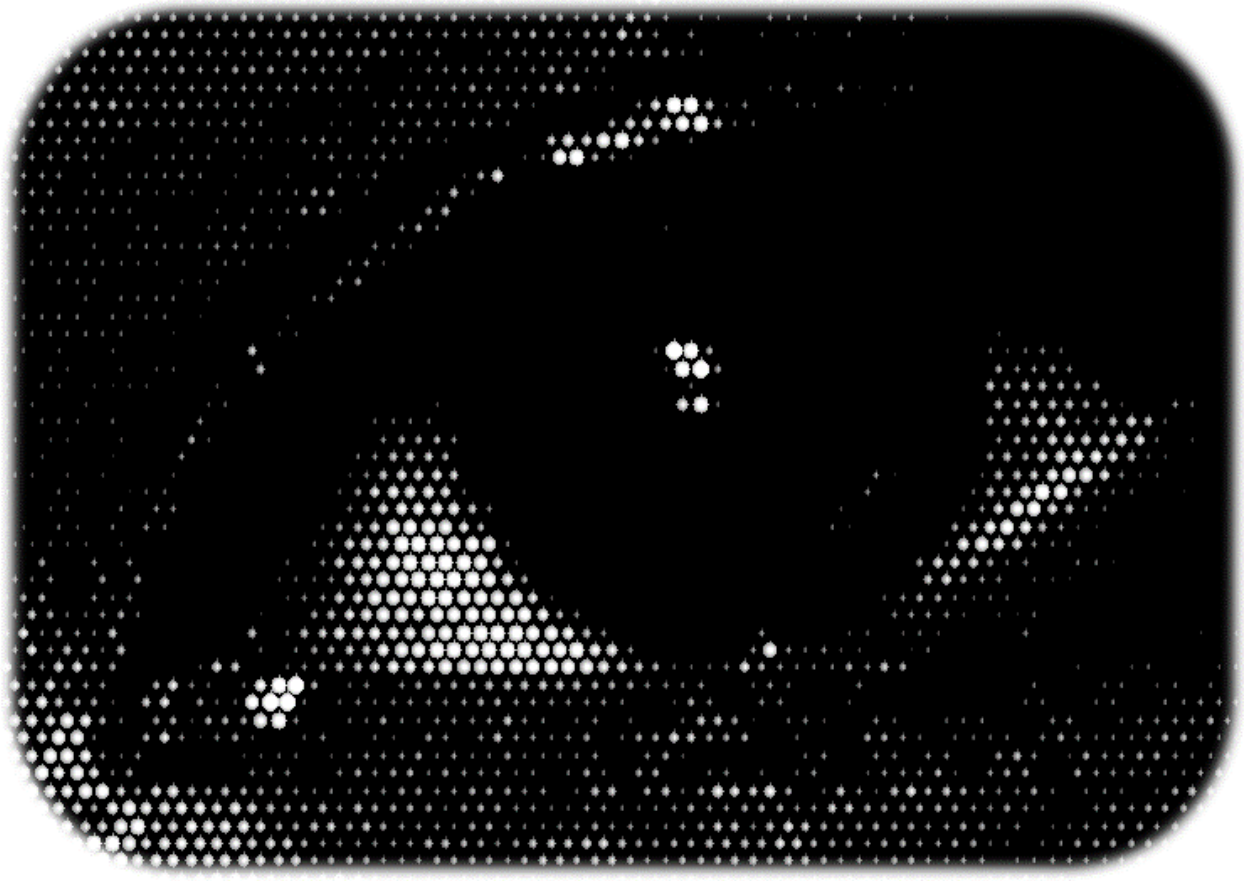
Offset method is where dots in your etching are arranged in the grid with the same distance (or offset) between the dots (hence, the name of the method). The intensity of color is then created by the strength of hit only. Below image represents dithering of person's eye using offset method. The size of each dot is proportional to the strength of hit that etching machine will create



Offset method tends to produce best results on ideal black granite, where halftones will be visible.

Also, because of its precision of image reproduction, you can use offset with lower resolutions , as low as 80 DPIs. Lower resolution will significantly increase the speed of your etching.

In most cases though, we recommend that you use Jarvis method.

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In Group 2 of dithering methods (the non-offset ones), the intensity of color is created by both the strength, as well as by the density of hits. Below image represents dithering of the same picture with Jarvis method.

Note that other non-offset methods (Floyd, Floyd-Steinberg etc.) are based on the same principles as Jarvis (modulating both strength and density of hits), but use different algorithms.

You can try all non-Offset methods, and they will likely produce very similar results.
Because Jarvis and other similar ditherings tend to articulate brightness of the image by putting dots closer to each other, Jarvis tends to produce better results, in particular, on colored stone. Jarvis algorithms result in some diffusion of pixels, that is why they are best used with increased etching resolution, which reduces the effect of that diffusion. This explains why, of 2 "Material Definitions" supplied with your machine, the "Jarvis" one has higher resolution than offset.

18 Servicing your etcher

18.01 Changing the diamond tip

The diamond tip is held in place by a magnet, so you do not need to use any instruments.
In most cases, you can use your fingers to pull the worn-out diamond tip from its socket in the etching head.
You can use small pliers to pull the diamond tip out of the head if doing so with your fingers does nor work.

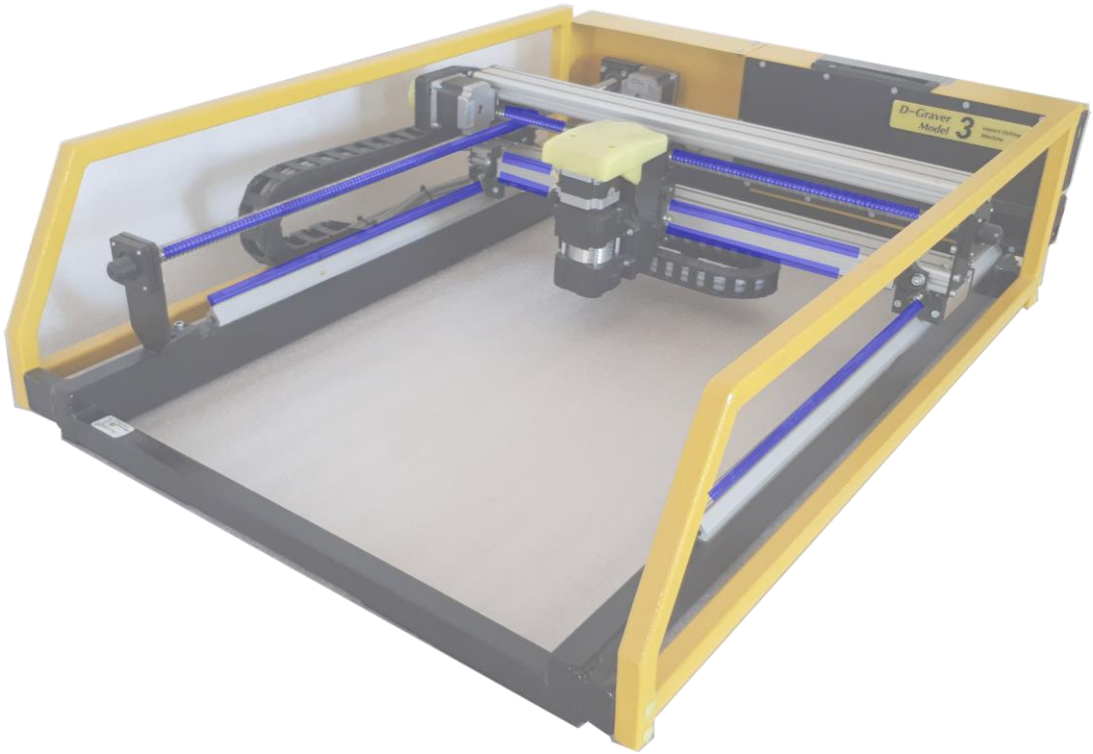
18.02 Lubricating the linear drive components

You will have to periodically clean and lubricate your machine's screws and slides.

For both operations, you would have to use the mineral oil-based lubricant compliant with NLGI 2 or DIN 51825 standards

DO NOT use any non-mineral-oil-based lubricants, such as graphite-based ones.

Take a clean tissue and apply some lubricant to it, then wipe the gliding surfaces and screws, paying special attention to surfaces with accumulated stone dust (usually, closer to the end of each screw).
When all dust is removed, leave a thin layer of lubricant on corresponding surfaces.
Places to lubricate are highlighted in blue on below picture (screws and slides)



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