



# USER MANUAL

## ARC ANNEALER

Thank you for purchasing our product,  
designed, and built with passion.

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## 1. Safety Instructions for Using the Annealer

- Always attend to the annealer during operation. Never leave it unattended.
- Continuously monitor the case position, and stop and remove the case immediately if positioned incorrectly. The bed will be damaged in case of bad positioning.
- Avoid using the annealer near water or in wet conditions.
- Do not operate or touch the device with wet hands.
- Do not attempt to open the casing, as there are high live voltages inside.
- For any servicing, refer to qualified service personnel only.
- Before replacing the fuse, identify and fix any issues. Contact us for assistance prior to replacing the fuse.
- Keep magnetically sensitive items away from the annealer.
- Use a grounded 3-pin AC source/cable for power supply.
- Do not operate or position the unit in direct sunlight or humid locations.
- Keep the annealer away from heat sources.
- Ensure the ventilation openings of the instrument are not blocked.
- **The annealer will heat the cartridge (neck and shoulder at least) to around 500°C. Always use protective measures when handling - do not touch with bare hands**

## 2. General Information

- Our YouTube Channel:  
<https://www.youtube.com/channel/UCSdgnOgXjikkfEKTh3lqUuQ>
- On Facebook:  
<https://web.facebook.com/ARCPrecision/>
- Email: [info@arcprecision.net](mailto:info@arcprecision.net)
- Web: <https://www.arcprecision.net/>

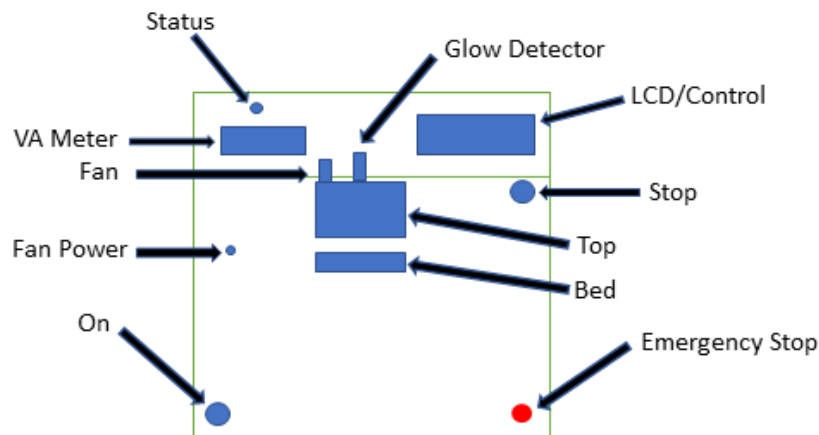
## 3. Operating Voltages and Fuse

The ARC Annealer has been tested to operate at both 110V AC and 220V AC. It comes with a default configuration of 220V 50Hz. However, if necessary, you can easily reconfigure it by removing the top cover and switching between the two voltage options. The switch for this can be found at the back of the main power supply or along the side. Remember to specify the desired voltage if different from the default setting. The following test results:

Supply Voltage	Idle Current	Anneal Current
239 V	0,27A	2,81A
110,1V	0,22A	6,26A

The fuse installed for 220V is 5.15A slow blow, 15mm standard fuse. Change to 6 Amp Slow Blow when changed and operating at 110V AC.

## 4. User interface



### 4.1. Graphical User interface (GUI)

The ARC Annealer is equipped with a touch screen for controls and adjustments, offering users a variety of menus and pages for navigation, guided by a clear menu structure. The design features two microprocessors: one for the user interface and another for operation. These key components communicate through an RS232 interface. Significant effort has been put into embedding protective limitations within the firmware to safeguard the hardware.

To operate the touch screen, gently press the buttons; no excessive pressure is required. Regularly clean the screen using a soft cloth, avoiding the use of chemicals or water. It is acceptable to occasionally use alcohol for this purpose.

### 4.2. Buttons and switches

The ARC Annealer features several buttons to facilitate user interaction:

The main On/Off switch is located at the back of the device. If you won't be using the annealer for an extended period, it is recommended to switch it off to completely isolate it from the mains.

The 'On' switch is positioned at the bottom left of the front panel.

The Emergency Stop (ES) button is situated at the bottom right of the front panel. It is activated when pushed in and can be released with a half turn, as it is spring-loaded.

The 'Stop' button serves two purposes:

Pressing it will open the drop door to release the case. IT will also halt and end the anneal cycle.

#### 4.3. VA Meter

The VA meter on the ARC Annealer displays both the voltage applied to the resonator circuit and the current used during the annealing process. Monitoring these values can serve as a health check for the device, allowing users to keep an eye on any significant changes over time that may indicate potential issues.

#### 4.4. Top

The Top of the ARC Annealer houses several key components, such as the core, winding, and load sensors. These load sensors, positioned at the bottom of the Top, are responsible for detecting when a case is placed for annealing. Make sure that they are not obstructed by any objects, as they also initiate the annealing process in Auto Mode. For this reason, it is essential to disable Auto Mode when not actively annealing.

#### 4.5. Bed

The bed of the ARC Annealer is adjustable and implements a stepper motor for height control. The bottom position serves as a reference for the height setting. At different times, the annealer will lower the bed first to ensure the correct height is achieved, according to the programmed settings.

Additionally, the bed houses the drop mechanism, which is operated by a servo that opens and closes the drop door. Ensure that the opening is not obstructed, as the servo is quite powerful!

#### 4.6. Glow Sensor/Detector

The Glow Sensor (GS) is a one-bit infrared (IR) thermal device specifically designed to monitor the heat signature reflected by the brass case during the heating and annealing process. This optical device works in conjunction with the annealer's hardware and firmware to ensure consistency.

Please be aware that environmental lighting may impact the sensor's performance, as nearly all light sources emit some degree of IR radiation. Although efforts have been made to isolate the sensor from such interference, it is important to be mindful of this aspect when using the device.

#### 4.7. Fan

In some instances, residual media left on cases may produce smoke during the heating process. This smoke can potentially interfere with the optical sensing of the Glow Sensor (GS).

The fan is not pre-installed but comes with double-sided tape for attachment to the top of the device. To power the fan, plug the supplied lead into the Fan Supply for operation.

The image showing fan placement.



## 5. Basic Principles

Many users anneal to extend case life, while others do so to achieve greater consistency in velocity and accuracy. For this reason, it is crucial for reloaders to follow a consistent process when reloading, avoiding numerous changes from one reloading session to another. The same principle applies to annealing. Define and maintain the same process, making adjustments only when necessary, and ensure that the expected outcomes align.

Below are some basic principles that can assist with the annealing process and the use of the ARC annealer:

### 5.1. Applying heat

Keep in mind that when heat or energy is applied to the neck of the case, the remainder of the case, which remains at ambient temperature, will absorb the heat. As a result, anneal time will vary depending on the starting temperature of the case. It takes less time to heat a case from 40°C to 400°C than from 10°C to 400°C.

The ARC Annealer features a Pre-Heat cycle that increases the case temperature before annealing, greatly improving the process. The neck provides coaxial stiffness and some resistance to the release of the projectile. The more consistent the neck pressures, the more consistent the velocities will be, assuming all other requirements are met. Although efforts are made to ensure a homogeneous alloy, variances can still occur, sometimes visible as black spots in the annealed region if a case is significantly over-annealed. These variances contribute to inconsistent annealing results, as they can vary from case to case and are brand-dependent.

Many users rely on discoloration as an indicator of proper annealing, which can be a considerable mistake. After thousands of annealing sessions, it has been noted that some brands (even expensive ones) do not give consistent discoloration. However, inconsistent discoloration is not necessarily a bad thing. It's merely an observation and a cautionary note if you rely on this method. Discoloration is only an indicator of the anneal results. If the glow were the same for all cases, the hardness should be the same for all, as the glow serves as a consistent giveaway.

### 5.2. Thickness gradient and Thermal Centre

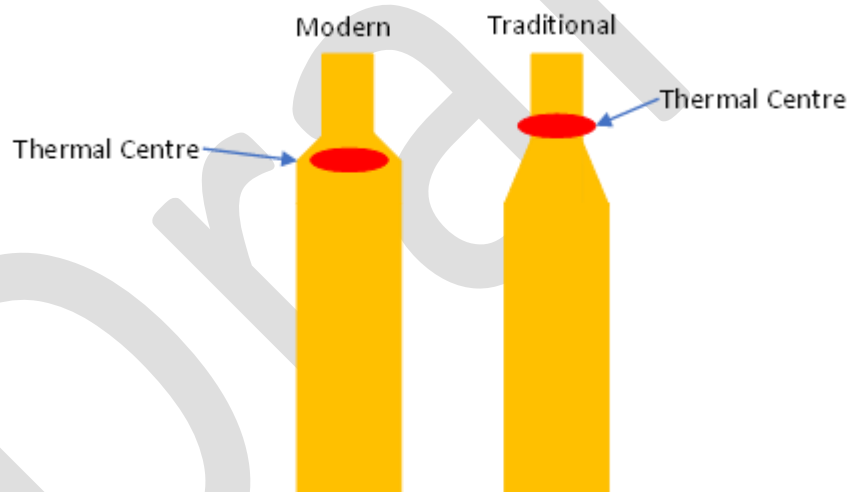
Cases can vary significantly in construction, particularly when comparing older calibers to more modern ones. Older calibers tend to have a gradually decreasing thickness, starting from the head and becoming thinner towards the mouth. In contrast, more modern calibers like the 6mmBR have a thickness gradient that reduces more rapidly than traditional cases. The thickness gradient measures the thickness before the shoulder and at the mouth, which are the regions applicable for annealing. Additionally, the shoulder region in modern cases can differ in length from that of traditional cases.

Take a look at the following thickness gradients.



The very steep gradient is that of 6mm BR, the same is applicable to the WSM.

Given the differences in case construction, heat flow or distribution will vary when heat is applied at the neck, depending on the case style. For traditional cases, applying heat in the neck area is adequate, but for those with a steep thickness gradient, it is necessary to position the case higher to achieve an even distribution between the neck and shoulder. In such cases, the Thermal Centre is located much lower, allowing the heat to flow more effectively from the shoulder to the neck, rather than from the neck to the shoulder.



### 5.3. Annealing Area

The following test was conducted to visually demonstrate the stretch that is annealed and provide explanatory images for users. In this test, the Time Based setting was set to 9 seconds (maximum time), and heat was applied to the case body by setting the bed at an unusually high position, enabling the achievement of these results.

The accompanying images show the case before annealing. For this test, the case was loaded at an abnormally high position, with the neck protruding approximately 6 mm, to allow for annealing the case body for visual demonstration. In the final image, after a 9-second anneal, the annealed stretch is visible, showing a reach of 40mm.





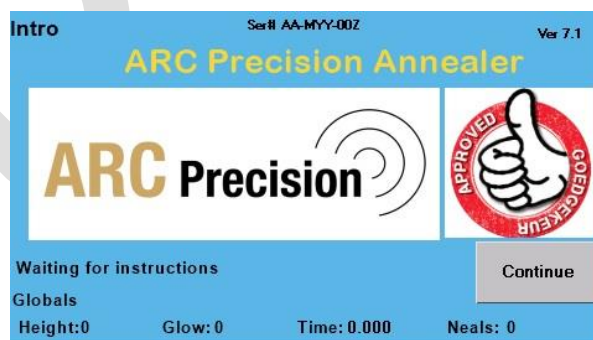
These test results help users understand what to expect while determining the appropriate bed height and the width of the heat application area from induction when the case is positioned in the bed.

It is important to note how the heat has spread to the neck area during this test, due to the extended annealing time. This visualization gives users valuable insight into how the annealing process works and how adjustments in height and time can impact the heat distribution across the case.

## 6. Operation

### 6.1. Introduction Screen

This screen is displayed when switched on.



Once “Press Continue” is displayed, the user can press continue. This is to confirm communication between the processors. Once Continue is pressed, the setup is completed and the Main Menu will be displayed.

## 6.2. Main Menu



The Glow, Height, Time displayed at the bottom of this screen and all other screens are the **global settings**. It is important to keep an eye on these settings as these are the settings used during operations. Any changes in any other menu will update and change these global settings.

The total Anneals from first day are kept and displayed. The value is automatically incremented, the user does not have access to this counter.

- Bed Down:** Will move the bed to the bottom start position. To be used for feet replacement with easy access.
- Bed Up:** Will move the bed down if not in the down position and up to the indicated height as per value displayed as global setting. This maximum setting is adjusted in the Set Height section.
- Switch Off:** Switch off the annealer, the annealer still powered until switched off at the main switch on the back.
- Memory, Set Height, Set Glow, Set Time** to access the respective screens and functions. Changes on these screens will be applied to the global settings.
- Normal, Time and Pulse Anneal.** Press these to access these functions.

## 6.3. Height Adjustment

- The height is calculated from the bottom position in number of counts, electronically adjusted by means of a stepper motor.
- The Maximum height is programmed during production as top end point.
- A higher number indicated a higher position.
- It is not an exact number but loosely each step relates to about 0.7mm.

- The Current setting is displayed at the top.
- The new setting displayed. This value to change as the user make adjustments.
- Adjust with the slider left or right.
- Use + or – for increments of 1 or 10 either side.
- Use **Test**, to test the setting, check for mechanical binding. Test will not store or activate the setting, **use Save to use and activate the new setting.**
- The maximum height is programmed after the production process.
- Use Save to store and use the new setting.
- The setting is transferred across all screens and functions as current height setting.
- Use “Back” for main screen.

#### 6.4. Glow Setting

Accessible from the LCD touch Screen.

- The Glow sensor limits are limited in the software for maximum protection.
- A higher Glow limit produces an earlier stop anneal. Ie, 1000 would result in early stop or minimal anneal time.
- A lower Glow Setting will result in a longer anneal time.
- The default setting is 950 and this is a good setting for the new user to start at.

- The Current setting is displayed At the top.
- The new setting displayed and will change as the user make adjustments.
- Adjust with the slider left or right.
- Use + or – for increments of 1 or 10 either side.
- Use Save to store and use the new setting.

- The setting is transferred across all screens and functions as current height setting.
- Use “Back” for main screen.

#### 6.5. Time Setting

- The current setting is displayed.

- Pressing on the white “New Time” field, will open a numeric keyboard.

- Delete and enter the new time. Pressing “OK” will close the numeric keyboard and update the new entered time.
- Press Save to update and keep the new time setting.
- Use Back to return to the main Menu.

## 6.6. Memory and related

- There are 4 memory pages.

Name	Height	Glow	Use	Save
M1	1001	900	Use1	Save1
M2	1002	901	Use2	Save2
M3	1003	902	Use3	Save3
M4	1004	903	Use4	Save4
M5	1005	904	Use5	Save5

Page 1  
Page 2  
Page 3  
Page 4  
Home

**Globals**  
Height:812    Glow: 1470    Time: 1.234    Neals: 587

- Page 1 and page 2 are used to store Glow Based Anneal setting.
- Page 3 and 4 are used to store Time based settings.
- The operational logic is the same for all 4 pages.
- In the case of Glow Screens, the height and Glow setting will be stored or retrieved.
- In the case of Time Screens, the Height and Time setting will be stored or retrieved.
- Each row represents one memory location.
- Assume Use1 is pressed, the settings from that row will be transferred as global settings to be used.
- Assume Save1 is pressed, the Global settings will be stored to the location.
- Use Page 1, Page 2, Page 3 or Page 4 to navigate between the 4 memory pages.
- The Home button will return to the Main menu in all cases.

## 6.1. Changing Names

- The name of each location can be changed, limited to 8 characters.
- Press on the name, ie M1 and the following screen to be displayed.

**Name Change**

Memory 1

Current Name M1

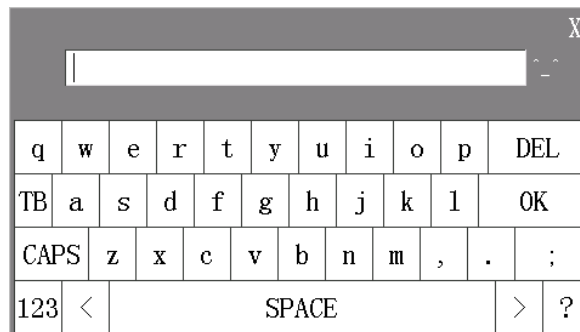
Copy Current

New Name  Press on New Name to change

Save Back

**Globals**  
Height:1000    Glow: 1000    Time: 1.345    Neals: 123456

- Touching the New Name field will produce a pop-up keyboard. Enter the new name.



- Copy will move the current name into the New Name field which might ease the process when wanting to modify a current name.
- Use P as part of the name for the user to identify a Pulse mode location.

## 6.7. Annealing

### 6.7.1. General

There are 3 options on the Main Menu, Normal, Time and Pulse Anneal.

The operational logic is the same for all 3 with similar or the same GUI layout.

Accessing any 1 of these functions or screens will produce the same preparation procedure.

- Firstly, the door will be opened to drop any possible case that might be on the bed.
- Secondly the bed will be lowered to the bottom position and then move back to the height as per global setting.

In all 3 options, there are two modes of operation available:

- **Manual:** This means the user must press the Anneal button to anneal a case.
- **Auto:** this means the system will automatically start annealing if a case is sensed/detected. For this reason, it is important to ensure that the bed is clear when not in use and that there are no other obstructions that can lead to a "false anneal."

\*\*\*\*\*

*There are two optical sensors placed on the inside bottom of the Top which is used to sense "loaded" or "not loaded/empty" Should this path be obstructed by perhaps a foot not placed well or any other obstruction, the ARC annealer might switch on the power circuit automatically which will cause damage to*

***your annealer. Please always keep an eye on the anneal process and ensure that the “sensor path” is clear when not annealing.***

**\*\*\* Ensure the correct foot is used as the cartridge will not centre if wrong foot is used and might cause serious damage if loaded in off-centre or skew position. See Foot section. \*\*\***

***\*\*\* If using a custom foot, ensure the load sensors are not obstructed \*\*\****

\*\*\*\*\*

Throughout the annealing processes, irrespective of mode, a 50% duty cycle is maintained. This is to slow heat build-up and will prevent further annealing until the system is ready. The delay is equal to the time taken for the previous anneal, including the pre-heating time. The buttons are disabled until the system is ready again.

## 6.7.2. Anneal Sequence

In all annealing Modes, the case is first pre-heated before annealing.

- Hence the Time set or measured exclude the pre-heat time.
- The displayed time during Normal and pulse annealing also excludes the pre-heat time.

## 6.7.3. Anneal Defaults

- The session counter will increase automatically after each successful anneal.
- The session counter starts at 0 when the user reaches the Anneal screens.
- The Neals and session counter will not increase if Stop was pressed at any time during an anneal.
- The statistical average Anneal Time or Glow also start at 0 each time the user reaches the Anneal screens.
- The average is active only up to 50 Neals within a session. Thereafter it will default to 0.

#### 6.7.4. Normal Anneal

The anneal cycle in this case is Pre-Heat and anneal to the desired Glow Level setting.

Normal Anneal		Avg Time	
Glow: 0		0.000	Auto
Time: 0.000		G+5	Anneal
Session: 0		G-5	
Temperature: 00.000			Main
<b>Status</b>			
<b>Globals</b>			
Height: 812	Glow: 1470	Time: 1.234	Neals: 587

- Auto will place the ARC annealer in Auto Feed mode. The anneal process will start once the Load sensor in the bottom of the Top detects a case (obstruction). The Anneal button is disabled when Auto is enabled.
- Anneal will start a normal anneal cycle.
- G+5 or G-5 will increase/decrease the Glow level by 5. This is useful for minor adjustments. Remember to update the related memory settings if applicable afterwards.
- The result Time and Glow level is updated after each anneal and zeroed at the start of the next.
- Session will increment automatically since the Anneal screen is reached. Leaving the Anneal screen will zero the session counter.
- The Avg time is updated after each anneal with respect to the current session.
- The Temperature of the power circuit is updated and will automatically action a "high Temperature" screen and procedure when the temperature exceeds 65 degrees Celsius.



### 6.7.5. Time and Pulse Annealing

We do show the following two screens for Time Based and Pulse annealing with some related notes.

#### Pulse Annealing Screen

Pulse Anneal		Avg Time	
Glow: 0		0.000	Auto
Time: 0.000		G+5	Anneal
Session: 0		G-5	Main
Temperature: 00.000			
<b>Status</b>			
Globals			
Height:812	Glow: 1470	Time: 1.234	Neals: 587

#### Time Based Annealing Screen

Time Anneal		Avg	
Glow: 0		000.0	Auto
Time: 0.000		T+100	Anneal
Session: 0		T-100	Main
Temperature: 00.000			
<b>Status</b>			
Globals			
Height:812	Glow: 1470	Time: 1.234	Neals: 587

- In Time based, T+100 and T-100 increase or reduce the anneal time by 100 ms.
- In Pulse anneal G+5 and G-2 increase or reduce the Glow level with 5, as in Normal Anneal.
- Again, as with al Anneal cycles, the case is Pre-heated before Annealing.

#### 6.7.6. Pulse Annealing explained

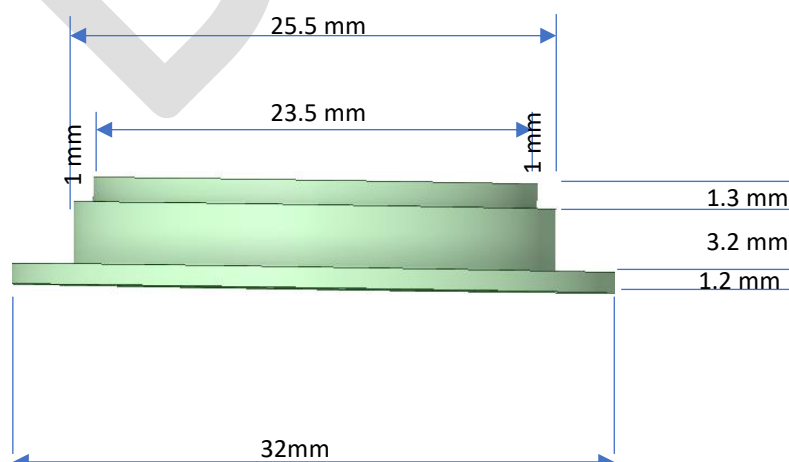
We found Pulse Annealing to be valuable when annealing modern cases with a lower Thermal Centre and steep Thickness gradient.

After pre-heating, 3 heating cycles occur, each to a different Glow Level with time delays in between. This method ensures that the applied heat is spread more evenly from the lower Thermal Centre to the neck/top.

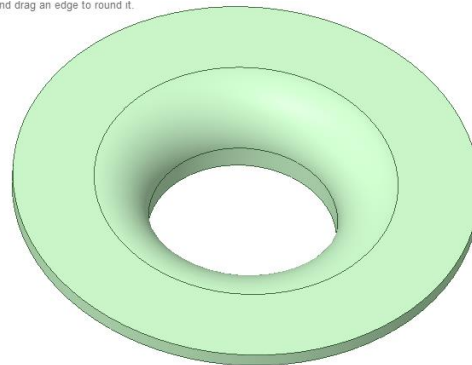
This do however take longer than Normal Anneal.

### 7. Foot

- Different feet are used for different calibres.
- A set of 8 feet is supplied.
- The user can order more and/or different feet or get them made locally. These are 3D printed.
- Feet are 15mm high with a diameter of 25.5mm.
- A ring is added to prevent falling through or stop the Drop Slide.
- The hole size is cartridge bottom size + 1mm and tapered top to bottom to guide the cartridge to centre position.
- The Magnetic flux will centre the cartridge within limits as per foot inserted.
- The feet are designed to be inexpensive, easy to use and easy maintenance by the user.
- In some instances, the case might move of-centre, that will not affect the anneal process. The inner guide is from PTFE and well protected against heat. The time spent by the case at heat within the bed is minimal and should not damage surrounding components and was well tested thousands of times.
- ***Feel free to email us, we will gladly email you the print data, enabling you to print feet locally!***

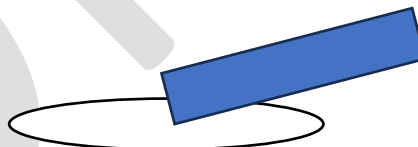


Click and drag an edge to round it.



## 8. Setting up your ARC Annealer

- In order to fully understand your annealer, we suggest that the user sacrifice old cartridge(s) when getting to use the ARC Annealer. IT does make sense to 'play' with low risk cases, making sure you fully understand your annealer.
- Ensure the correct foot are selected and installed.
  - Lower the bed, remove, and install correct foot.
  - Press Stop to discard/drop the case. Ensure it falls freely when dropped.
  - If stuck, the heat will reach the remainder of the case and cause melting.
- Adjust the Glow Level to 950. This is the default setting and a good starting point.
- Navigate to the Set Height screen.
  - Gently load a case, it should fall to a default centre position.
  - Hold the case such that the end is above the opening and release, the weight of the case will let it fall into position. No need to throw or force it in.



- Moving the slider left and right will produce different height values.
  - Use the Test function and observe the result from the new setting.
  - As a starter position and as a new user, set the height for the case to be in line with the centre of the core.
  - This is only getting the user to understand his ARC Annealer, no need to be critical on the height setting now.
  - Once comfortable navigate to the Anneal screen.
- Getting to the anneal screen, observe the sequence. The drop door will open, and the bed will move down and up to the programmed height.
- If possible, switch of lighting, it will make it easier for the user to see the glow/heat.
- Load the cartridge and press Anneal.
- In some instances, the case might move or "dance", this is acceptable and will still produce a valid anneal.
- Adjust the height and Glow level and observe the changes.

- Even though dis-colouring can be misleading, it is useful to see the difference as you change settings, higher, lower of lower Glow levels.
- You are ready to produce top class annealed cases!

## 9. Cooling and temperature control

- ARC Annealer is air cooled.
- Ensure the vents are not blocked during operation.
- Use Auto mode where possible to ensure 50% duty cycle is maintained.
- The resonator will stabilize at around 45 °C, dependant of environmental conditions.
- Above 55°C the temperate displayed will change to Red as early warning,
- Above 65°C, a “High Temperature” screen and routine is activated. The ARC annealer will prevent further annealing until the temperature reaches 50°C whereafter the Main Menu will be displayed again.
- The Process is also visible with a double door open when activated and again when ready and on the Main Menu again.
- Please pace accordingly to ensure longevity of your ARC Annealer.

## 10. Maintenance

- Keep an eye on the VA meter. The current will change during annealing, and it will differ from cartridge to cartridge. The user will quickly get used to the readings and be able to notice big differences.
- The Amps on the VA meter should never exceed 12.5Amp. If this is the case, switch off and contact us.
- Check the two sliding rods and screw rod, if it appears dry, apply some grease to these. We used “Copper Grease” during production.

## 11. Specifications

**Size:** 360 (w) x 335 (l) x 330 (h) mm

**Enclosure:** Steel, powder coated, Black

**Power:** 220V, 3A, 50Hz

**Cartridge:** max 100m long and 16mm wide at base. Contact us for your customer product should your requirements fall outside of these specifications.

**Duty Cycle:** 50% maintained during Auto Mode

**Temperature:** Shut Down above 60 °C

**Speed:** Typical 8 cartridges per minute of .223 This varies with respect to calibre and cartridge make (Brand)

**Environmental:** Do not use when the environment temperature exceeds 40°C.

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