

HUKY 500T ROASTER

HUKY SETUP AND OPERATION MANUAL



www.showroomcoffee.com

Your Source for

Specialty Green Coffee, Huky Parts and Roasting Supplies

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****SAFETY WARNING & PRECAUTIONS****

- Propane tanks or any other gas sources used to power your roaster should always be stored outside.
- Check to make sure that you conform to all local laws, building codes, fire codes or any applicable local regulations before you install and use your roaster. If any of the installation instructions included here do not conform to your local laws/regulations, follow your stricter local regulations instead.
- Hire a professional installer or speak with local utility providers if you are not sure of regulations around gas-fired equipment, exhaust or use of a roaster
- Personal Protection: To avoid injury or burn due to hot parts of the machine or hot coffee beans, operator should take necessary precautions such as wearing gloves and proper clothing.
- Excessive heat may cause fire during operation. In case of accident, misuse, or malfunction leading to fire, user should take all necessary steps for fire prevention, including the following:
 - Fire Extinguisher should always be accessible near the machine
 - Water should always be accessible near the machine
 - Conform to all local building codes in regards to but not limited to gas use, electrical, machinery, food production, exhaust and heat.
- Temperatures exceeding 480 F may result in combustion of coffee beans, resulting in fire and/or

injury. In case of combustion/fire in the drum immediately close the gas line at the rear of the machine and at the propane tank and turn the gas pressure knob to completely off. Detach and remove the propane tank from the area. Inside the drum (through the trier hole) or in the cooling tray pour/spray water on the beans or spray with a fire extinguisher if necessary.

- In case of combustion/fire in the chaff collection bin, follow the instruction in the bullet point above then remove chaff bin (with protective gloves) and address fire with water and/or fire extinguisher.**
- If there is a fire in the drum, note that opening the door will give the fire more oxygen and lead it to burn more. In this case spray water and/or fire extinguisher through the trier hole.**
- Failure to adequately and regularly clean the machine, pipes, fans and exhaust tubes may result in fire in or around the machine and/or inside ventilation pipes due to buildup of material. User should ensure that cleaning is performed regularly and roast only high quality beans with no impurities and foreign matter.**
- Never store or use flammable materials near the machine.**
- If user smells gas at any time before, during or after the roast, immediately shut off all gas lines and shut off power.**
- User/operator should never leave the roaster and shall continuously monitor performance and conditions when the roaster is powered on before,**

during or after the roast. Never leave the machine while it is powered on, and always stay alert and watch out for any sign of electrical malfunction, or fire or other malfunction within the machine, outside the machine and within the entire ventilation system.

This manual provides only general guidance and, due to the variety of Huky configurations, and variations in safety regulations in different countries and municipalities, this manual in no way provides complete direction for proper installation, use and safety. Proper installation, use and safety are solely the responsibility of the user, and Showroom Coffee assumes no liability in case of an accident, misuse or malfunction causing injury, fire or any other damage or incident to persons or property.

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Note:

Showroom Coffee developed this manual with the goal of providing Huky and roasting assistance to users no matter if you purchased your Huky from Showroom or elsewhere. Some steps in this manual may not pertain to your exact Huky unit if you did not purchase your unit at Showroom.

We welcome suggestions from the global Huky community to continually improve this manual. Please share your feedback or suggestions to huky@showroomcoffee.com

We would also like to call special attention to Artisan. Artisan is an open-source software that helps coffee roasters record, analyze, and control roast profiles. It is built and maintained by a small staff and a small team of volunteers, and support from the roasting community is critical to the software remaining available and continually improved. If you use Artisan please remember to support them through their [Donate page](#).

1. UNPACK

- ***PLEASE OPEN/UNPACK BOXES VERY CAREFULLY. DO NOT DAMAGE OR DISCARD CRATE PACKAGING.
- *** IN CASE OF DAMAGE DURING TRANSIT YOU MAY NEED TO USE THE SAME BOXES FOR RETURN SHIPMENT
- ***FULLY INSPECT THE BOXES AND ROASTER UPON ARRIVAL, AND PHOTOGRAPH/DOCUMENT ANY ISSUES

PACKING LIST

Please ensure that the following items are included in the crate:

- Huky Roaster
- Burner/Stove with pressure gauge
- Roaster door/handle and bracket
- 2 x fans
- Exhaust fan stand (with exhaust outlet) and screws to connect fan
- Cooling Tray Stand and screws to connect fan
- Zip ties to tie fan cords to stands
- 2 x funnels (1 for bean hopper, 1 for exhaust fan)
- 2 x mesh trays (1 for exhaust fan, 1 for cooling tray)
- T-pipe with airflow damper
- Exhaust pipe with wood adjustment collar
- Bean Trier
- USB cord
- Gas hose with regulator
- Set of wrenches, lubricating oil and screwdriver
- Thermocouple Kit Only:
 - Center Thermometer
- RTD Kit Only
 - 2 RTD temperature probes (or 3 if MET version)
 - 2 x Phidget RTD TMP1200 (or 3 if MET version)
 - 1 x Phidget VINT HUB
 - 2 x wires to connect TMP1200 to VINT HUB (or 3 if MET version)
 - 1 x case to hold wires

NOT INCLUDED: EXHAUST HOSE TUBING (the exhaust outlet below the fan is 2.5")

2. SETUP

1. Unwrap all items from protective plastic and cardboard covering.
2. Remove protective film on roaster
3. Place complete roaster unit in a location suitable for roasting.
 - Your chosen roaster location must have access to outside ventilation or nearby exhaust hood. Distance between the exhaust fan hole and your final exhaust vent outlet (outside or up into a powered exhaust hood) should be no more than 8 feet.
 - Leave at least 12 inches of open space between roaster and building walls or any other obstruction. This allows for adequate space for the gas line and heat protection. Vertical clearance (from top of roaster) should be at least 5 feet.
4. Place door (including rod and handle) on the faceplate of the Huky roaster. Secure with provided bracket and screws (use a 2mm hex)
5. Place roaster unit on top of the burner. The black ignition switch should face forward
6. Place exhaust fan stand to the right of the roaster. Place the fan on top of the stand and, before screwing them together, turn your stand and fans in a manner so that your power cord and exhaust outlet point to your desired directions. Then screw fan to exhaust stand. Use a zip-tie to secure cord in your desired direction
7. Place fan on cooling tray stand and screw together. Use a zip-tie to secure cord in your desired direction (you can also wait to secure fans and cords until you are completely done with set up so that you can change directions of exhaust and cords if necessary)
8. Connect exhaust tubing (not included with the roaster) to the exit port under the exhaust fan. The exhaust port is 2.5" and you can find flexible tubing at most hardware stores (e.g. dryer vent supplies or similar). Ensure that the other end of the exhaust tube is directed outside or up to a working exhaust hood that will blow exhaust outside. Roasting produces smoke and gases, and the roaster must be vented to the outside.
9. Place mesh trays on both fans
10. Place one funnel on top of the exhaust fan mesh (funnel should be placed upside down like a bell)
11. Place T-pipe on the top connection of the roaster
12. Connect long L-shaped tubing to the side opening of the T-pipe. Secure with set screws. Connect the other end of this pipe to the funnel on top of the exhaust fan. Use the wood collar to move the pipe to the

proper angle and height then tighten with set crew so that the system does not wobble.

13. For Huky Kits sold by Showroom, connect the gas hose to the brass fitting on the outside of the burner. Always hold the brass fitting on the burner with a wrench so that, when you tighten the hose's nut, you do not turn the fitting on the burner and any parts inside the burner. For kits not sold by Showroom you may have a different gas connection type, for example hose-barb style fitting.
14. Attach the regulator end of gas line to propane tank, tighten by hand (this is for propane regulators in the US, for regulators provided by Showroom). If you are in a different country (for example using hose-bab style connection or other) your connection requirements will be different)
15. To check for leaks in the gas connection, apply leak detector liquid all around the connection of the hose nut and the burner's external brass fitting. (You can purchase leak detector liquid from a local hardware store or make a solution of 2 parts water and 1 part dish soap, then brush on or spray on). Slowly open propane tank to allow gas to flow to the roaster. If there are any leaks you will see bubbles begin to appear. If bubbles appear, immediately turn off/close propane tank, undo brass fitting, and reinstall brass fitting. Repeat until no bubbles are detected. When finished with leak detector make sure to wipe away leak detector liquid using a wet rag to prevent corrosion. Repeat test if you are unsure of proper connection with no leaks.

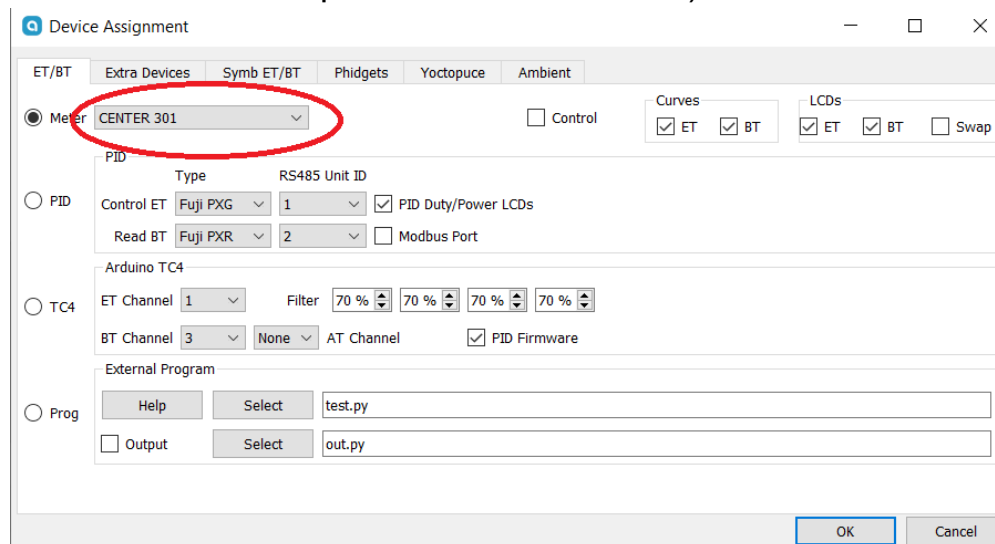


16. **ENSURE THAT YOUR INSTALLATION CONFORMS TO ALL LOCAL BUILDING CODES, FIRE CODES, GAS CODES AND ELECTRICAL CODES BEFORE USING YOUR ROASTER.**

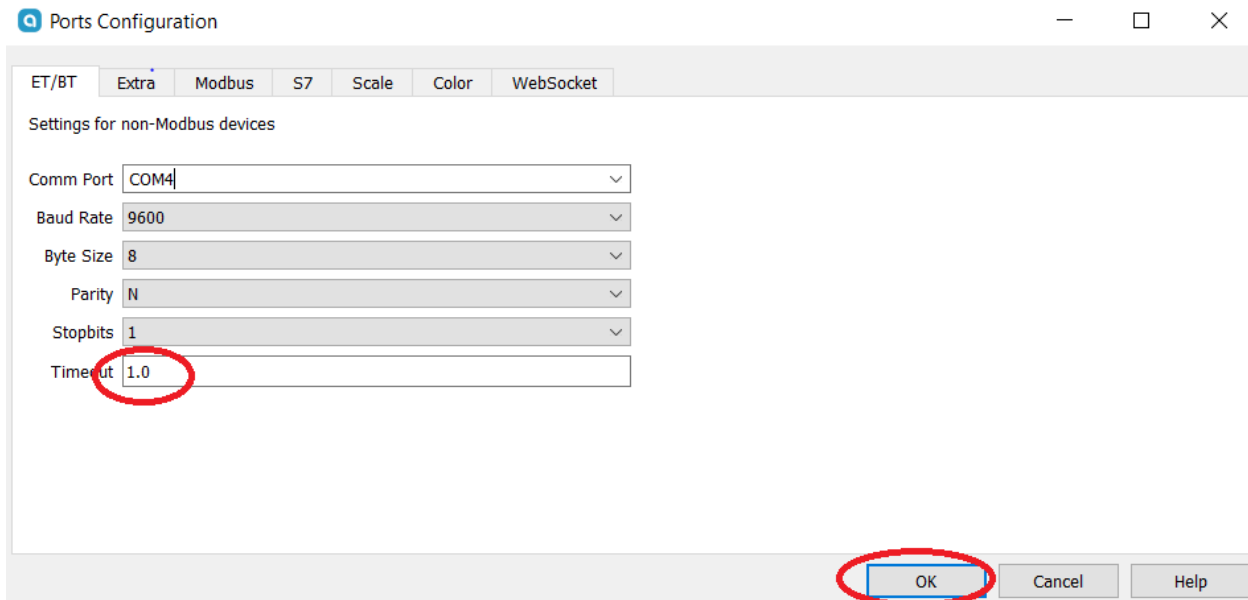
17. Connect the power cord at the rear of the motor, and plug power cord into power outlet. Ensure motor remains OFF during additional setup procedures.
18. Connect the temperature probes to Center Thermometer and/or to Artisan roast software on a computer

(if you have an RTD unit, scroll down a few pages to “**b. RTD UNITS**”

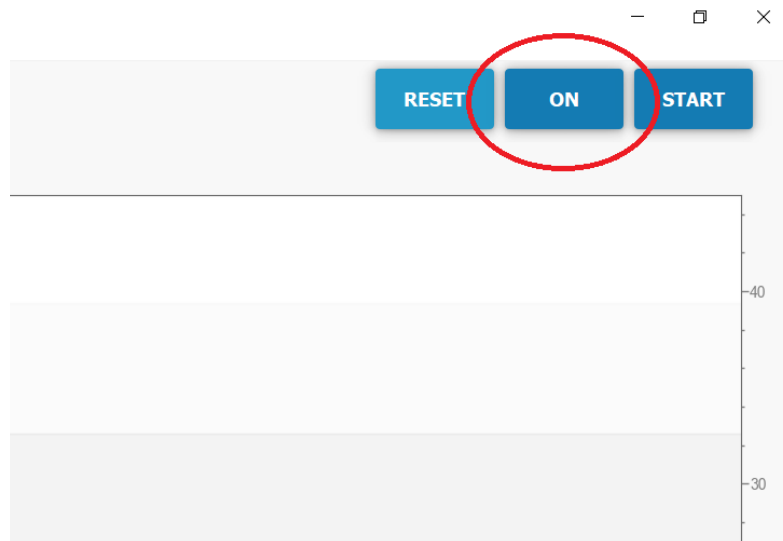
- a. **THERMOCOUPLE (TC) UNITS:** On TC units, the temperature probes come installed on the machine already.
 - i. Connect the wires from the probes (the wires connected to the thermocouples out the face of the roaster) to the Center Thermometer. Plug BT into port 1, ET in port 2, and (if you have chosen the MET add-on) MET in port 3.
 - ii. If connecting to a computer (to track roasts on Artisan software), connect the Center to your computer using the provided USB cord (see instructions below for Artisan setup). Take special care of this USB cord, as it is a proprietary cord from Center, and not easily replaced.
 - iii. On your computer, download and install the CP210x driver from the Silicon Labs website [here](#) (go to “Downloads” section).
 - iv. Download and install Artisan Roast Software from <https://artisan-scope.org/> (don’t forget to [donate](#) to Artisan!)
 - v. In Artisan, go to the Config Menu and choose Device. In the ET/BT tab choose Center 301 in the Meter list (or choose Center 304 if your unit includes a third thermocouple for the MET add-on).



- vi. Press OK, then in the next window keep Timeout at 1.0. You may need to change your Comm port depending on which of your computer's USB ports you have plugged your Center cord into. Press OK.



- vii. Press "On" in the Artisan window. If all the hardware and software are set up correctly then the correct ET and BT temperature readings should show as numbers. If they do not show correctly, ensure you have the driver from Silicon Labs installed, and check all wires/connections.



- viii. If connection problems persist, try the following: 1) close Artisan, 2) uninstall the driver from your computer, 3) ensure you have the most recent version of the driver downloaded from Silicon Labs, 4) reinstall driver, 5) restart your computer, 6) reconfigure Artisan as per the above settings.

- ix. If you receive error message "Serial Exception:Unable to open serial port":
- Uninstall Silicon Labs driver
 - Reinstall Silicon Labs driver
 - Connect Center 301 to computer via USB300 cable
 - Check the USB connections
 - Open Artisan and click "Config" > "Devices" > ET/BT > Meter, select Center 301, click OK
 - The Ports Configuration window will pop up. In the ET/BT tab, go to the Comm Port field and, if available, choose "CP2102 USB to UART Bridge Controller" in the Comm Port dropdown. If it does not appear as an option in the dropdown, delete what text is there (e.g. delete "COM4" or whatever else shows there), then manually type "CP2102 USB to UART Bridge Controller," then press OK
 - Press the "ON" button on "Artisan" and check if the temperatures appear in the appropriate fields.
- x. Setup your MET thermocouple probe in Artisan (if you ordered the MET add-on). Disregard this step if you only have two thermocouples (ET and BT) and the Center 301 thermometer)
1. With your MET probe plugged into port 3 in the Center 304 thermometer, and your thermometer connected to the computer via USB, go to Config > Device settings in Artisan.
 2. In the Extra Devices tab, expand the Device column by hovering your mouse at the column line between "Device" and "Color 1" then click and drag to the right so the column expands and you can see all content written in the Device dropdown options
 3. In the Device dropdown, choose "Center 304 34". If you don't see a row with a dropdown yet, click "Add" in the bottom left corner.
 4. Type MET into the field "Label 1" and uncheck LCD2 and Curve2

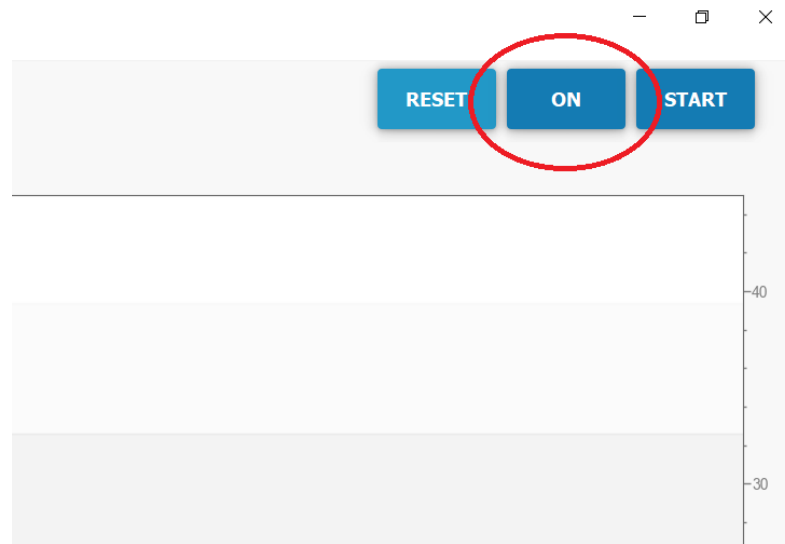
Device Assignment											
ET/BT Extra Devices Symb ET/BT Phidgets Yoctopuce Ambient											
	Device	Color 1	Color 2	Label 1	Label 2	y1(x)	y2(x)	LCD 1	LCD 2	Curve 1	Curve 2
1	CENTER 304 34	black	black	MET	Extra 2			☒	☐	☒	☐

5. Press OK then confirm your computer's correct COMM port and keep Timeout at 1.0. Press OK again.
6. Press ON in the Artisan window to confirm that Artisan now reads all 3 temperatures (ET, BT and MET). Because MET is an "Extra Device" it may take up to 15 seconds or more for Artisan to begin reading MET.

- b. **RTD UNITS:** On RTD units (the RTD Kit sold by Showroom Coffee) the probes do not come installed on the Huky, however, our kits already have the adapters installed on the face of the roaster and it is easy to install the probes
- i. Insert the RTD probes into the provided adapters on the face of the roaster. Use a flashlight to look into the roaster and ensure that the drum fins do not hit the probes when spinning. The adapters should properly ensure that the probes do not go in too far, but if you do find that any probe is in too far, pull it back a little at a time until it is not in the way of the spinning drum fin. **Gently** tighten the set screws in the adapters to hold the probes in place.
 - ii. If using the provided case (to keep wires tidy), push the probe wires into one hole on the side of the box, and push the USB cable (mini-B side) into the other hole. Place the Phidgets (TMP1200) and the VINT HUB into the case before connecting the wires.
 - iii. In the provided case, for each thermocouple attach its 4 wires to an RTD Phidget (TMP1200). The 2 white wires go in RTD - and EXC -, and the 2 red wires go in RTD + and EXC +. Using a small flat head screwdriver, you will likely need to open each port slightly before inserting the wire. Tighten the screw on each port snugly.
 - iv. Connect each Phidget to the VINT HUB using the provided Phidget cables. Insert the Phidget for the BT probe into channel 2 on the Hub, and the Phidget for the ET probe into channel 3. The Phidget for the MET probe (if included in your kit) goes into channel 4.
 - v. Connect the VINT HUB to your computer using the provided USB cable.
 - vi. Ensure no wires are loose and gently arrange all the devices and wires in the case. Close the case once you are

sure that all wires are snugly in place. Place the case behind the roaster or another convenient location where the wires won't interfere with your fans and your general movements around the Huky.

- vii. Install the Phidgets driver on your computer. Download here: [Windows](#), [Mac](#), [Linux](#) or [RPi](#)
- viii. Download and install Artisan Roast Software from <https://artisan-scope.org/> (don't forget to [donate](#) to Artisan!)
- ix. Setup within Artisan for RTD/Phidgets is rather easy, as this setup is already pre-loaded in Artisan (newest version) in the Machines dropdown list. Choose the following settings: Config > Machines > Phidget > "VINT TMP 1200 2xRTD". Follow the prompt by choosing "Yes" to load these settings.
- x. Press "On" in the Artisan window. If all the hardware and software are set up correctly then the correct ET and BT temperature readings should show. If they do not show correctly, ensure you have the Phidget driver installed, and check all wires/connections.



- xi. If connection problems persist, try the following: 1) close Artisan, 2) uninstall the driver from your computer, 3) ensure you have the most recent version of the driver downloaded from Phidgets, 4) reinstall driver, 5) restart your computer, 6) reconfigure Artisan as per the above settings.
- xii. Setup your MET RTD probe in Artisan (if you ordered the MET add-on). Disregard this step if you only have two thermocouples (ET and BT).

1. With your MET probe (via Phidget TMP1200) plugged into Channel 4 on the VINT HUB, and your HUB connected to the computer via USB cable, go to Config > Device settings in Artisan.
2. In the Extra Devices tab, expand the Device column by hovering your mouse at the column line between “Device” and “Color 1” then click and drag to the right so the column expands and you can see all content written in the Device dropdown options
3. Leave in place the Device row that is already there. In Row 1 it should already show “Phidget TMP1200 1RTD A”. Do not modify this.
4. Click “Add” at the bottom left. In the new row 2, choose “Phidget TMP1200 1RTD A” in the dropdown.

The screenshot shows the 'Device Assignment' window with the 'Extra Devices' tab selected. The table has columns: Device, Color 1, Color 2, Label 1, Label 2, and y. Row 1 contains 'Phidget TMP1200 1xRTD A', 'black', 'black', '2nd RTD', 'Extra 2', and an empty 'y' cell. At the bottom, there are buttons: Add, Delete, Copy Table, Update Profile, Reset, Help, OK, and Cancel. A red arrow points to the 'Add' button.

5. Type MET into the field "Label 1" and uncheck LCD2 and Curve2

The screenshot shows the 'Device Assignment' window with the 'Extra Devices' tab selected. The table has columns: Device, Color 1, Color 2, Label 1, Label 2, y1(x), y2(x), LCD 1, LCD 2, Curve 1, and Curve 2. Row 1 contains 'Phidget TMP1200 1xRTD A', 'black', 'black', '2nd RTD', 'Extra 2', and empty cells for y1(x), y2(x), LCD 1, LCD 2, Curve 1, and Curve 2. Row 2 contains 'Phidget TMP1200 1xRTD A', 'black', 'black', 'MET', 'Extra 2', and empty cells for y1(x), y2(x), LCD 1, LCD 2, Curve 1, and Curve 2. The 'LCD 2' and 'Curve 2' checkboxes are unchecked.

6. Press OK then confirm your computer's correct COMM port and keep Timeout at 1.0. Press OK again.

7. Press ON in the Artisan window to confirm that Artisan now reads all 3 temperatures (ET, BT and MET). Because MET is an “Extra Device” it may take 15 seconds or more for Artisan to begin reading MET.

USING ARTISAN

We recommend all users review Artisan’s [Quick Start Guide](#) to learn more about the capabilities of the software, in particular check out the section “Learn what Artisan can do and Your First Roast.”

When you start your roast, click the green “START” button to begin tracking your roast (under most circumstances you first heat up the roaster to your desired charge temperature, then click START at the same time as you drop the beans into the drum via the hopper). Refer to Artisan’s website and other manuals for further information on how to use Artisan. Artisan is provided free to the roasting world, and Showroom encourages all users to [donate](#) to Artisan to keep the software maintained and continuously improved.

3 . ROASTER OPERATION

1. Ensure the hopper door and roaster door are closed and ensure the trier is securely in place.
2. CLOSE the blue needle valve
3. Turn on power switch behind the motor
4. *Slowly* open your propane tank to send gas to the roaster
5. *Slowly* open the blue needle valve. Opening it too quickly may damage the pressure gauge
6. *Slowly* turn the black ignition switch. If you turn it too quickly there will not yet be enough gas at the igniter spark. After ignition, keep the black ignition switch in the horizontal position
7. Turn on exhaust fan as you begin heating. Keep the airflow damper near to fully closed throughout the heating process.
8. Use the blue needle valve to adjust gas pressure / flame level during the roast
9. Upon reaching the desired preheat time and temperature, double check that the main roaster door is closed so that beans don’t fall out when you drop them from the hopper (any roaster is lying if they say they never made that mistake :-). Open the door below the bean hopper to

allow green beans to flow into the drum. Immediately close the hopper door after all beans have fallen into the drum.

10. Open or close the damper on the T-pipe to control airflow.
11. Roast to your desired level, using the trier to view the roast level.
12. When the roast is complete, turn on your cooling fan and hold the mesh cooling tray below the roaster door, then open the door to let out beans.
13. Place the cooling tray on the cooling fan and cool until beans are no longer warm.
14. If you plan on roasting another batch, immediately close the roaster door. If you are finished roasting, turn off the gas at the gas tank and let the burner burn all remaining gas in the system. When the flame goes out, close the blue needle valve and return the ignition switch to vertical position. Allow the roaster to cool down to 120 degrees F with the door open and exhaust fan running. Turn off power when finished and place gas tank in a safe storage place.
15. If you find that green beans stay in the charge tunnel, gently and slightly tilt the roaster back to drop any green beans stuck there. Only do this with gas and power off. Remove stray greens from the drum through the front door.
16. Empty chaff from the tray under the exhaust hood, clean your roasting space and clean exhaust lines if needed (see maintenance schedule later in this document)

4. MAINTENANCE

********Chaff and other buildup of oils and coffee debris within the machine and within the exhaust lines are highly flammable********

Maintaining a clean machine and clean exhaust lines is critical to the safety of the operator.

The below maintenance schedule is only a recommendation - users will need to continually monitor buildup of chaff and any other debris throughout the roaster and exhaust tubing to determine how often cleaning is required. All beans, roast styles and roast levels behave differently, with some producing more or less chaff which can become a dangerous fire hazard if it builds up within and around the machine, exhaust tubes and the exhaust line

It is always the user's responsibility to check for buildup of chaff and ensure a clean roasting machine (inside and out), clean chaff collection tray, and clean exhaust lines.

CAUTION WHEN DISASSEMBLING - SCREWS PRONE TO STRIPPING

Many of the screws on the Huky are prone to stripping. Take special care to use only the correct size hex on each screw, and ensure that you use a high quality hex with no worn edges. One suggestion, where tight angles don't require you to use a hex key or rotating/angle adapter, is to always use a high quality hand driver with the correct hex bit on the end, and when using this you can gently tap the handle end of driver with a hammer to ensure the bit snugly fits into the screw before turning

After Every 3-5 Roasts

- Empty chaff collection tray on the exhaust fan
- Clean around the entire machine (table, floor, walls, under roaster, on roaster surfaces, etc) to avoid build up of chaff or other materials such as dust, dirt, garbage or coffee beans.
- Carefully remove the roaster from the burner and use a vacuum to clean out the burner and the area around the burner.

After Every 15 Roasts, or more often: CLEAN VENTILATION SYSTEM

- Clean out T-pipe, L-shaped exhaust tube, fans, trays exhaust tubing and any associated ventilation pipes you have installed, including all ventilation tubing, pipes and vents leading outdoors.

After 50 roasts, or every 5 months, or more often as needed:

- Lubricate the ceramic bearings using the provided food-grade lubricant

Annually, or more often as needed:

- Replace flexible exhaust tubing as needed (when discoloration/oils and build up can no longer be cleaned effectively)
- Replace your gas regulator hose connecting the roaster to your gas tank.
- Completely disassemble the Huky and clean drum and any other parts that need cleaning. There is a good document put together by a Huky user at the Huky Forum [here](#).

5. TROUBLESHOOTING

PROBLEM	POTENTIAL CAUSE	SOLUTION
Flame won't ignite	Gas is off	- Check gas to make sure gas tank is open and is not empty.
	Not enough gas in the line	Open the blue needle valve more and/or turn the black knob slower to allow more gas to reach the burner before reaching the spark point when the black knob is in horizontal position
Grinding or metal sound that doesn't go away after heating up the drum.	The bearings need lubrication	Lubricate bearings
	The drum is too close to the front wall (more of a metal scratching sound)	Contact Showroom Coffee for instructions on how to adjust drum position.
Temperatures not reading correctly or fluctuate wildly	Loose probe or wire connections or old probe	Check probe connections on the front wall of the roaster, and check if wires have come loose going into the Center thermometer or to the Phidgets. If readings are erratic and probes (thermocouples or RTDs) appear to be damaged, replace probes.
Artisan not showing numbers in the C and F displays (may appear like the letter "u")	Software/Driver	Center driver or Phidget driver needs to be installed on your computer, or re-installed, or updated to the newest version. Visit hyperlinks earlier in this manual to find updated drivers

6. ROASTING TIPS

Recommended Preheat Temperatures by green coffee batch size:

250g @ 220 C / 428 F

300g @ 240 C / 464 F

400g @ 280 C / 536 F

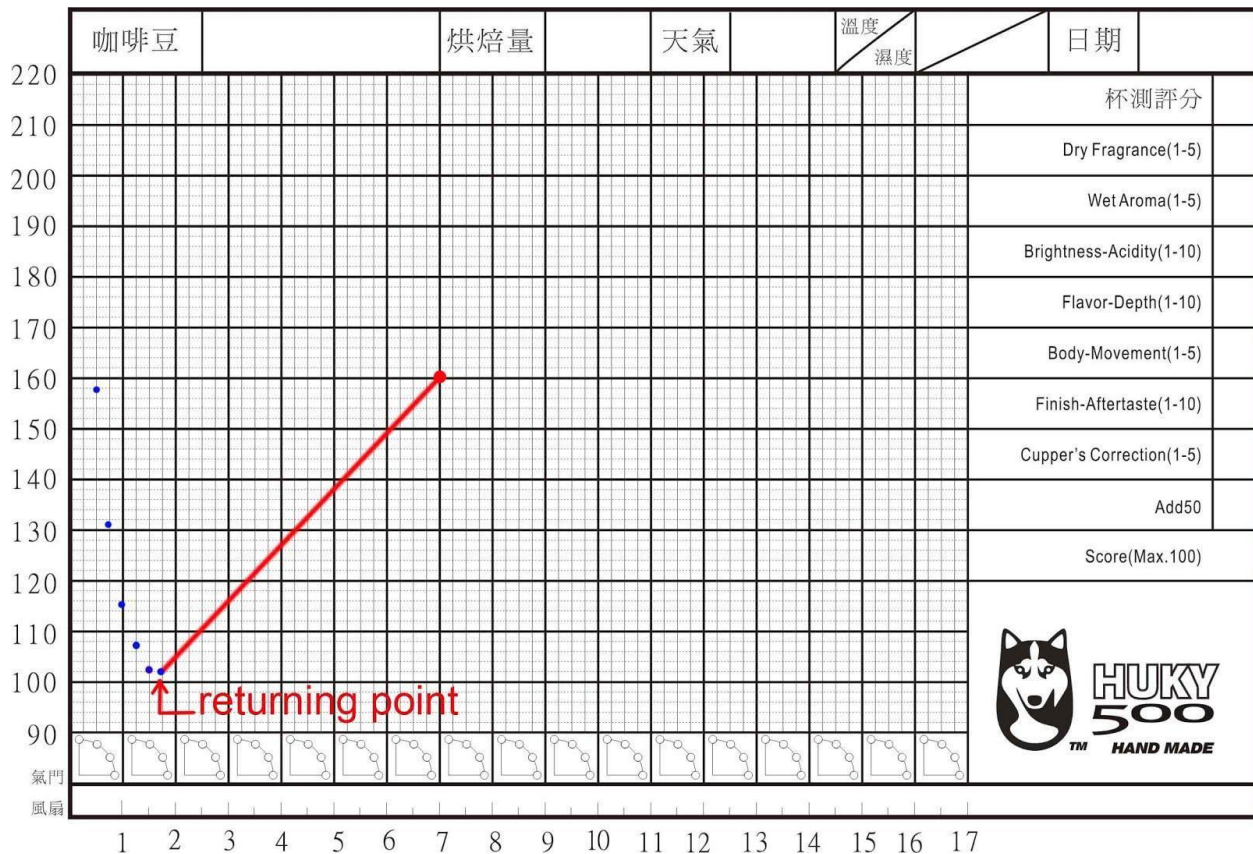
500g @ 300 C / 572 F

Maintain your preheat temperature (“charge temp”) for at least 3 minutes before “charging” (dropping) green beans from the hopper into the drum. This allows all drum and exhaust parts to stabilize at temperature.

After you charge the beans, you’ll notice the temperature drop as the beans cool the air inside the drum. Begin to increase your gas pressure upon the temperature dropping to around 100 C / 212 F.

A good base roast profile should have you drop to 100 C / 212 F between 1 and 2 minutes into the roast. Then, as you slowly increase gas pressure you should reach 160 C / 320 F around 7 minutes (this is your dehydration stage). If you find that your temperature is higher than the reference line shown in the graph below, then reduce gas pressure/ flame level. If temperature falls below the reference line then increase gas pressure/flame level.

Dehydration time may vary depending on the moisture content and density of the beans.



Upon reaching 160 C / 320 F, increase gas pressure/flame to full until you hear “first crack.” Gradually decrease gas pressure until the end of the first crack period.

Kepe the airflow damper close to fully closed until you reach 160 C / 320 F
Increase airflow after 160 C / 320 F

Suggested final bean temperatures (“drop temps”):

Light Roast	@ 205 C / 401 F
Light-Medium Roast	@ 215 C / 419 F
City Roast	@ 215-225 C / 420-437 F
Full City	@ 225-230 C / 437-446 F
Dark Roast	@ 230-240 / 446-464 F

Enjoy your coffee roasting journey! Every bean roasts differently; explore the wide world of coffee producing countries, farming/processing styles and roasting styles. As you grow as a roaster you will hone your styles and preferences. Don't fall into a rut - always try something new!

7. ROASTING BASICS

Critical points of a roast (each is covered more thoroughly below):

- **Pre-roast:** Heat stabilization of roasting machine, charge temp
- **Drying phase:** Start of roast through the beginning of chemical reaction
- **Maillard phase:** Start of chemical reaction until beginning of first crack
- **Development phase:** First crack through end of roast

Pre-Roast:

It's very important to properly pre-heat your machine before roasting. Heat stabilization is key for roasting consistency.

The charge temp is important because it establishes the initial thermal momentum of the roast, which ultimately helps you achieve even development and balance in your roast.

Charging too hot can lead to rapid heat acceleration, resulting in toasty, grainy, and burnt flavors (also known as tipping, which is considered a roast defect). It can also lead to inconsistencies when driving off moisture, which causes inconsistencies in your development later in the roast.

If you charge at too low of a temp or your machine isn't properly warmed up, you will create a lack of pressure in the coffee during chemical reactions, which will result in deficient flavor development and acidity (e.g. coffee tastes flat or muted).

Drying Phase:

The drying phase is defined by the start of the roast through to the beginning of chemical reaction (which is marked by color change in the coffee).

The turning point (also known as 'the turn' or 'turnaround') is the point where the temperature of the coffee equalizes with the declining temperature of the

thermocouple. It's an important point in setting the appropriate thermal momentum of the roast (coincides with charge temp, which is a factor as to when the turning point will happen). After equalizing, the rate of rise (speed at which the temperature of your beans are increasing, usually measured in 30 second intervals) begins to jump, which results in the bean temperature to rise as well. At this point, moisture in the coffee begins to be driven off, hence the name "drying" phase.

There are no significant chemical reactions happening during this phase. Water vapor is being driven off, pressure in the coffee begins to build, and the thermal momentum is established. When enough moisture has been driven off, chemical reactions will begin as the coffee begins to change color. This is the start of the Maillard phase.

Maillard Phase:

The Maillard reaction is a chemically complex reaction that more than doubles the number of volatile aromatic compounds in roasted coffee vs. green coffee. It begins early in color change, as the coffee begins to yellow. Amino acids act with reducing sugars, which results in a sugar browning process. The Maillard reaction technically continues until the coffee has been removed from the roasting drum and has sufficiently cooled, though, for the sake of roasting phases, we consider the beginning of first crack as the end of the Maillard phase.

Among the aromatic compounds created during the Maillard phase are melanoidins, which directly contribute to flavor and texture. As more melanoidins are created, they increase flavor complexity and perceived body, as they have a high molecular weight, which correlates to higher viscosity and thicker mouthfeel.

Lengthening the roast during the Maillard phase increases the perception of complexity and body, but can also lead to muddled flavors if you spend too much time in this phase.

Shortening your time in the Maillard phase will decrease the perceived body of the coffee (less melanoidins created = less molecular weight), but can help improve clarity in flavor.

Development Phase:

The development phase begins at first crack and continues through the end of the roast. It is an interaction between many separate chemical reactions happening on their own and interacting with each other. Most importantly; the Maillard reaction continues, but is reacting differently after coming into contact with new compounds. Sugar caramelization, acid degradation and pyrolysis are all occurring simultaneously with the Maillard reaction.

Pyrolysis is the thermal decomposition of compounds into more basic compounds, eventually leading to carbon (second crack). Carbon is the main contributing factor to what many consumers consider classic “roast” flavors (e.g. what they think coffee is *supposed to* taste like).

Leading up to first crack, sucrose begins to caramelize, forming water vapor and carbon dioxide. When that pressure builds, we experience first crack. The structure of the coffee fractures and expands, which leads to rapid off-gassing. Caramelization then continues, leading to sucrose being converted into caramel, resulting in more complex, bitter flavors. At the same time, organic acids are degrading. The trick is to try and create a balance between the acids you want to taste (acidity) along with the appropriate amount of sugar caramelization (sweetness).

Developing too quickly will result in too many unpleasant acids remaining, which might taste overly bitter, metallic or vegetal. Moving too fast through the development phase might also prevent flavor complexity.

Roasting for too long can mute the acidity completely, which also tastes unpleasant. You will also start to decompose compounds into more basic compounds (pyrolysis) and will risk an overabundance of carbon flavor.

The degree of caramelization is also connected to the final end temperature of the roast. If the end temperature doesn't get high enough, there's a greater chance for vegetal flavors to be present (because of a lack of pyrolysis), or a lack of caramel/sugar notes (not enough caramelization). This means the coffee has been ‘underdeveloped’. And again, too much caramelization or pyrolysis, or too high of an end temp, will lead to too much bitterness and a lack of flavor complexity, and ultimately, corn and ash flavors. This means you have ‘overdeveloped’ your coffee.

BALANCE IS KEY!

Thank you to Devin Eiring of [Showroom Coffee](#) / Crop to Cup Coffee Importers for contributing to the Roasting Basics section of this manual!

For additional guidance and exploration on roasting, green coffee buying and coffee preparation, we recommend [Scott Rao's line of coffee books - see here](#).



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