# MVP & MVP HYDRA

# TECHNICAL MANUAL VERSION 2015.1

Last update: Oct 14, 2015

**3 Group MVP**


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SYNESSO

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# INTRODUCTION

Congratulations on the purchase of your Synesso™ espresso machine. Please read this Owner's Manual and retain it in a safe location for future reference. If you have any questions about your machine, please contact Synesso™ and our knowledgeable staff will assist you

**Factory Contract Information:**
Synesso™ Inc.
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Seattle, WA 98108 - USA
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Web: www.synesso.com
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Instagram: Synesso_factory

Please WRITE your Serial Number & Offset Information here. This can be found on the 2nd & 3rd Menu Levels of the Display Controller. Have this available BEFORE calling for service or technical support.

S/N: _____

The offsets for this machine are:

BG1: _____°F / BG2:_____°F / BG3:_____°F

Steam Tank:_____°F

Included in the package with this machine you will find the following:

- Thumb Drive containing the Owner's Manual, MVP Series Video and other technical documents
- Pump/Motor Combination + hoses (3/8" compression fittings on all hoses)
- 8' Flexible ¾" ID drain hose + hose clamp (attached)
- Fitting, 1/4" male NPT x 90° x 3/8" Compression (if not CE/C-Tick)
- Accessory Package: Portafilters (per customer specification), blind basket, Synesso™ 3 oz. (90ml) shot glass, JoeGlo™ cleaning kit, 58.4mm tamper, 4 rubber leg pads
- Electrical plugs are ONLY included on CSA Certified machines (Canada). For all other machines, the owner of the machine must purchase an appropriate plug end for their machine. Please see the installation instructions starting on page 8 for more information.

**Serial Number**

Your espresso machine has a unique serial number, located on the left inner frame of the machine, just under the drain tray on a serial plate. The number can also be read on the display during start-up. Please have this serial number available for reference when contacting the factory.

This manual applies to Synesso™models: MVP and MVP Hydra machines. The MVP machines can be configured to operate any group head as manual, manual with a program and full volumetric with a program that includes adjustable total water volume. The MVP Hydra machines have an individual pump and motor per group head and come standard with Bypass hardware and a Pressure Regulator for 4 Stage Pressure Ramping.

# SAFETY WARNINGS

IMPORTANT Information for Synesso™ Espresso Machines: **DISCONNECT FROM POWER BEFORE SERVICING.**

- Read the entire manual before operating this machine.
- Steam and condensation from the steam wand discharge are very hot and may cause burns.
- The steam wand tips and bases become hot during use: do not touch these surfaces.
- Cover the steam wand tip or submerge in a filled pitcher to safely divert the steam before opening the steam valve.
- Never remove the steam wand from the product that is being heated when the valve is open.
- Never remove the portafilter from the machine during the active brewing process.
- Keep water and moisture away from any electrical device or live power.
- Steam tank water is heated to 260°F (126°C) or more; Use caution near steam tank.
- The brew groups deliver water as hot as 210°F (99°C). Avoid exposure to this water.
- The hot water mix valve can be adjusted to deliver water as hot as 212°F (100°C), which can cause severe burns: please use caution when activating this water source.

## Safety Label Locations:

Synesso™complies with UL regulations by posting the following labels on its machines:

Electrical Box:

**WARNING:** Disconnect from power supply before servicing

**AVERTISSEMENT:** Couper l'alimentation avant l'entretien et le depannage.

California only:

**CALIFORNIA PROPOSITION 65 WARNING**
**WARNING:** This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. (California law require this warning to be given to customers in the State of California)

Electrical

The conductors of the power supply cord are marked "L1", "L2" for the ungrounded ("hot") supply conductors and "G" for an equipment grounding lead.

Warning: Risk of Fire. Use UL Listed Grounding Type Plug rate for 220 Volts, _____ Amperes, _____ Phase, #_____ Wire. Plug to be Selected and Installed only by Qualified Service Personnel.

Under drain tray

**This equipment is to be installed to comply with the applicable federal, state or local plumbing codes.**

Materials information for Synesso™machines:

- All stainless steel coming into contact with the water supply is 300 series
- All brass fittings are low lead per the CA360 specifications or better
- All electronic devices are lead free
- All gaskets are made from food-contact safe material

Test Information

- Brew (coffee) tanks are hydrostatically tested to 375 psi
- Steam tanks are pressure tested to 75 psi
- The electrical system is subject to an electrical withstand test of:

  1.20 kvac, at 5.00 mA, for 1 second

# BREW & STEAM TANK SAFETY

## Safety Precautions:

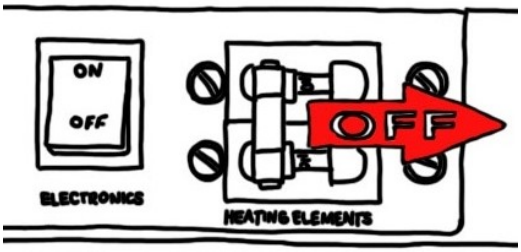
Espresso machines have numerous potential hazards, and it is of paramount importance to Synesso™ that people servicing our machines take all necessary precautions to ensure their personal safety. When working on the machine's boilers (unless otherwise instructed in the directions):

- Turn the machine off and shut off the incoming water supply.
- Depressurize the boilers as shown below.

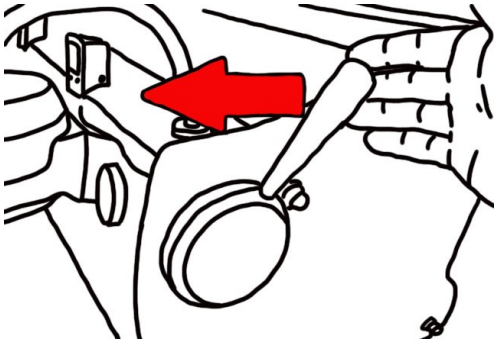
When working on any electrical wiring (unless checking voltage or amperage readings or otherwise instructed in the directions) ensure that the machine is switched off at the electrical box and the machine is unplugged.

## Depressurizing the Steam Tank:

1. Turn off the element circuit breaker located under the machine



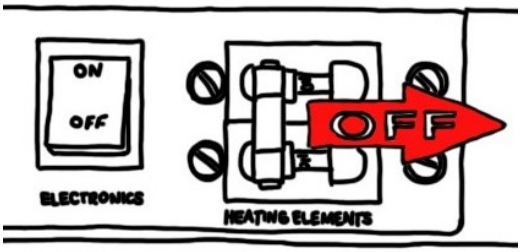

2. Open the steam valve by moving the steam actuator lever forward



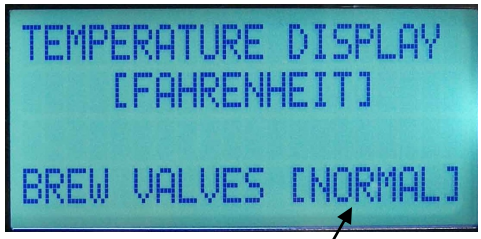
3. The steam tank is depressurized when the steam gauge reads zero. Note: the steam gauge is rated @ 0-60 psi


## Depressurizing the Brew Tanks:

1. Turn off the element circuit breaker located under the machine.
2. Also turn off the water supply to the machine.

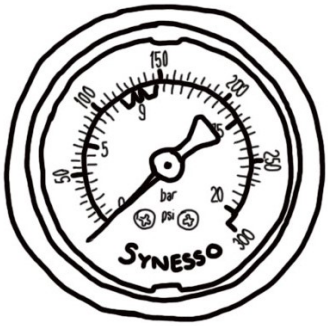



3. In the second level menu, change the brew valves from "Normal" to "ON" this will bleed the pressure.




Normal to On

4. The brew tanks are depressurized once the pressure gauge reads zero. Note – the brew gauges are rated at 0-300 psi



# START UP SCREEN


When cycling the power on, this screen is shown momentarily . It displays your software version and your serial number.

Understanding the information displayed in the serial number. i.e.: 301142030
3 - is the number of groups on this machine (this is a 3 group machine)
01 - is the month is was built (Jan is 01)

14- is the year is was built (14 is the year 2014) & 2030 is the machine sequence number

# RECOMMENDED TOOLS & SUPPLIES

**Tools and recommended items required to fully diagnose, service and maintain Synesso espresso machines.**

- Multi Meter – reads volts, amps and ohms (The Fluke T5-600 is recommended)
- Heat Shrink Gun or Torch
- Vacuum with a Hose
- Compressed Air
- Descaler – Citric Acid
- Flashlight
- Box Knife
- Thread Sealant – Red and Blue Loctite
- Food Grade Grease (Super Lube) 1.8600
- Tube Bender for 1/4”, 5/16”, and 3/8” Tube
- Flare Tool - 45°
- Tube Cutter
- Brass Bristle Wire Brush
- 3/8” Drive Socket Wrench with 7/16”, 1/2” and 9/16” “Deep Sockets”
- Hammer Medium Size Ball Peen
- Wire Stripper / Crimper
- Small Punch and Chisel
- Small Files – Round and Triangular
- Picks – Straight and Curved, an Ice Pick is great for replacing portafilter gaskets
- Dies: 1/8” NPT, 1/4” NPT, and 1/8” BSPP
- Taps: 8-32, 10 - 32, 3/8 – 16, and M6 x 1 bottoming Tap
- Allen Wrenches: 3/32”, 1/8”, 9/64”, 5/32, 3/16”, 1/4” (steam valve seat)
- Wrenches: 2x11/32, 1/4, 5/16, 3/8, 2x7/16, 1/2, 2x9/16 , 5/8, 11/16, 3/4, 12mm & 17mm
- Adjustable wrenches: Medium size 1 1/4” opening and Small for tight spots
- Pliers: Channel Lock, Standard pliers and Side Cutters
- Philips Head Screwdrivers: #2 short, #2 long and #1
- Flat Head Screwdrivers: #2 short, #2 medium length, #1 medium, #0 medium
- A large flat head screwdriver (or small flat nail puller) to use as a pry bar or wedge.
- Pen and paper

# WARRANTY & WATER STANDARDS

## Limited One-Year Non Wearing Parts Warranty

Synesso, Inc and/or your Distributor warrants to the original purchaser that Synesso espresso machines are free from defects in materials and workmanship under normal use and service for the period commencing upon the date of shipping and continuing for 12 months from the original date of shipment. Synesso will make a good faith effort for prompt correction or other adjustment with respect to any non wearing part that proves to be defective within the limited warranty period. This Limited Warranty is conditional upon proper use of the machine by the purchaser.

This Limited Warranty does not cover defects or damage resulting from: accident, misuse, abuse, shipping damage, neglect, unusual physical, electrical or electromechanical stress, unauthorized customer modifications or improper water filtration.

**Proper water filtration and regular filter changes are a requirement to keep your factory warranty valid and your machine functioning properly.** It is highly recommended that you contact a professional water filtration specialist in your area and have your water tested to determine the proper filtration system. It is important to note that many municipalities change their water sources throughout the year, so additional water tests may become necessary.

**Water Standards to keep your warranty valid:**

| | |
|---|---|
| Total Dissolved Solids (TDS) | 30 to 200 ppm (parts per million) |
| Total Hardness - in ppm | Less than 85 ppm |
| Total Hardness – in grains | 3 to 5 grains (divide ppm by 17.1 to get grains) |
| pH | 6.5 pH to 7.5 pH |
| Chloride | 5-15 ppm – any Chlorides can be corrosive and harmful |
| Total Alkalinity | Less than 100 ppm |
| Chlorine | 0 ppm |
| Iron | 0 ppm |

**In Synesso's experience, Everpure Claris and Cirqua formulator systems can produce a result that can damage the Synesso stainless steel tanks. Use of either system is highly discouraged and will void the water related parts of the machine warranty.**

Any part which is determined to be defective in materials or workmanship should be returned to Synesso or to an authorized service location, shipping costs prepaid, as Synesso designates. Synesso may repair or replace the product or part with new or factory refurbished equipment at Synesso's sole discretion. If the product or part is determined to be defective and in compliance with the Limited Warranty conditions, the replacement part or product will be returned to the purchaser with shipping prepaid **.

Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from area to area. While Synesso attempts to assure that its products comply with such codes, it cannot guarantee compliance and cannot be responsible for how the product is used or installed.

# WARRANTY & WATER STANDARDS

Synesso's liability is limited to the purchase price of the product and shall not be held liable for damages that extend beyond the product itself. Synesso's liability of consequential, incidental damages, indirect or direct damages for personal injury, inability to properly use this product, loss of business profits or interruption to business is expressly disclaimed.

** Regarding equipment sold or residing outside the United States: purchaser maybe required to pay for the shipping and associated costs for warranty parts, repairs and services. Please contact your local distributor to resolve the issue regionally, if possible.

# INSTALLATION

**To maintain the 1 year warranty, an authorized or certified espresso service representative must perform the installation of this espresso machine.**

Site Preparation - See Diagram p.9

The machine must be placed on a level horizontal surface that can be easily cleaned and is capable of sustaining a minimum of 300 lbs.

The counter top requires a depth of 28", which provides a minimum clearance of 1" behind and 3" in front of the machine.

Make a 2 ½" minimum diameter hole through the counter top located 4" from the rear and 7" from the right side of the machine. The hoses, drain tube, and electrical lines will all pass through this hole.

A 3/8" min. diameter cold water supply line from the filter with a shut off valve is required within 5' of the machine. The valve should be easily accessed for machine service.

The machine supply hose and pump fittings are 3/8" tube compression fittings.

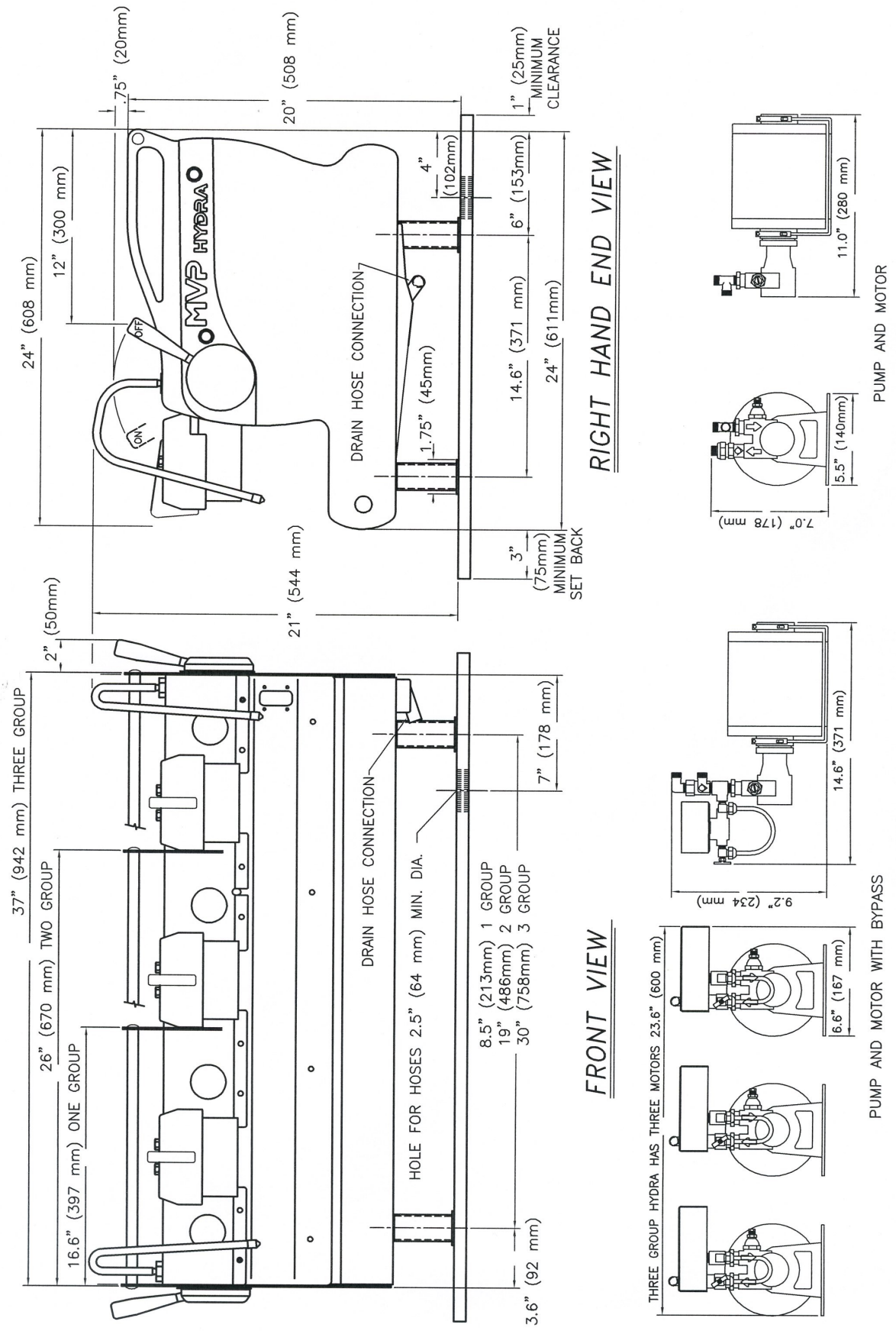
A proper water filtration or softening system must be installed on the incoming water supply. Water treatment requirements will vary, and it is important to use a system designed to match the needs of your specific area. Water filtration systems require periodic maintenance, including cartridge or filter replacement. Proper filtration and service is vital to the function of the machine and the quality of the espresso served. Follow the instructions provided by your water treatment system for proper installation.

Note: Improper water filtration can result in severe damage to the machine including scale deposits and corrosion. **DAMAGE CAUSED BY IMPROPER WATER TREATMENT WILL NOT BE COVERED BY THE MACHINE WARRANTY.** See page 7.

There must be adequate room under the counter to locate each motor and pump. The pumps must be easily accessible for adjustment and motors must have a minimum of 3" clearance on all sides for air flow.

A floor drain or sink must be available. The best location is directly under the machine. The 3/4" drain hose should descend as vertically as possible for optimal drainage. An air gap is required between the end of the drain hose and the highest water position of a clogged drain. This is to prevent the possibility of drain water backing up into the machine.

# INSTALLATION



# MVP & MVP Hydra - 2 Piece Side Panels

This side panel is shown with the trim plates removed, to display the way the lower panel interlocks with the upper panel.

When removing the Lower Side Panel from the espresso machine:

- Loosen the 2 side panel mounting bolts , but do not remove.
- Remove the Thumb Screw from the drain tray
- Push the panel to the back of the machine while lifting slightly up

This allows the user easy access to the drain box & allows the technician easy access to all water control valves on the water inlet (right) side and to the level probes and thermal switches on the left side.

For the technician to access the steam valve, the Upper Panel must be removed.

When removing the Upper Panel from the espresso machine:

- Remove the 2 side panel mounting bolts completely.
- Each bolt is threaded into a plate fastener inside the frame. **Be careful not to lose the fasteners**.
- The Safari Rack is suspended by, but not threaded onto, short bolts on each side panel. ***The Safari Rack needs to be supported while removing the Upper Panel.**

# PLUMBING REQUIREMENTS

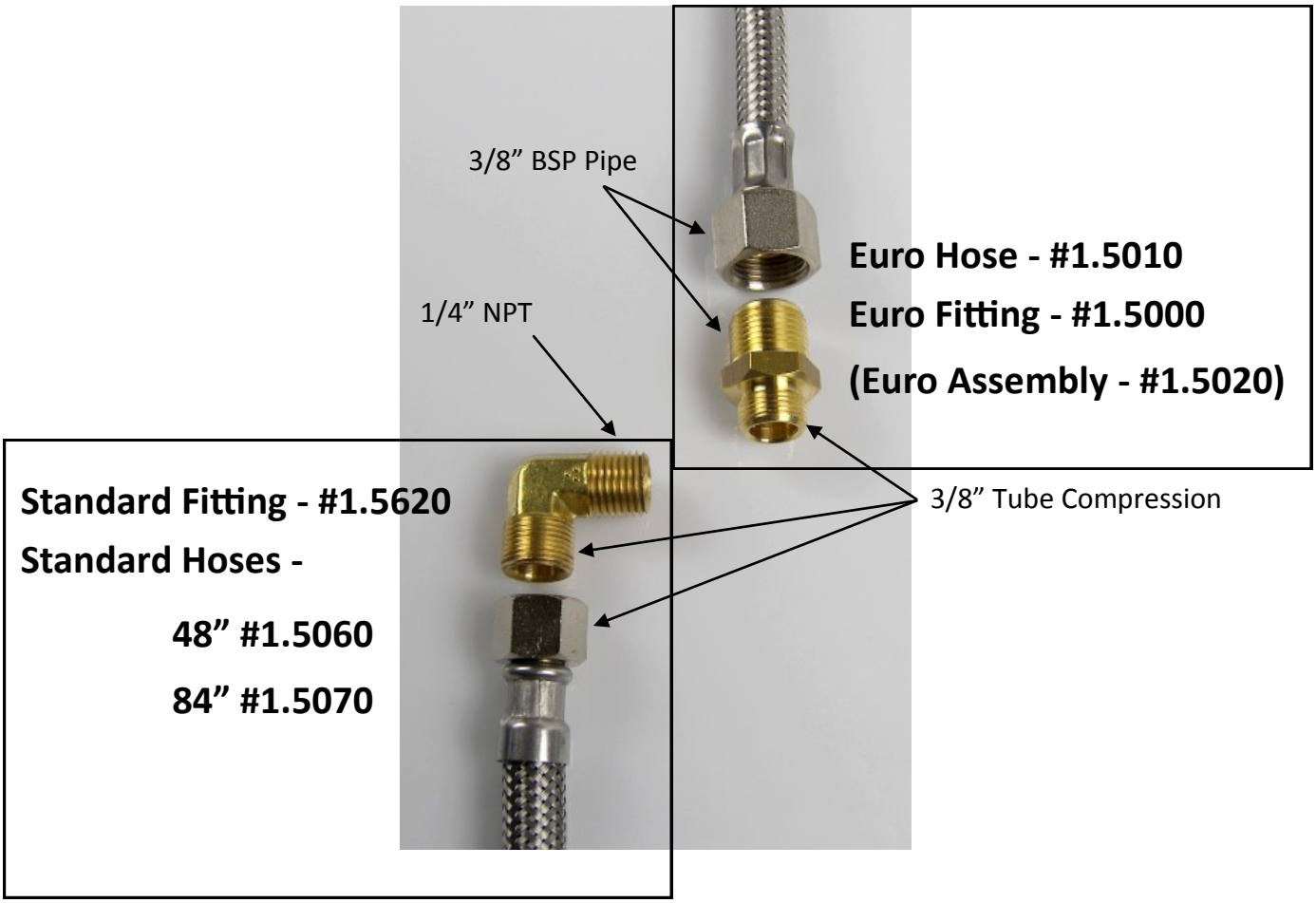
This equipment must be installed to comply with the applicable federal, state or local plumbing codes. WATER TREATMENT IS REQUIRED TO PRESERVE THE FULL MACHINE WARRANTY. Please ensure that the incoming water complies with the warranty requirements listed on page 7.

Using the provided stainless steel braided hose, connect the pump to the shutoff valve on the filtered cold water line. Fittings on the hoses and pumps are 3/8" tube compression. Thread sealant or Teflon tape is not necessary. Make connections snug, but do not over tighten.

Turn incoming water ON and check for leaks.

Synesso™machines require a minimum of 50 PSI (3.5 bar) of line pressure at 30gal (120L) per hour to have the auto-fill system for the steam tank functioning properly. Please ensure that the incoming water meets this requirement or contact Synesso™for alternative methods of boosting water pressure.

NOTE: Synesso™sells a "Euro-hose" adaptor hose and fitting (part number is 1.5020) which converts from a 3/8" tube fitting to a pipe fitting, suitable for most non-US plumbing. Please refer to the picture below to identify the differences between the standard and Euro-style fittings and hoses.



# ELECTRICAL REQUIREMENTS

All Synesso™machines are rated to operate on 220v AC with a 50 or 60 Hz frequency, single phase. Machines will operate between 208v and 240v.

Listed amp ratings are all measured at 220v. Incorrect voltage can cause malfunction or damage to the machine.

An electrical socket and matching plug, rated at the proper voltage and amperage are required within three feet of the machine. Plug ends are NOT included with the machine unless required by CSA or other certification.

| Model | Cord Plug Rating (UL Listed) | Machine Max Amp Draw |
|---|---|---|
| 2 Group MVP | 30 amp | 28 amp |
| 3 Group MVP | 50 amp | 36 amp |
| 1 Group MVP Hydra | 20 amp | 16 amp |
| 2 Group MVP Hydra | 30 amp | 30 amp |
| 3 Group MVP Hydra | 50 amp | 40 amp |

| **North American Wire Color** | | **Worldwide Wire Color** | |
|---|---|---|---|
| Green | Ground | Green and Yellow | Ground (Earth) |
| White | 110v Line 1 | Brown | 220v |
| Black | 110v Line 2 | Blue | Neutral |

Attach the plug end per manufacturer's instructions.

Make sure that the red electronics switch and the heating element breaker on the front of the electrical box are in the OFF position, then plug the power cord into the receptacle.

OPTIONAL: If recovery time is slow, install an In-Line Buck-Boost transformer to increase voltage below 208v to optimize machine recovery time. Buck-boost transformers come in different sizes. Please choose the appropriate one for your machine if required. 1 and 2 Group Machines require a 1.0 KVA transformer, 3 Group Machines require a 1.5 KVA transformer.

**SPECIAL ELECTRICAL INFORMATION FOR EMC-COMPLIANT MACHINES**

(C-TICK FOR AUSTRALIA, CE FOR EUROPE AND OTHER LOCATIONS)

To comply with EMC (Electromagnetic Compatibility) regulations, Synesso™is required to install a capacitor in the electronics box across the main power IN. **To avoid an electric shock from the charge held in the capacitor, unplug the cord, taking care to NOT touch the metal prongs on the plug end. Turn the electronics ON/OFF red rocker switch to the ON position and wait a few seconds until the red switch "goes dark." At that point, the electrical charge has dissipated.**

# HYDRA PACKAGE REQUIREMENTS & INSTALLATION

## MVP Hydra Installation Requirements:

**Electrical:**

The Hydra package has a slightly greater amp draw than the single pump machines; please note the max amp draws and plan your electrical installation accordingly. See table on page 12.

Each pump motor has a distinct color association, which is indicated throughout the machine by colored wires and zip ties. The colors are as follows:

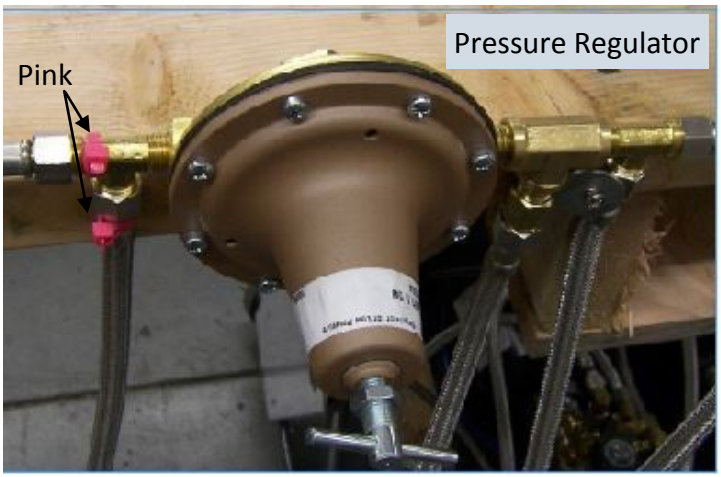
- Group 1: Grey
- Group 2: Purple
- Group 3: Brown
- Water inlet for the steam tank: Pink

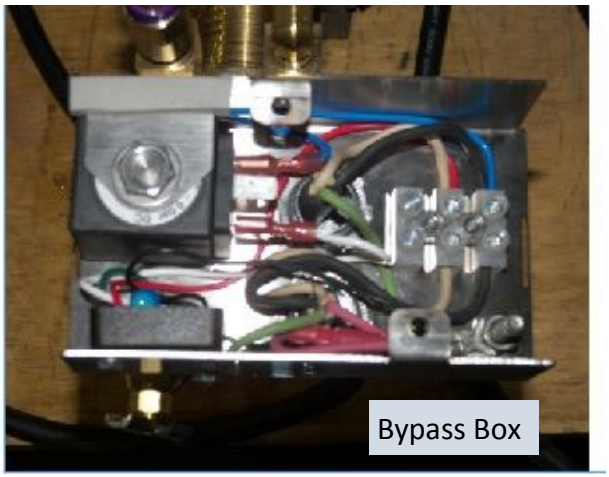
Wherever these colors are seen, it is critical for proper machine function that they are matched up correctly (grey to grey, etc.) for both electrical and plumbing systems.

**Plumbing:**

Hydra packages require one incoming water source like single pump machines. The water passes through a manifold (commonly part of the line pressure regulator) and is distributed to each pump. Once again, follow the color coding for proper installation of the hoses from the output of each pump to the machine.

## Pressure Regulator Plumbing & Bypass Box Wiring:




Pump cord installation: Insert the color coded pump cable into the opening of the matching bypass box and attach the wires to the terminal as shown in the picture above: green wires stacked on the ground bolt, white to white/red, black to black/blue, connect the bullet connectors.

Pressure regulator: Used to achieve the stage 1 low pressure pre-infusion. It is set and tested at 50 psi in the Synesso™factory. This pressure setting can be lowered if desired, but 50psi is the maximum output pressure. To adjust the pressure regulator, first loosen the nut on the threaded post, then turn the post counter-clockwise to decrease pressure.

# START UP

## Start-Up Instructions

1. To fill the machine, connect the water lines, connect the drain hose and turn the water ON.

2. Switch the red electronics On/Off switch to ON. This activates the machine's water auto-fill feature for the steam tank and the electronics, but NOT the heating elements.

3. The water level sight glass for the steam tank is located on the right side of the machine. As the tank fills, the water level will rise in the sight glass and will automatically stop when the preset level is reached.

4. Bleed the group heads of air:

- Hold each brew group handle left until the corresponding display reads M: shift each group head handle left momentarily, (see pictures below) allow the group to run until there is a steady flow of water. Shift each group head right to turn off.

5. Wait until the steam tank has stopped filling and the level in the sight glass reads at least ½ full. Turn the heating element breaker to the ON or (1) position. All the heating elements (brew and steam) are now activated.

6. To adjust the pump pressure, activate the pump by shifting the brew group handle momentarily left two times on MVP and three times on MVP Hydra.

7. Locate and read the pump pressure / brew gauge located to the right of the rightmost group on MVPs and to the right of each group on MVP Hydras.

8. Set the pump pressure to 9 Bar:

- Locate the pump adjusting screw on the right side of the brass pump housing.
- Loosen the lock nut and turn the screw with a screwdriver:
  - ⇒ Clockwise to INCREASE pressure
  - ⇒ Counterclockwise to DECREASE pressure
- Once the desired pressure is reached, retighten the lock nut.

9. Please allow at least 30 minutes of "warm up" time before using your Synesso™espresso machine to brew shots or steam milk. The steam gauge (the left hand gauge) should read a minimum of 1.1 Bar.

Center Position - At Rest

Shift Left - Start or Advance

Hold Left - changes M to MP to VP

Shift Right - Off or

Select Brew Program

# BYPASS SETUP


**Pump Bypass:** With the brew group in M mode, turn the associated brew group actuator momentarily to the left. Adjust the regulator to control pre-infuse pressure. Turn left twice in a row and adjust the pump pressure (typically 9 bar.) Finally, turn left once more and adjust bypass pressure using the pin valve at the pump. Adjust to taste (factory setting is 7 bar.)


The pre-infusion time and ramp up, or bypass, time are set on the Temperature Control screen of the display by following the directions on page 34. Press the button next to the line to be adjusted and use the up and down arrows to adjust the set time.

With these settings in place, you can taste the effects of pressure ramping applied to each shot. The shot begins with pre-infusion. Low pressure water saturates the puck, swelling it to reduce channeling. After the pre-infuse time has elapsed, ramp up (bypass) begins. The bypass system creates a slow rise in water pressure by partially diverting water away from the brew group. After the ramp up time ends, the bypass closes and a brew pressure (9 bar) stage begins. Ramp down returns to bypass pressure. When in M or MP mode, the operator enters ramp down by moving the group top actuator momentarily to the left. Volumetric groups can be programmed to automatically begin ramp down at a set percentage of the shot as described on page 35.

# MVP / MVP HYDRA INTRODUCTION

The MVP Hydra is a machine model with a pump and motor for each group head. The MVP Hydra has internal plumbing and wiring to accommodate separate and distinct pressures in each brew group. In contrast, an MVP has a single pump and motor for the entire machine. Having individual pumps and motors allows the operator to control brewing pressure at each group head, and each brew group functions independently without affecting the pressure at the other groups.

MVP Hydra groups can function in Manual mode (M) with full manual control, in Manual Program mode (MP) with timed pre-infusion and pressure ramp up, or in Volumetric Program mode (VP) with programmed pressure ramping. Any group head can be changed on the fly to any configuration at any time.

### Last Shot Brewed:

The MVP and MVP Hydra have a storage feature where the last brewing function is stored in a temporary memory. This applies to any brewing function. If you quickly purge a screen, this will be stored as the last shot brewed. If you manually brew an espresso that is perfect, this is the last shot brewed. The following functions do not change the memory of the last shot brewed:

- Turning on save mode (hold any brew group handle right for 2.5 seconds)
- Shifting thru the 6 available programs (momentary presses of the brew group handle to the right)
- Saving (momentarily pressing the brew group handle left from within save mode)
- Saving again to additional program locations, on the same, or different groups
- Exiting save mode (hold any brew group handle right for 2.5 seconds)
- Shifting between programs M, MP, VP, by holding the handle on the desired brew group left

When a running group is stopped, the parameters are stored. After shot parameters are saved they can be viewed and altered on the hand held controller. Any alterations are saved as new shot parameters.

# OPERATION

## Prepare a Portafilter

1. For best results, use fresh coffee. Ground coffee should be brewed as soon as possible after grinding.

2. Select the correct spout and basket configuration. Single, double and bottomless portafilters are available through Synesso™. The single spout portafilter is used with a single (7g) basket to brew a single shot. The double spouted or bottomless portafilters can be used with double (14g) or triple (18g or 21g) baskets to brew triple, double, or 2 single shots of espresso.

3. Fill the portafilter basket just above level and wipe off the excess.

4. Press straight down evenly on top of the grounds with the tamper.

NOTE: When not in use, keep the portafilter engaged in the group head to keep it warm.

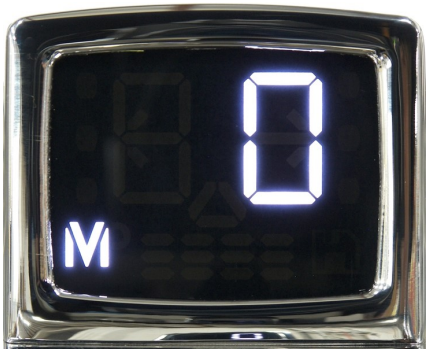
## Espresso Brewing

1. Grind a dose of coffee appropriate to the basket you will be using.

2. Dispense into the portafilter basket.

3. Level the mound and compress using a tamper. (A tamper is supplied with the machine.)

4. Engage the portafilter into the brew group that has the correct temperature setting for this espresso roast and pull firmly to the right to set the seal.






Hold handle LEFT to change the Operation Mode from M (Manual) to MP (Manual Program) to VP (Volumetric Program).

**M - Manual**

5. Pre-infuse the coffee puck by momentarily shifting the brew group left. This allows line pressure to saturate the puck.

6. When a drip shows at the spout (or on the basket if bottomless,) momentarily shift the brew group left again to advance the process. Repeat to continue advancing thru the brewing process until complete.

7. You can end the shot by momentarily shifting the group cap right at any time while brewing.

*If brewing in manual program mode continue to step 8 (Manual Program)*

**MP - Manual Program**

8. Manual Program allows a time to be set for pre-infusion (and also for ramp up on MVP Hydra models.) At the completion of the set time the next stage begins automatically. If “0” is selected for the amount of time then the stage will be skipped.

9. When the process has advanced to full pressure brew (9 bar) the operator shifts to the next brew stage

manually or ends the brewing process manually.

**VP - Volumetric Program**

5. Select a program to run by momentarily shifting the corresponding group head right, this will shift through the programs displayed on the shot timer. There are six to choose from. Some may be turned off, and therefore not displayed.

6. Check the program on the hand held controller. Press the down arrow to move to the corresponding group. The program number and pressure times are displayed on the first screen, and the percentage of shot brewed and total water count on the next screen. See pages 34 & 35.

7. The shot will automatically end once the set total water count has been registered.

## Brew Pressure Graph

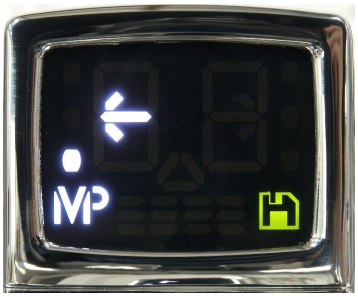

Pre-infuse Bar


Ramp Up Bar


Brew Pressure Bar


Ramp Down Bar

## Display Functions



Shift LEFT to SAVE to Program 5


SAVE Lockout is ON


Steam Tank, Low Water Level or Low Flow Error

5 Minute Time Out Error or Low Flow Error


6 Programs Shown. Only the selected program displays when in use.


MVP Brew Pressure Graph.

# OPERATION

## Milk Steaming

1. Fill the pitcher halfway with fresh, cold milk. Smaller pitchers are recommended for drink sizes less than 10 oz. steamed, unused milk should be discarded.

2. Condensation can collect inside the wand. Activate the steam handle to blow the wand clear before steaming milk.

3. Insert the tip of the steam wand deep into the milk pitcher. This will prevent milk from splashing once the steam is turned on.

4. Open the steam valve by pulling the handle towards you.

5. Place one hand on the side of the steam pitcher to feel the rising temperature of the milk.

6. As the milk agitates and heats, lower the pitcher to keep the tip of the steam wand closer to the surface. Allow the steam jets to push some air beneath the surface, then raise the pitcher to lower the tip of the wand deeper into the milk. This will continue the heating process and minimize further foaming. Do not touch the steam wand to the bottom of the milk pitcher; this can create an inaccurate temperature measurement.

7. Heat milk to approximately 150F to 170F (65°C to 76°C). If you are using your hand to help determine the temperature, it will feel about as hot as you can stand without burning yourself. Milk thermometers are also an excellent way to determine the temperature of the milk.

**Caution: Do not overheat the milk and scald it. Scalded milk should not be used.**

8. Remove the wand from the milk, purge with steam, and wipe clean immediately after each use.

**NOTE:** Although Synesso™steam wands are made with a proprietary double-walled process that helps to keep the outer wall cooler, the tip and base can become very hot and caution must be used.

**NOTE:** Whole Milk, 2%, 1%, Non-Fat, Soy Milk, Rice Milk and other milk type products may require different techniques to foam properly. In general, the higher the fat content, the easier it is to steam.

# HYDRAULIC SYSTEM

## Overview

The hydraulic system in the Synesso™ is comprised of all parts through which water flows starting with where it enters the machine from the water treatment/filtration system. This chapter will detail the flow of water and some of the associated electrical components.

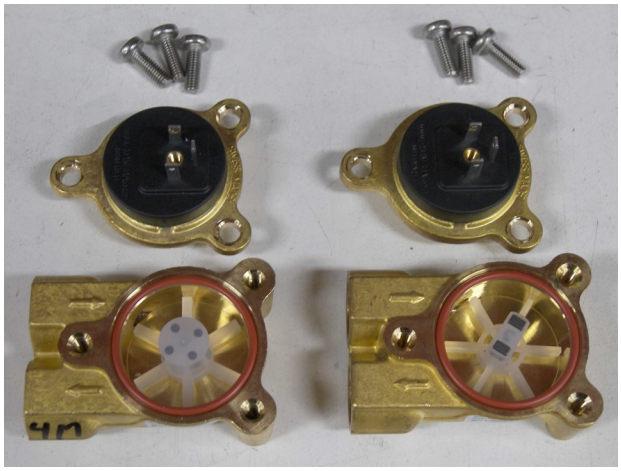
Synesso™ utilizes 3/8” braided stainless hoses (supplied with machine) to connect to the water treatment system. Once the machine is set up and the water quality is checked, the machine is ready to connect to the water treatment system. The water then passes to the pump and motor.

On single pump and motor machines, water for the brew boiler goes through the pump and the water for the steam boiler travels through a separate line to the steam tank fill valve. The next 2 pages show the dual inlet system, and Hydra inlet water paths.

# FLOW METERS


The MVP and MVP Hydra incorporate a high precision 4 Magnet Flow Meter. While the outward appearance is identical, the label part number ends in “14”.

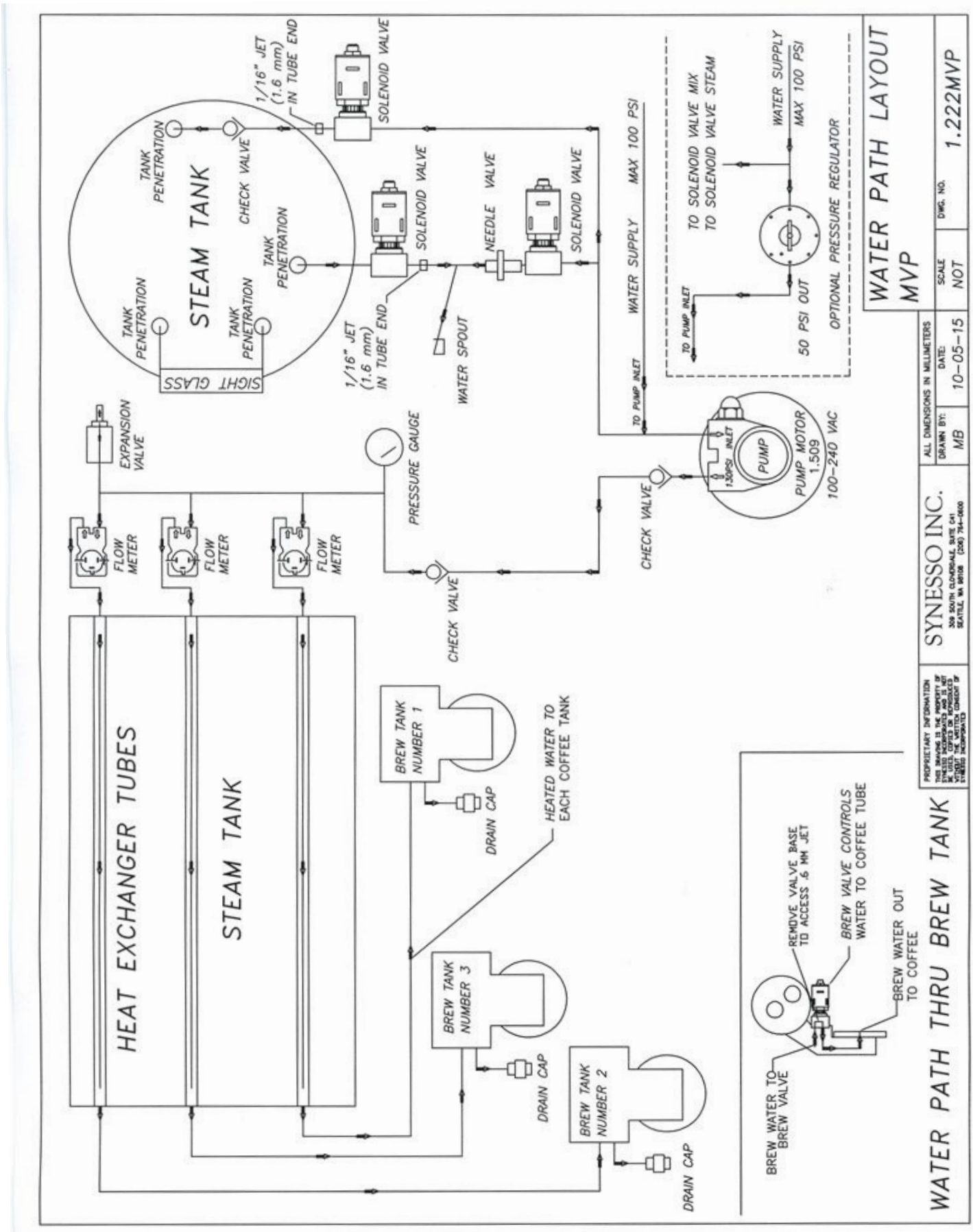
Synesso part number is 2.3057 - they are NOT inter-changeable with the previous 2 Magnet Flow Meter Synesso part number (#2.3052)



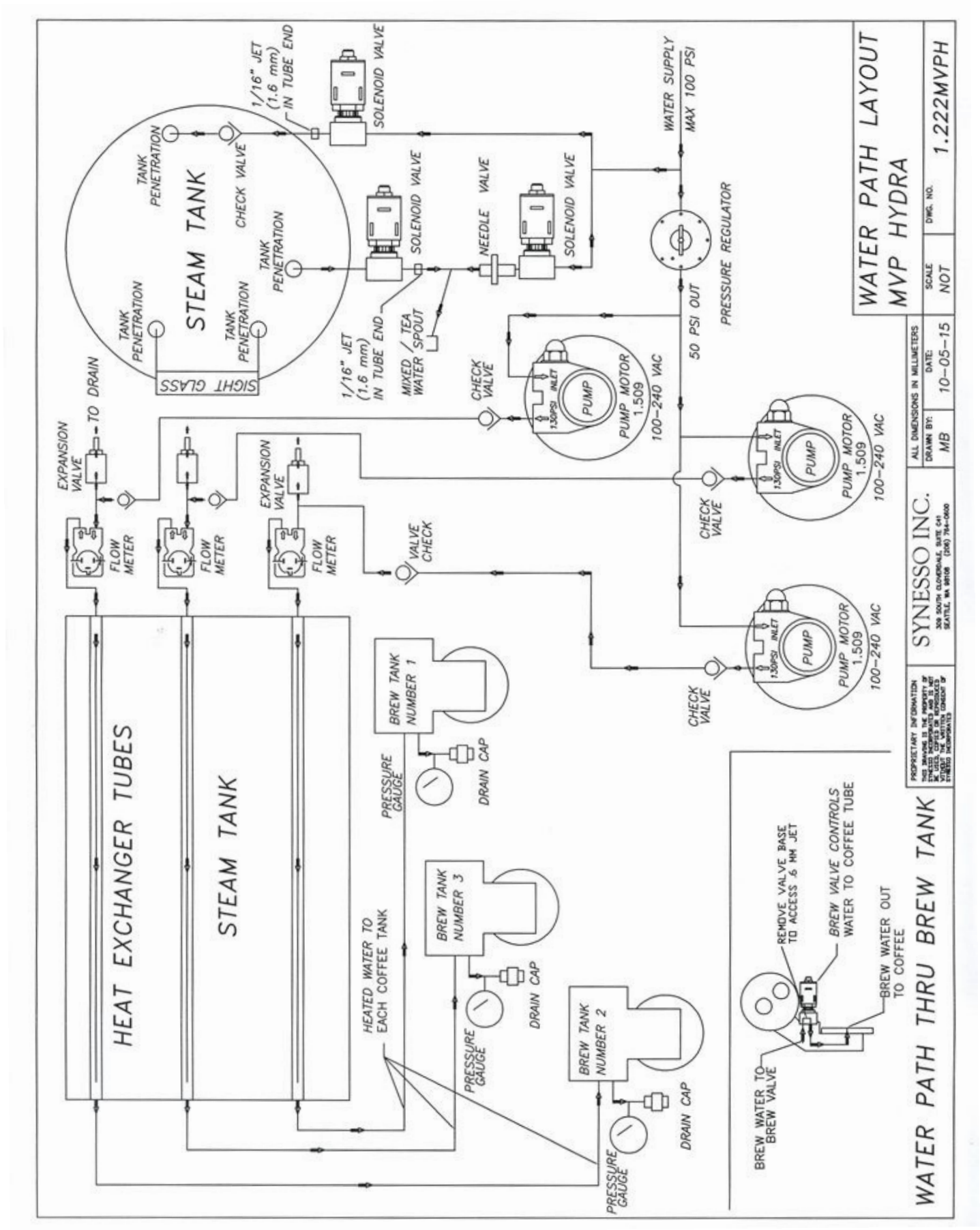
The 4 Magnet Flow Meter is shown on the LEFT

The 2 Magnet Flow Meter is shown on the RIGHT

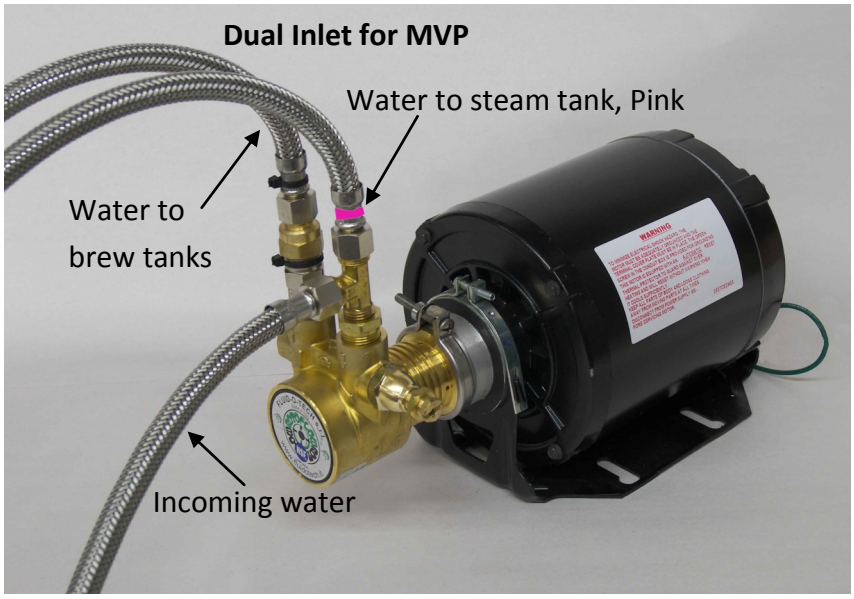
# HYDRAULIC SCHEMATIC - MVP



# HYDRAULIC SCHEMATIC- MVP HYDRA



# HYDRAULIC SYSTEM




**Pump and Motor:**

Synesso™ uses a Fluid-o-Tech rotary vane pump which boosts incoming water pressure to 9 bar when the motor is activated. Pressure can be a adjusted by loosening the nut on the right side fitting and then turning the adjustment screw:

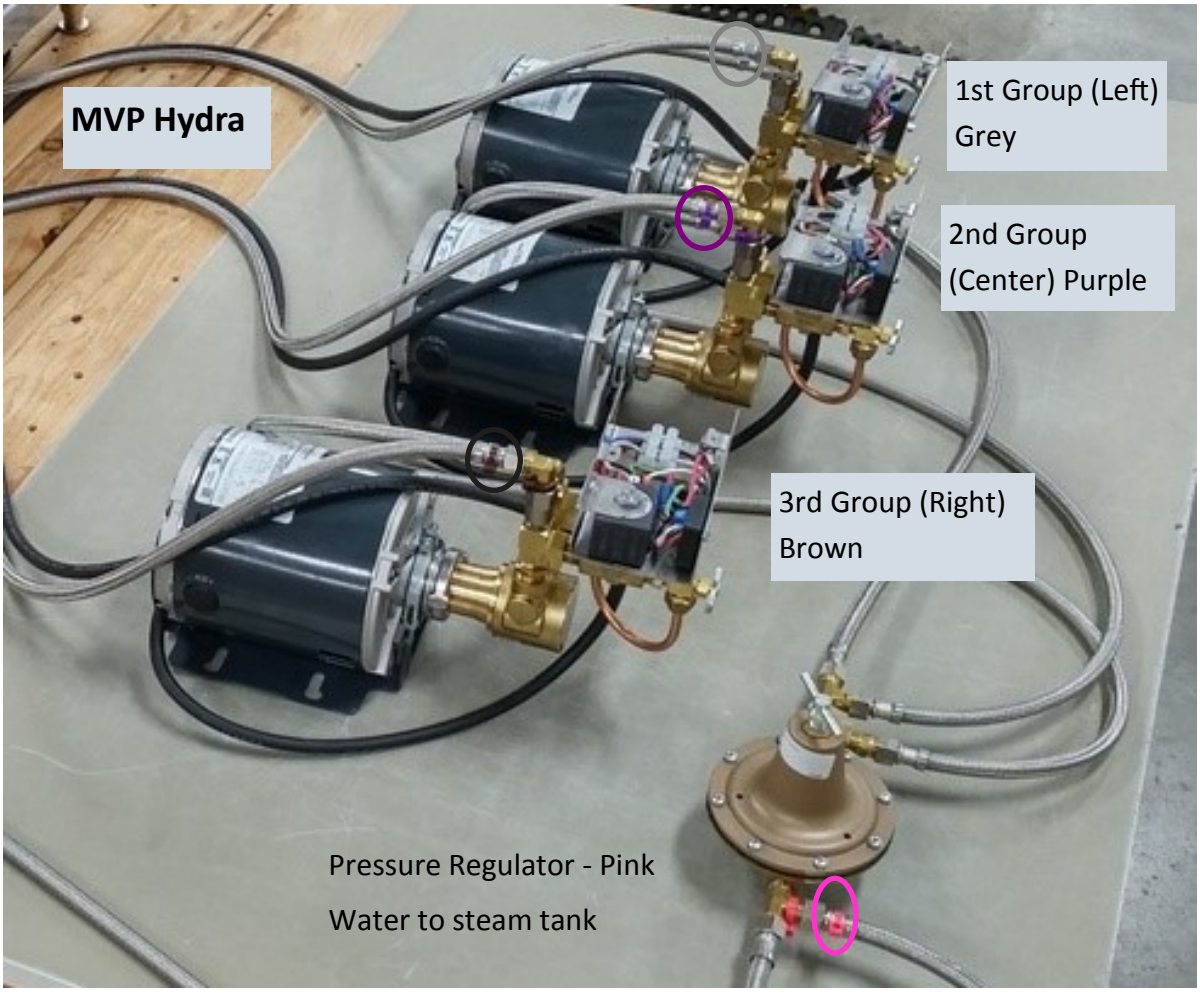
Clockwise - Increasing pressure

Counter-clockwise - Decreasing

**Pump configurations:**

MVP machines have the dual inlet configuration, as shown above.

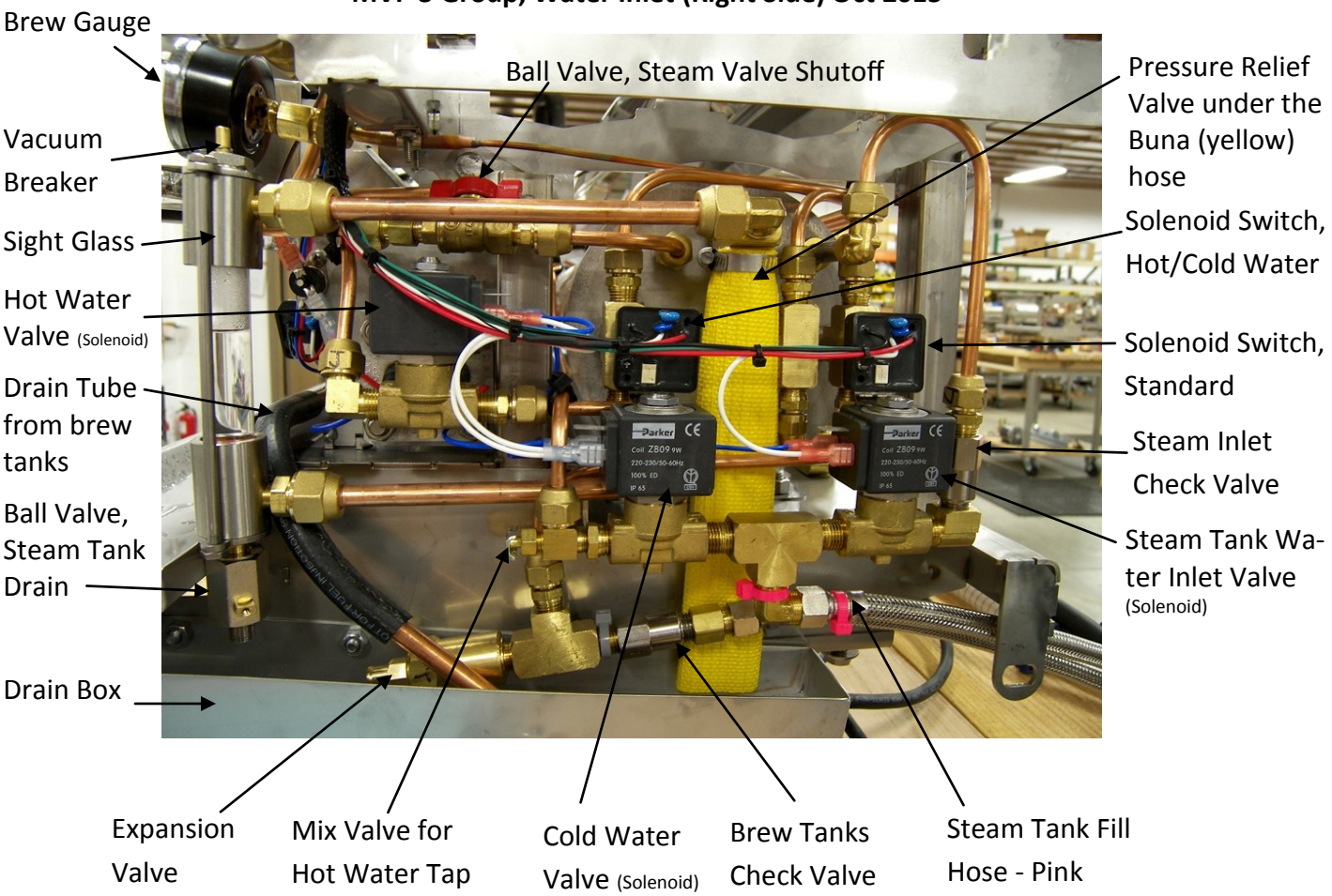
MVP Hydras have separate pumps and motors for each group. Hydra 3 Group is shown with Bypass Boxes



# HYDRAULIC SYSTEM

## MAJOR COMPONENTS OF THE WATER INLET SYSTEM (Right Side)

**MVP 3 Group, Water Inlet (Right Side) Oct 2015**




### Water Inlet Components:

**Brew Gauge:** The brew gauge reflects pressure in the brewing system. On an MVP, there is one gauge for the entire brew system; on an MVP Hydra, each brew tank has its own brew gauge. The gauge normally moves between 3-5 bar (line pressure) to 9 bar (brewing pressure) and up to 12 bar (expansion pressure) at which point the expansion valve releases the excess pressure.

**Brew Tank Check Valve:** Check valves are one-way valves which ensure that pressurized water cannot overwhelm the incoming water pressure and exit the machine through the inlet lines.

**Brew Inlet Hose:** Supplies the brew system with water from the pump. Hydra models have a pump, motor, and hose for each group. A 3 group MVP Hydra will have 3 hoses, 2 group - 2 hoses, and 1 group - 1 hose.

**Drain Box:** Water flows into this box prior to going through the drain hose to the floor drain. Periodically pour small quantities of hot water down this drain box to clear coffee oil buildup.

**Drain Hose:** Waste water and some grounds go down this tube to the drain. Keep this free of clogs and maintain a steep vertical path to the floor drain.

# HYDRAULIC SYSTEM

## MAJOR COMPONENTS OF THE WATER INLET SYSTEM (Right Side)

**Drain Tube (from brew tanks):** This copper manifold allows water from the brew valves to discharge safely down the drain after shots are completed.

**Expansion Valve:** The brew tanks are completely saturated with water. As they heat, the water expands and the pressure increases. The expansion valve allows this water to release safely into the drain box. The release point is 12 bar and is adjustable by turning the end of the valve with a wrench clockwise to increase or counterclockwise to decrease.

**Heat Exchanger Tubes:** In order to maintain extremely stable brewing temperatures, Synesso™ incorporates heat exchanger tubes which run through the steam tank, then supply water to each coffee boiler. The heat exchangers are precisely designed to aid in the energy efficiency and thermal stability of the brew system.

**Cold Water Valve:** Synesso™ machines have 2 valves which provide water to the hot water tap (tea tap or Americano tap): the hot and cold water valves. Mixing in cold water allows the user to moderate the temperature at the spout. Boiling water is not appropriate for all beverages.

**Hot Water Valve:** This valve supplies hot water from the steam tank (which is mixed with cold water from the cold water valve) to the hot water tap.

**Mix Valve Adjuster:** This pin valve allows the user to increase or decrease the flow of cold water (from the cold water valve above) going to the hot water tap. Turning this valve completely clockwise shuts the cold water off, while turning it counterclockwise allows more cold water in.

**Pressure Relief Valve (PRV):** The PRV is a safety release for the steam boiler which opens and releases pressure if the boiler rises above 3.5 bar (50 psi). The PRV is housed inside the yellow tubing which directs any releases to the drain box.

**Sight Glass:** Connected to the steam tank by two tubes, the sight glass provides a visual representation of the level of water in the steam tank. It should be 1/2 to 2/3 full during normal operation.

**Steam Inlet Check Valve:** See Brew tank check valve description. (Page 23).

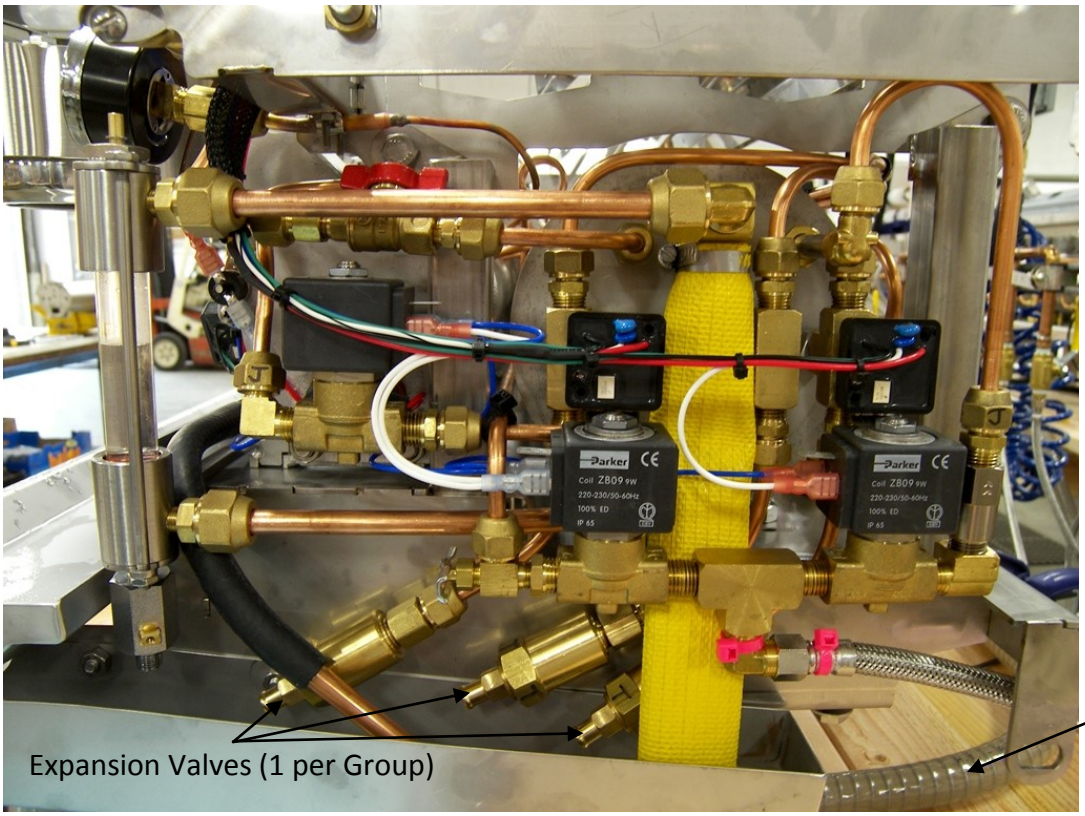
**Steam Inlet Water Control Valve:** When the upper level probe (Page 25) detects an absence of water, the control board will send a signal to open this valve and allow water into the steam tank.

**Steam Tank Inlet Fill Line:** This is the incoming 3/8” steel braided line which supplies the steam tank with water. It will be labeled with a pink tag.

**Vacuum Breaker:** Prevents steam tank pressure from dropping below atmospheric pressure. As the tank heats, the pressure from the steam pushes an internal rod and o-ring up, sealing the vacuum breaker. When the tank cools below the boiling point, steam will condense and shrink in volume potentially pulling a vacuum in the steam tank. At this point, the internal rod and seal will drop down and allow air into the tank to replace the cooling steam, preventing a vacuum.

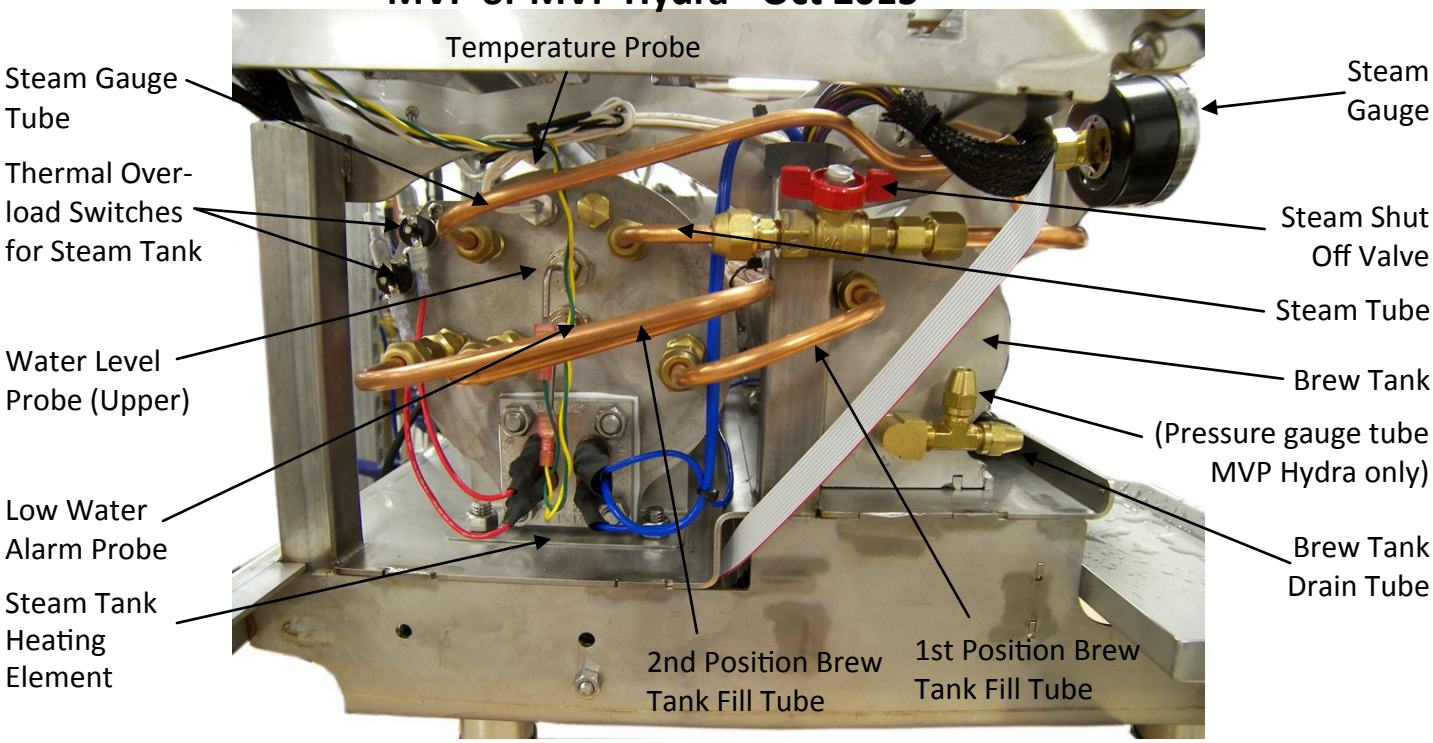
# HYDRAULIC SYSTEM

**MVP Hydra 3 Group, Water Inlet (Right Side) Oct 2015**




## Major Components of the Water Outlet (Left Side)

**MVP or MVP Hydra - Oct 2015**



# HYDRAULIC SYSTEM
## Major Components of the Water Outlet (Left Side)

**Brew Tank Fill Tubes:** (there will be one per group, the picture above shows a 2 group) Heat exchangers exit on the left side of the steam tank and copper tubes deliver the water to the brew tanks.

**Brew Tank:** Synesso™'s brew tanks are entirely stainless steel, welded internally and externally to be water tight and thermally stable. Each brew tank has its own temperature probe and element which allows the user to set different temperatures on each group, as well as operate without a group if a serious service issue arises. Attached to each group is a 3-way brew valve which controls the flow of water from the group head to the brew chamber.

**Brew Tank Drain Tube:** Each group head is fitted with a brass fitting with a copper seal. The fitting and seal can be removed and temporarily replaced with a short length of tube in order to drain the brew group.

**Heating Element:** A 2-leg Incoloy and stainless steel heating element which provides the heat for the steam boiler. It is controlled based on readings from the temperature probe and also protected by the thermal overload switches, and will be shut off in the case of over-heating or low water levels.

**Low Level Probe:** Detects when the water in the steam tank is very close to the element. The controller board immediately cuts power to the heating elements, registers an "STLW00" error on the display (2nd Gen only) and begins an audible alarm to alert the operator to the problem.

**Steam Actuator Rod:** This rod is pushed in when the steam handle is activated. The rod opens the internal seal, releasing steam through the valve.

**Steam Gauge:** Displays the pressure in the steam tank. The gauge reads between 0 and 4 bar (0-60 psi). Standard operating pressure is about 1.3 to 1.4 bar at 250° F.

**Steam Shut-off Valve:** Shuts off steam to the steam valve for safety during field repairs.

**Steam Tube:** Delivers steam from the steam tank to the steam valve to heat and foam milk.

**Steam Tank Thermal Overload Switch:** Cuts power to the element if the temperature exceeds 280° F. Must be manually reset if triggered.

**Temperature Probes:** Send thermal data to the controller board to regulate the temperature within the steam tank.

**High level probe:** Detects whether the desired water level has been reached. Water level is adjustable by rotating the entire probe to raise the tip out of the water. The tank will then fill to the new set height.

# ELECTRICAL SYSTEM

This chapter will cover the fundamentals of the electrical layout and functions of the machine.

**SAFETY NOTE: Please use caution when working on any part of the Synesso™ electrical system. Live current poses the risk of electrical shock, harm, permanent injury or death. Take all appropriate precautions, including turning off the machine, breaker, and/or unplugging the unit prior to working on the machine.**

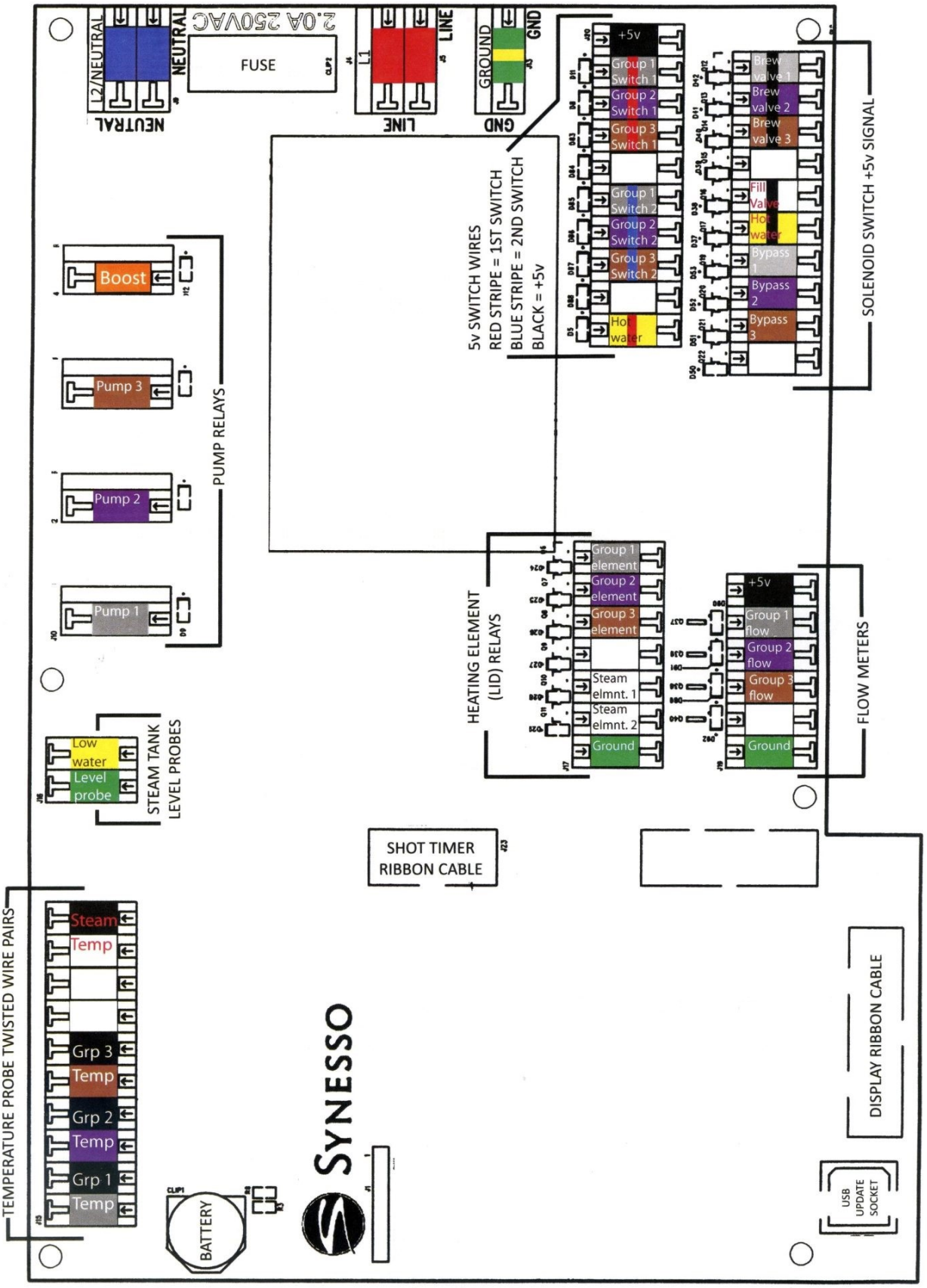
The major components of the electrical system can be broken down into the following functional categories:

1. Heating components (temperature probes, elements, thermal resets, and various parts of the CPU)
2. Water control (water inlet valves, brew valves, mix and hot water valves, water level probes and various parts of the CPU, rocker and brew/pre-infusion switches, pump, and motor)
3. Operator feedback (visual display)

The locations and descriptions of the components above were covered in the chapter “Hydraulic System,” with the exception of the CPU and display, which will be covered in this chapter.

# ELECTRICAL SYSTEM

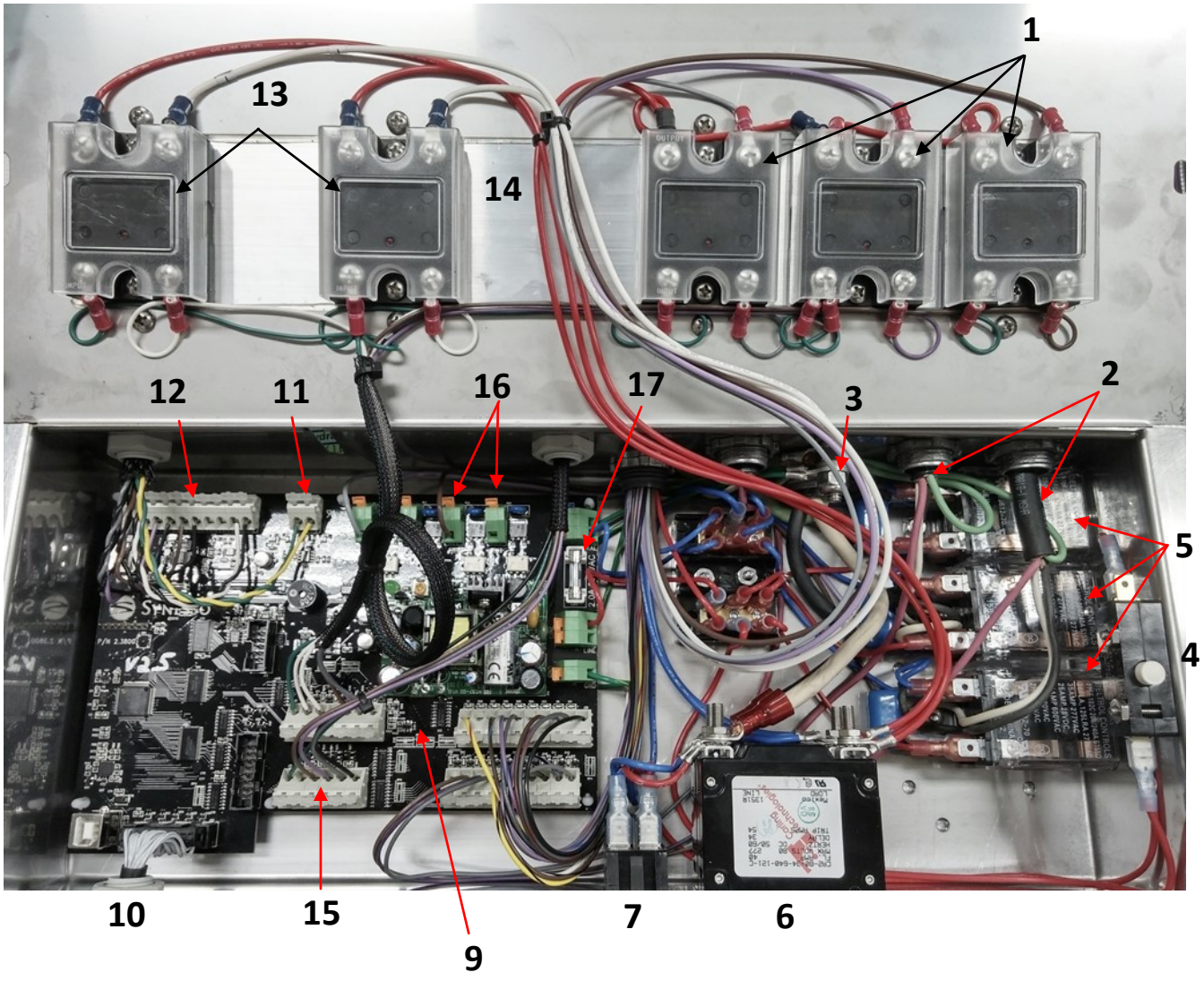
## Main Electronics Board - MVP & MVP Hydra #2.3081



# ELECTRICAL SYSTEM - Electrical Box

Located underneath the machine, the electrical box contains all the power and signal wiring running to and from the Synesso™ machine. Since the 2 boxes represented below have many of the same components, they have been labeled with numbers for matching components and the descriptions follow in the next pages.

**3 Group MVP Hydra Electrical Box**




1. **Brew Relays:** Switch high voltage onto the brew tank heating elements.

2. **Each Pump Motor Wire:** Carries 220v to the pump motors from the electrical box. Contains 3 wires: black (L2/N), white (L1) and green (ground). A fourth wire (Red), is used for bypass system control when appropriate.

3. **Grounding Post:** For all earth ground connections.

4. **Lid Safety Switch:** Cuts power to the control board and other electronics when the lid is removed.

# ELECTRICAL SYSTEM - Electrical Box

5. **Pump Relays:** Switch high voltage onto the pump motors. Relay wiring includes a noise-reducing snubber (large light-blue object) connected in parallel with pump leads.

6. **Element Breaker:** Disconnects voltage from all heating elements.

7. **Electronics Power Switch:** Turns the machine off and on. If the machine is plugged into an electrical source, the switch will be illuminated when in the "On" position.

8. **Conduit Tube:** Protects power and signal lines from abrasion and other damage. (Not Shown)

9. **Main Electronics Board, MVP:** Controls all automated systems throughout the machine.

10. **Round Ribbon Cable:** Connects the hand held display to the Main Electronics Board.

11. **Level Probe Wires and Connectors:** Connect level probes to power board and ground.

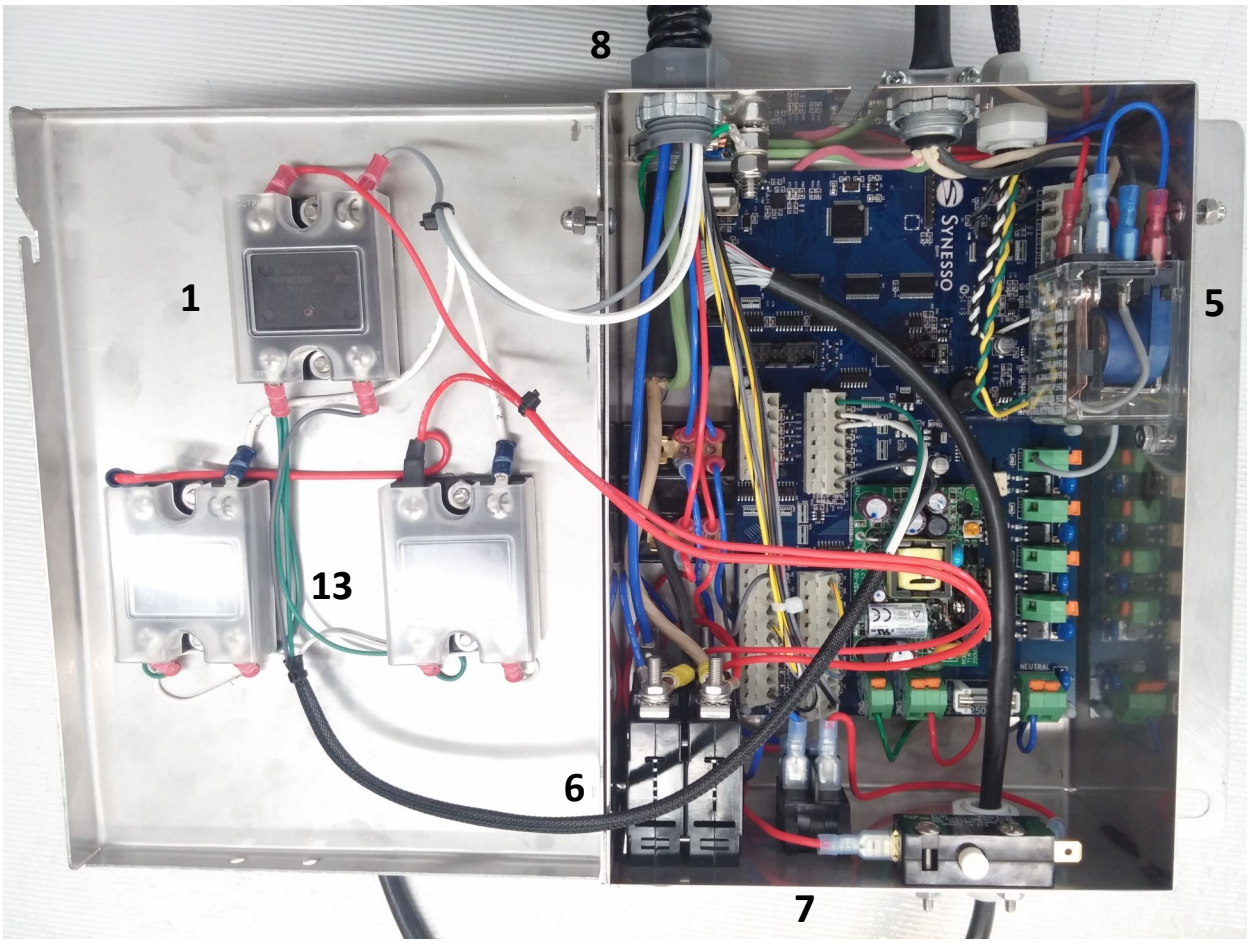
12. **Temperature Probe Connections:** Connect temp probes to display board.

13. **Steam Tank Element Relays:** Switch high voltage onto the steam tank heating elements.

14. **Heat Sink: Fanned Aluminum Block:** Dissipates heat produced by the element relays. Located on lid. Sealed with silicon to protect against water penetration.

15. **Flow Meter Wires:** Main Electronics board to Flow Meters

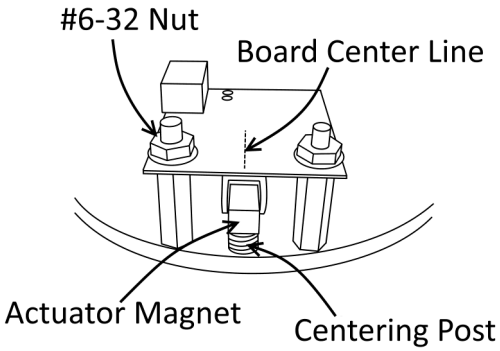
**1 Group MVP Hydra Electrical Box**

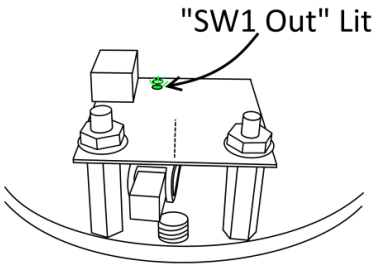


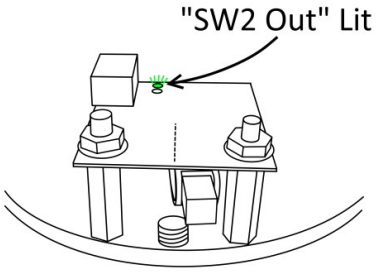
# ELECTRICAL SYSTEM

## Hall Effect Board Replacement Guide:

1. Turn off machine.
2. Unplug 4-pin connector from back of board.
3. Remove two #6-32 nuts and two #6 washers.
4. Lift board off of mounting posts.
5. Lower replacement board over posts.
6. Replace washers and loosely thread on nuts.
7. Rotate actuator until Actuator Magnet is perfectly centered over Centering Post.
8. Align Board Center Line mark with Actuator Magnet center as closely as possible.
9. Tighten nuts.
10. Reconnect 4-pin connector to new board.
11. Turn machine back on and test trip points as follows:
    a. Very slowly turn actuator clockwise, watching the “SW1 Out” LED towards the back of the board. The LED should light at some point before the actuator magnet reaches the far left position.
    b. Slowly allow the actuator to return to center. The “SW1 Out” LED should turn back off before the actuator reaches its center resting position (note that the actuator will never quite return to the exact center on its own, though it should get fairly close.)
    c. Slowly turn the actuator counter-clockwise, watching the “SW2 Out” LED. The LED should light at some point before the actuator magnet reaches the far right position.
    d. Slowly allow the actuator to return to center. The “SW2 Out” LED should turn back off before the actuator reaches its center resting position.

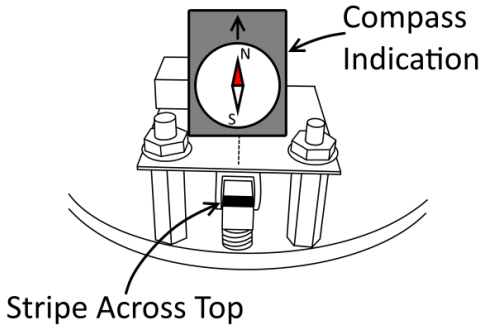


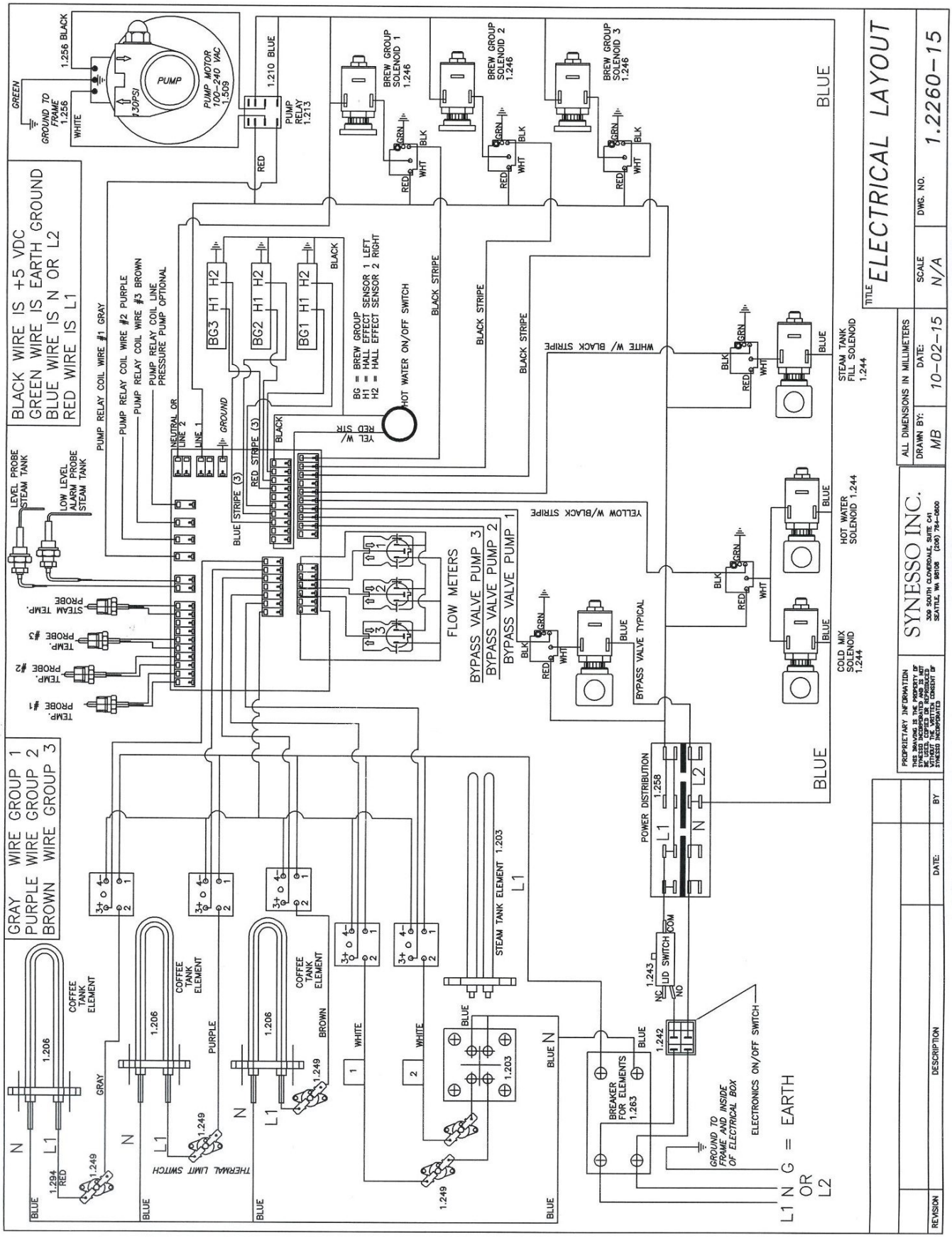

## Actuator Magnet Replacement Note:

For the Hall Effect Board to read the Actuator Magnet position, the magnet must be oriented properly. Replacement magnets will come marked with a solid stripe on the top face of the magnet. Magnet orientation can also be verified with a compass as shown to the right.



# ELECTRICAL SYSTEM

## Electrical Schematic



# PROGRAMMING

This programming section applies to all MVP Synesso™ machines. MVP machines have a hand held (wired) controller, pictured below, to allow the user to easily view and change the machine settings.

**To change settings on these screens, first press the line button on the left side of the display associated with the setting you wish to change. The value will flash once selected. Press the up or down buttons until the desired value is displayed. Press the line button again to confirm the change. The value will stop flashing. Use this procedure to change any variables in the controller menus.**


The top line of every screen indicates the title. In this case, Temperature Overview.

**You can return to this screen at any time by pressing the home button at the top right of the controller.** The machine will also return to this screen automatically after a short time.

Lines 2,3,and 4 may contain information or settings, many of which can be changed by the operator. This screen provides the current temperatures for each brew group along with the steam tank. The most recent error will also be shown in the lower right corner. No settings can be changed on this screen.

In some circumstances, numeric temperatures will not be shown. If a tank is reading 'LOW', this indicates that tank is below the temperature probe's effective range of measurement (170F-270F / 76.6C-132.2C). Readings above the effective range will show as 'HIGH'.

The programmable temperature range for a brew group is from 180F (82.2C) up to 220F (104.4C). The factory set temperature is 203F (95C). To change brew group set temperatures, refer to page 34.

The steam tank is set by the factory to a default setting of 250F (121.1C). To change this temperature, see page 35.

The [OK] on the right hand side of line 4 is indicating that there have been no errors detected by the control system. If, in place of the [OK] you find an error code (EX: STLW01), refer to the Error Log codes on page 37.

To cycle to the next display screen, press the down arrow button. (You may press the up arrow instead to travel back to the previous screen.)

# PROGRAMMING

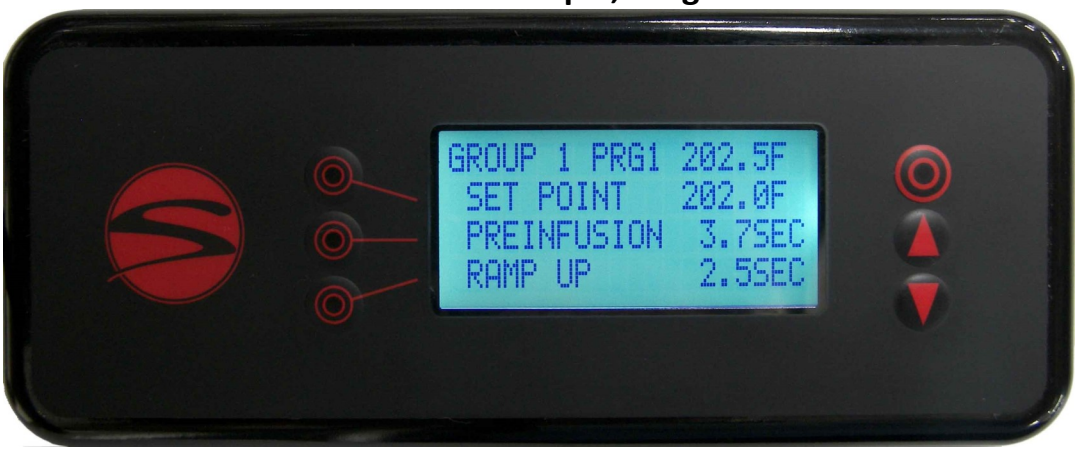
## Factory Settings:

The factory settings for your machine are as follows:

| | |
|---|---|
| Brew Group Temperature | 203°F |
| Steam Tank Temperature | 250°F |
| Brew Mode | M (Manual) |
| Right-Hold Save Lockout | Locked (To Unlock refer to page 45) |
| Enabled Programs | 1 & 2 Enabled (3-6 Disabled) |
| Temperature Units | Fahrenheit |

| Program 1: | | Program 2: | |
|---|---|---|---|
| Pre-Infusion | 4 seconds | Pre-Infusion | 4 seconds |
| Ramp Up | 2 seconds | Ramp Up | 2 seconds |
| Ramp Down | 92% | Ramp Down | 92% |
| Total Water Count | 280 | Total Water Count | 380 |

## Menu Level 1: Group 1, Program 1




Line 1 of the first brew group control screen indicates the current temperature of the brew tank as measured by its probe. Once this temperature reaches the set point, it will continuously cycle up and down by small increments as the electronics balance the temperature. This line also indicates the active program (PRG1 in this case). Changing the active program will update the settings on lines below.

Line 2 is indicating the set point of 202.0F (94.4C).

Line 3 indicates the length of time pre-infusion is set for in the current program. When starting a shot in MP or VP mode, pre-infusion will allow line pressure water to soak the puck for as long as indicated before moving on to the next brew phase. Setting the pre-infusion time down to 0.0 seconds will skip the pre-infusion phase in MP and VP modes. One step lower than 0.0 is the “MAN” setting, which will require the operator to exit the pre-infusion phase manually in MP mode, and will skip pre-infusion in VP mode.

Line 4 indicates the length time set for the ramp-up phase in the current program. This option will ONLY be visible on MVP Hydra models. Ramp-up time begins once the pre-infusion stage has finished.

To cycle to the next display screen, press the down button.

# PROGRAMMING


Line 1 indicates the brew group and program associated with the settings below.

Line 2 shows the percent of the total water count at which the machine will ramp the shot pressure down. Lowered pressure near the end of the shot will change the extraction rate and alter the flavor of the shot.

Line 3 and 4 show the total water count associated with the current program. As indicated, there are about 4.5 'counts' per milliliter dispensed by the machine. Some of this dispensed water is absorbed and retained by the coffee puck, but generally, if you add 9 counts, you should receive 2 additional mL of water.

To cycle to the next display screen, press the down button.

### Menu Level 1: Steam Tank


Line 1 shows the current reading of the steam tank temperature probe (250.7F in this example). Once this temperature reaches the set point, the digital display will continuously cycle up and down by small increments as the electronics balance the temperature.

Line 2 is indicating the set point of 250.0F (121.1C). The adjustable set range for the steam tank is between 200F and 265F (93.3C and 129.4C).

Line 3 and 4 are indicating that the independent loops 1 and 2 of the heating element are active.

NOTE: Turning off either loop 1 or 2 of the element can be used as a troubleshooting procedure and is not a recommended method of energy conservation.

To cycle to the next display screen, press the down button.

# PROGRAMMING

## Menu Level 1: Hot Water Tap


Line 1 indicates that you are on the hot water tap control screen.

Line 2 indicates the adjustable amount of time that the hot water tap will run before shutting off.

Line 3 gives the option of setting the hot water time on line 2 by activating the tap and letting the water flow, then shutting it off. The machine will store the duration of this pour as the new dispense time.

To cycle to the next display screen, press the down button.

## Menu Level 1: Auto Backflush


Auto backflush can be activated by pressing the line button associated with the group you want to flush. Set the value to “ready”, then place a portafilter equipped with a blind basket into the selected brew group. Shift left on the group head. The selected group will run the brew valve and motor for 10 seconds, followed by 10 seconds off. This will repeat 5 times. The shot timer will count up to 10 to let you know when it is running. Upon completion, the timer will read 10. Remove the portafilter and thoroughly clean the diffuser screen.

If you have used soap or other cleanser during the backflush, run the backflush process a second time with no soap or chemicals to rinse the internal tubing and brew valve. Failure to rinse after a soap backflush can leave soap residue in the brew valve affecting taste and/or machine behavior.

Any number of brew groups can use the auto backflush feature at the same time. The auto backflush can be interrupted mid-cycle by shifting to the left, or right, or by turning the setting on the controller back to “off”.

To cycle back to the temperature overview screen, press the down button.

# PROGRAMMING

## Menu Level 1: Brew System Error Codes


In an effort to prevent damage to machines and to help operators troubleshoot issues, Synesso™ has engineered several safeguards into the programming. By understanding these codes, operators can remedy issues more quickly. The most recent error can be found on the temperature overview screen at the lower right corner.

Error code key (See Pages 38-44 for more info)

| **BR - Brew System Codes** | **GROUP 1** | **GROUP 2** | **GROUP 3** | **CODE DESCRIPTION** |
|---|---|---|---|---|
| BV - Brew valve | BRBV01 | BRBV02 | BRBV03 | Brew Valve has been on for 5 consecutive minutes |
| OT - Over Temp | BROT01 | BROT02 | BROT03 | Over Temperature (220°F) |
| UT - Under Temp | BRUT01 | BRUT02 | BRUT03 | Group reads < 180°F for 1 minute while reheating |
| BP - Bypass Valve | BRBP01 | BRBP02 | BRBP03 | Bypass Valve has been held on for 5 consecutive minutes |
| **ST - Steam System Codes** | | | | |
| LOW H2O | | | | Low level probe not in contact with water (audible alarm) |
| LW - Low Water Probe | STLW00 | N/A | N/A | Indicates past LOW H2O warning |
| FP - Fill Probe | STFP00 | N/A | N/A | Fill Probe is not in contact with water for 1 minute |
| FV - Fill Valve | STFV00 | N/A | N/A | Fill Valve has been on for 5 consecutive minutes. |
| OT - Over Temp | STOT00 | N/A | N/A | Over Temperature (270°F) |
| **VM - Volumetric System Codes** | | | | |
| UF - Unexpected Flow | VMUF01 | VMUF02 | VMUF03 | Unexpected flow detected while group is off |

# PROGRAMMING -Brew System Error Codes

ERROR CODE
BRBV01, BRBV02, BRBV03
BRPR01, BRPR02, BRPR03

Is the blind basket engaged in the affected group?

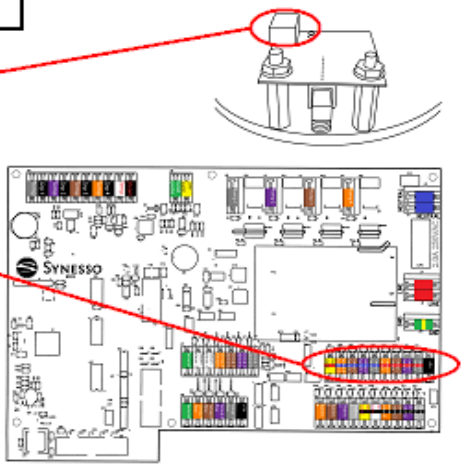
YES → Was the group left running for over 5 minutes as part of a backflushing routine?

YES → Clear the error displayed on the shot timer by shifting paddle in either direction, then resume normal operation.

NO → Was the group left running unattended or bumped and turned on accidentally?

YES → Clear the error displayed on the shot timer by shifting paddle in either direction, then resume normal operation.

NO → Check all wires at Hall effect board and switch wires at power board for loose, frayed, or shorted connections. Was problem resolved?

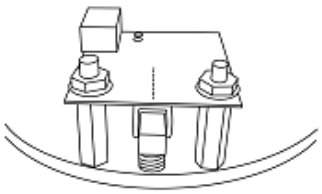



YES → Congratulations, you're done!

NO → Check wiring on top frame (5V and Ground wires) for intermittent shorts or breaks, stripped insulation, etc. Was problem resolved?

YES → Congratulations, you're done!

NO → Check Hall effect board alignment, basic operation, and trip point sensitivity as described elsewhere in this manual. Does the Hall effect board appear to work properly?



NO → Replace Hall effect board and retest.

YES → Is machine responding to outputs from Hall effect board?

NO → Check SW1 Out and SW2 Out terminals on Hall effect board. They should read 5VDC relative to Ground when switches are active (LEDs lit) and no voltage when switches are off (LEDs off.) Is 5V output signal working properly?

YES → Power board failure is very rare. Unexplained 5 minute timeout errors are most likely due to intemittent wiring faults or user error. However, if all else fails, replace the main power board and retest.

YES → Power board failure is very rare. Unexplained 5 minute timeout errors are most likely due to intemittent wiring faults or user error. However, if all else fails, replace the main power board and retest.

# PROGRAMMING -Brew System Error Codes

BROT01, BROT02 OR BROT03

Using the keypad, access the "BREW GROUP SETTINGS" screen for the group posting the error. Is the current temperature higher than the set temperatue as shown below?


YES

Using your multimeter, measure the amperage at the brew tank heating element. Is it drawing any amperage?

NO

YES

Disconnect one lead from the thermal limit switch on the tank and check for amperage on the BLUE wire to the element. Is amperage present?

YES

Replace element

NO

Open the electrical enclosure and bypass the safety switch. Look at the Solid State Relay for the Brew Tank in question. Is the RED LED that indicates the presence of control voltage ON?

YES

Replace CPU

NO

Replace Solid State Relay

NO

Disconnect the drain line from the bottom of the Brew Valve. Is there a constant drip/pour from the drain port on the valve?

YES

Replace Brew Valve

NO

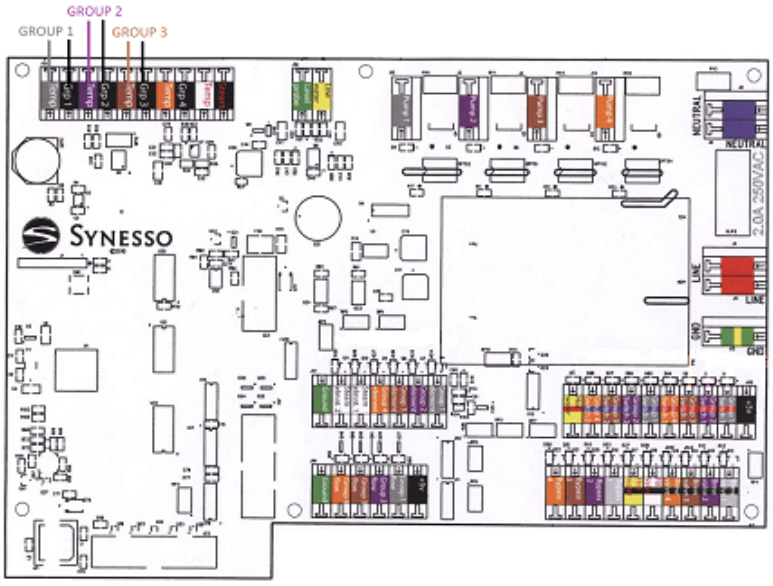
Inspect the wires indicated in the diagram below. Are any of them loose or showing signs of corrosion?

YES

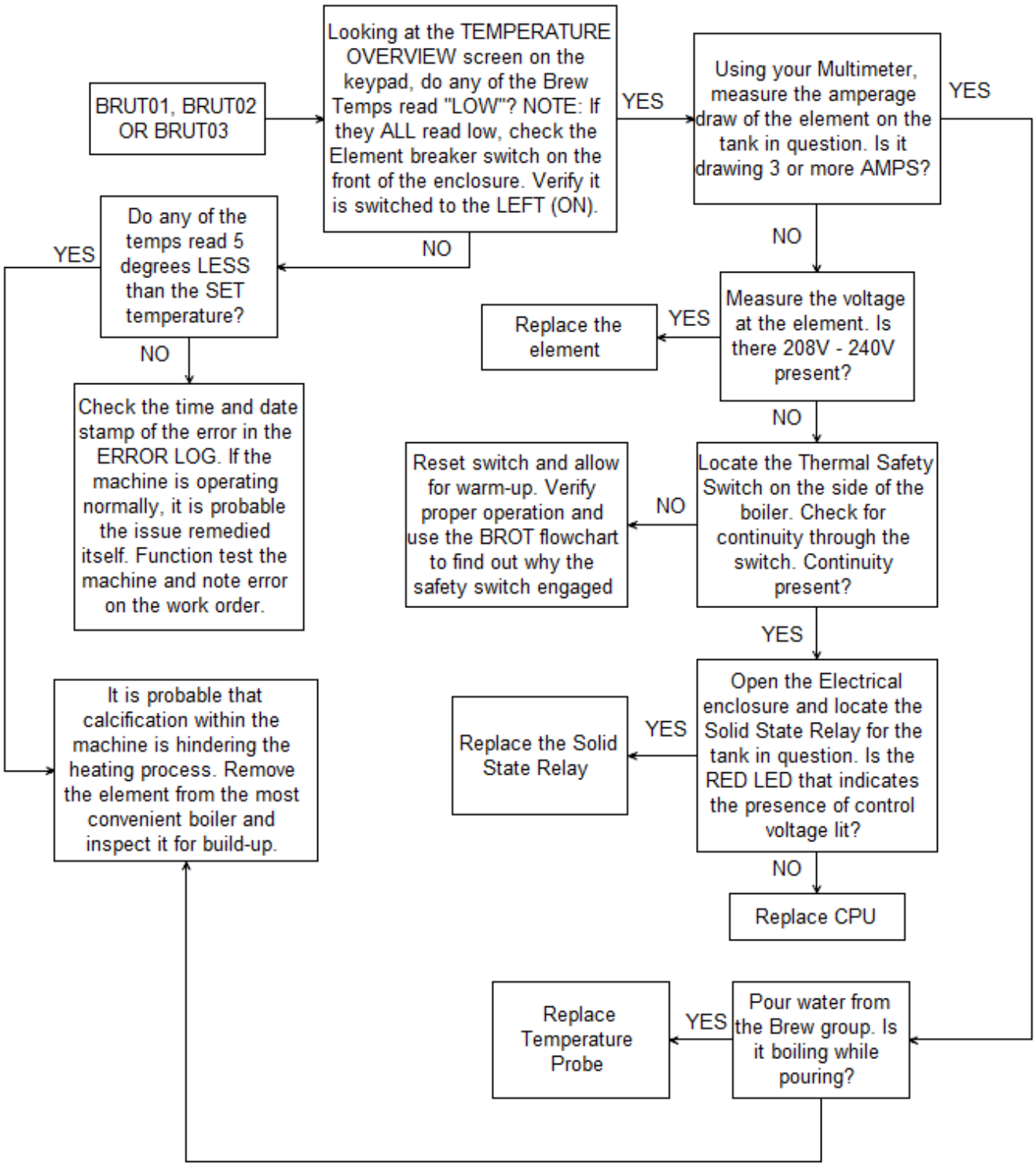
Repair and test

NO

It's likely the temperature probe is not posting accurate temperatures. Replace probe and test.



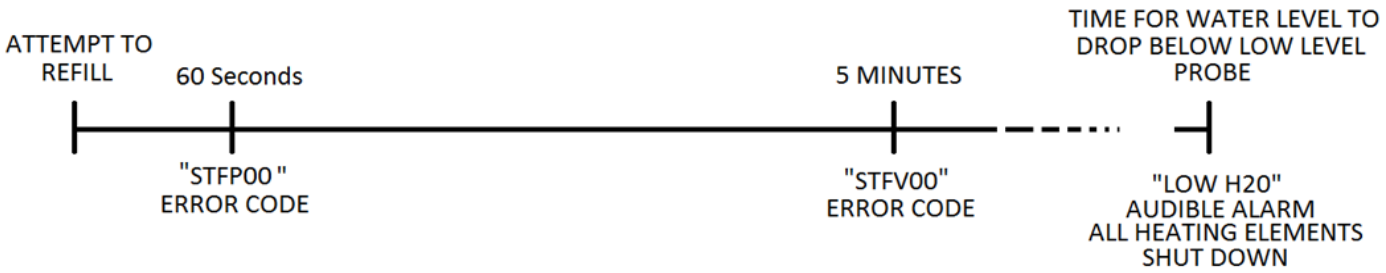
# PROGRAMMING -Brew System Error Codes



# PROGRAMMING -Steam System Error Codes

**STEAM SYSTEM ERROR CODES**

It should be noted that when it comes to the error codes associated with water level control, there is a cascading effect as the water level in the boiler drops. For example, if the water inlet to the tank is clogged or the fill solenoid fails, the system will be unable to re-fill the boiler. Look at the timeline of this scenario below:




This timeline shows that all three Error codes will be posted for this issue. The time it takes for the water level to drop below the LOW LEVEL probe and post the “LOW H2O” error depends upon the water and steam usage of the machine during operation.

The following flowchart will begin with the “LOW H2O” heading because that is the error likely to be seen on a machine that has ceased to heat the boilers. However, the flowchart will cover all three of these Error codes as they are all tied to the same general issue.

To view the timeline of these failures on the keypad screen, simply access the Level 2 Programming and scroll to the ERROR LOG screen. Once there, the Date/Time stamps can be viewed for all past errors on the machine.

# PROGRAMMING -Steam System Error Codes

-LOW H2O- AUDIBLE ALARM

Is the water level in the sight glass low?

NO → The level probes are not recognizing water in the tank. Follow instructions below.

YES → Inspect the Level Probes. Verify they are not touching each other inside the tank. Are they touching?

YES → Adjust probes so they are not touching. Test fill process.

NO → Perform a power reset on the machine. Can the audible "click" of the steam fill valve opening be heard and felt shortly after power-up?

YES → Turn off the power to the machine. Verify there is no pressure in the steam tank by opening the steam wand. Disconnect the flare fitting from the fill valve output. Inspect reducing orifice inside copper tube. Is the reducing orifice plugged?

YES → Clear debris from reducer. Re-assemble and test.

NO → Unplug the Hot Water valve and press the Hot Water button. Does cold water flow from the Mix Valve to the water spout?

NO → The incomming water supply to the machine has been turned off or hindered in some way. Check shut-off valves and water filters.

YES → The input to the tank fill valve is plugged or the check valve has failed. Disassemble and clean.

NO → Using a multimeter, check for 220V at Fill Valve. Is 220V present?

YES → The fill valve is faulty. Replace the solenoid coil and test. If the valve is still not opening, replace the valve assembly.

NO → Is the RED LED that indicates 5VDC at the solenoid switch ON?

YES → Solenoid switch is faulty. Replace and test.

NO → Access Electrical Enclosure and verify 5DVC output where indicated on diagram below. Is 5 VDC present?

YES → There is either a break in continuity on the WHITE wire to the solenoid switch or the switch itself has failed.

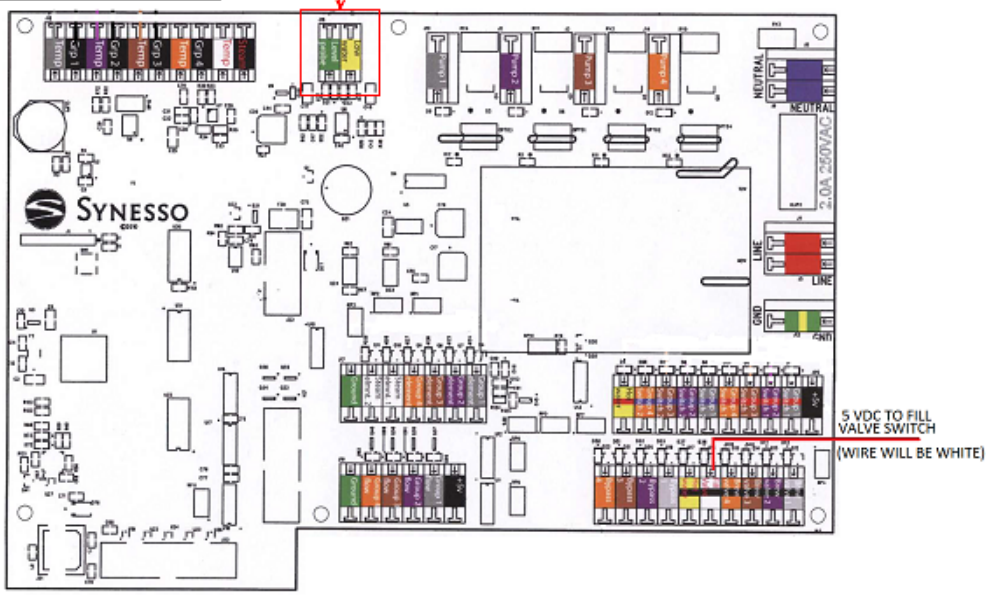
NO → Replace CPU

YES → Check for proper connections here. Connections secure?

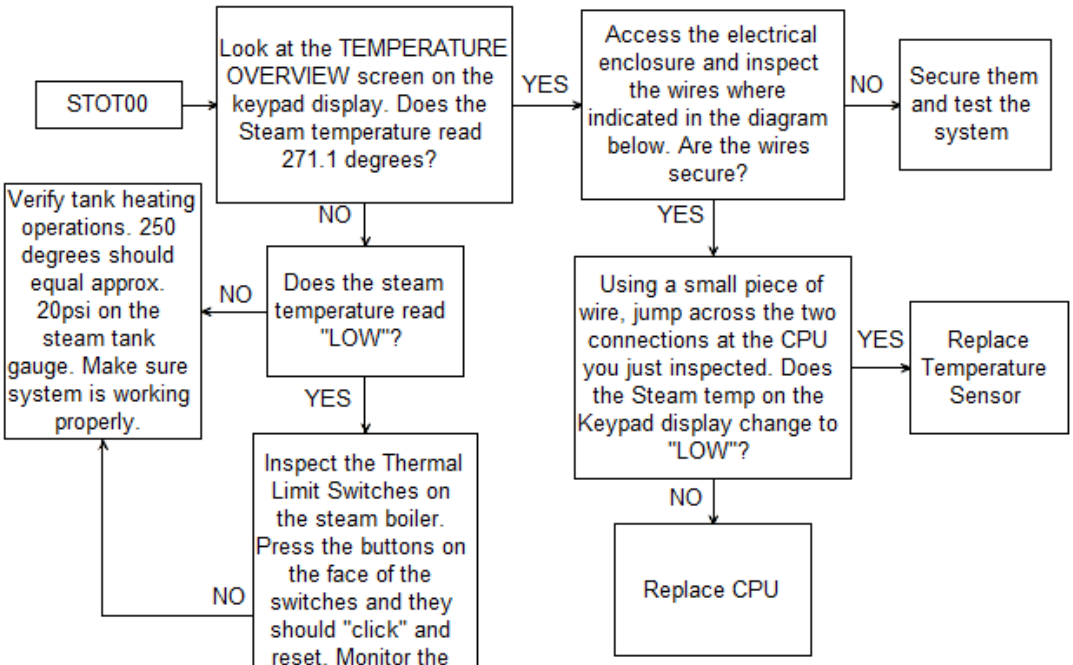
YES → Verify continuity to level probes. Continuity present?

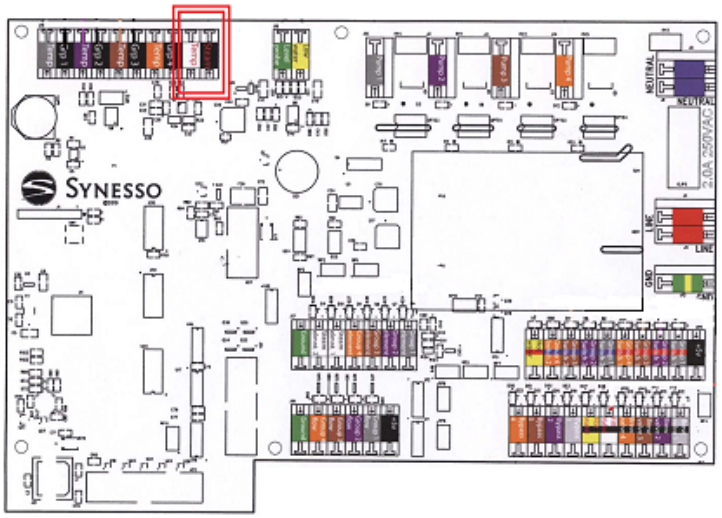
YES → Remove the wire from the LOW LEVEL probe and ground the wire against the frame of the machine. Does the "LOW H2O" alarm remain?

NO → The probes are most likely scaled over. Remove and clean them.

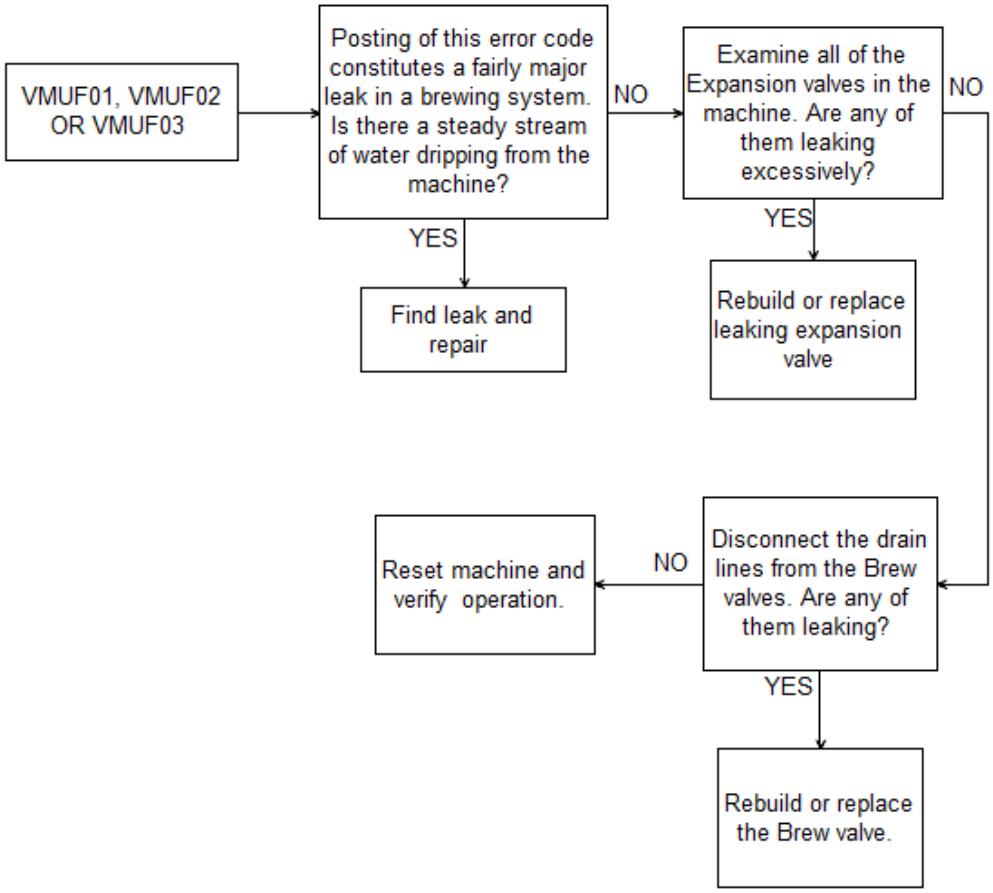


# PROGRAMMING -Steam System Error Codes



# PROGRAMMING—Steam System Error Codes



# PROGRAMMING

There are 3 levels of menus a technician can access through the wired controller:

Menu level 1 described on pages 34-37 contain settings relevant to the day-to-day operation of the machine.

Menu level 2 may be reached from level 1 and contains settings relevant to technicians and machine owners. **To access menu level 2, first press the home button to return to the temperature overview screen. Next, press and hold the home button. Press and release the 4th line button, then release the home button.**

## Menu Level 2: Lockout


This is the first screen of the 2nd level of menus, the right hold save lockout screen.

Line 3 can prevent the accidental use of save mode. When this setting is “locked”, holding right on the group heads will not enter save mode, instead the shot timers will blink a red error light at the operator.

To cycle to the next display screen, press the down button.

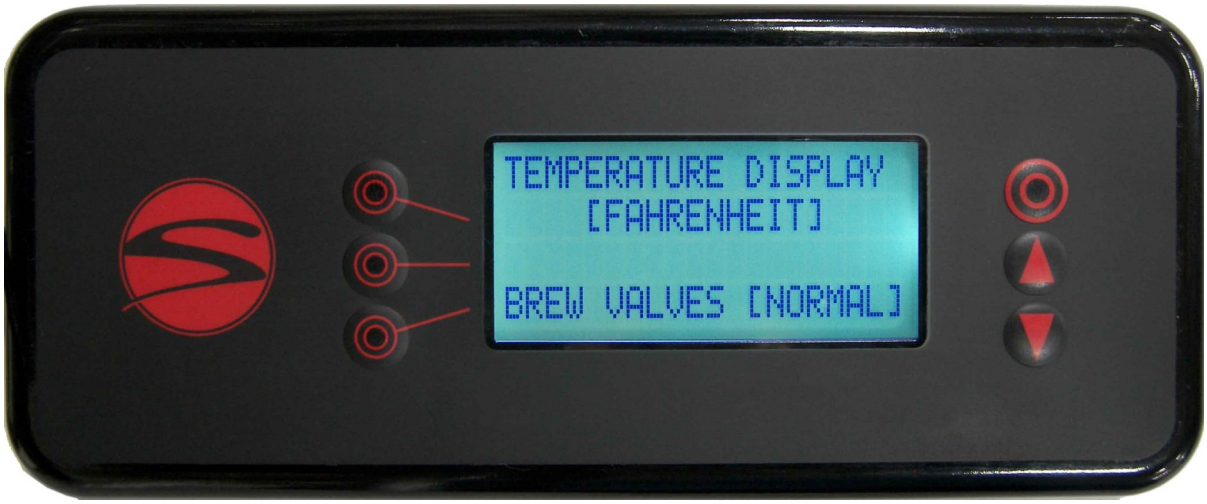
## Menu Level 2: Programs


On this screen, you can activate or deactivate program storage positions 2 through 6. Program #1 cannot be deactivated. Shifting right while not brewing a shot will cycle through any program save locations currently active in numerical order. (1->2->5->1… as shown.) This setting is applied to all groups.

To cycle to the next display screen, press the down button.

# PROGRAMMING

## Menu Level 2: Temperature




This is the temperature display screen.

Line 2 indicates the Temperature scale that you are currently in (Fahrenheit or Celsius).

Line 4 indicates the operation status of the machine's brew valves.

Setting the brew valve function to [ON] will activate the brew valves, allowing the pressure to be bled from the brew tanks. Once the pressure has dropped, turn the brew valve setting back to [NORMAL] and attach the appropriate drain hose to the brew group's drain tube. Turn the brew valve setting back [ON] once the drain hoses are securely attached. This will allow the water in the brew groups to fully drain in approximately 5 minutes. When the brew groups are finished draining, set the Brew Valve indicator back to the [NORMAL] setting. If the draining process takes longer than 5 minutes, the machine's safety programming will automatically turn the brew Valve indicator to the [NORMAL] setting while exiting back to the temperature overview screen. If more time is needed, return to the Temperature Display screen and set the Brew Valve display back to the [ON] position to finish the procedure. Once finished with the draining procedures, make sure the Brew Valve indicator is set back to the [NORMAL] position. To cycle to the next display screen, press the down button.

## Menu Level 2: Line Pressure Boost

# PROGRAMMING

## Menu Level 2: Line Pressure Boost

If the machine has an optional line pressure boost pump installed, you will see this menu screen, otherwise it will not be shown.

“AUTO” is the setting on line 2 for normal operation. In “AUTO” mode, whenever a brew valve or water control valve is activated, the power board will also trigger a pump relay to run a line pressure generating pump and motor package. If this is set to “OFF”, the line boost motor will not activate. The “ON” setting will run the boost motor constantly. This is factory set to “OFF” to protect the boost pump from running without water.

To cycle to the next display screen, press the down arrow

## Menu Level 2: Brew Offsets


Line 2 indicates the measured water temperature at the selected brew group’s temperature probe.

Line 3 indicates the temperature adjustment made at the Synesso™ factory, in order to match the measured temperature with the temperature desired inside the puck.

The Synesso™ testing method is as follows:

Using a bottomless portafilter, dose out 16-18 grams of coffee into a 14 gram basket with a thermal probe inserted 1/8th of an inch from the surface and in the middle of the puck, packing and tamping the grounds in the basket as usual.

The thermal probe is then wired to a FLUKE thermometer to relay the actual temperature of the water flowing through the puck while pouring a 25 second, 2 ounce shot. This process is repeated a minimum of 3 times per brew group in order to get the most accurate readings. The difference between the measured puck temperature and the raw tank temperature becomes the brew offset

This offset should not be altered without thoroughly testing the puck temperature, as mentioned above.

To cycle to the next display screen, press the down button.

# PROGRAMMING

## Menu Level 2: Steam Offset


Line 2 indicates the measured steam temperature at the steam tank temperature probe.

Line 3 is the offset used to calibrate the steam tank temperature and pressure so that when the steam tank is set at 250f, there is 1.3bar pressure on the gauge.

Line 4 of this display screen is showing a 5 second delay. The fill probe will wait this long before turning the steam tank fill valve on or off. Add time here if the machine is in an unstable installation such as a food truck or catering cart. There is no need to drop this time below 5 seconds.

To cycle to the next display screen, press the down button.

## Menu Level 2: System Clock


This is the system clock screen.

Line 2 allows the operator to set the local time in a 24 hour format.

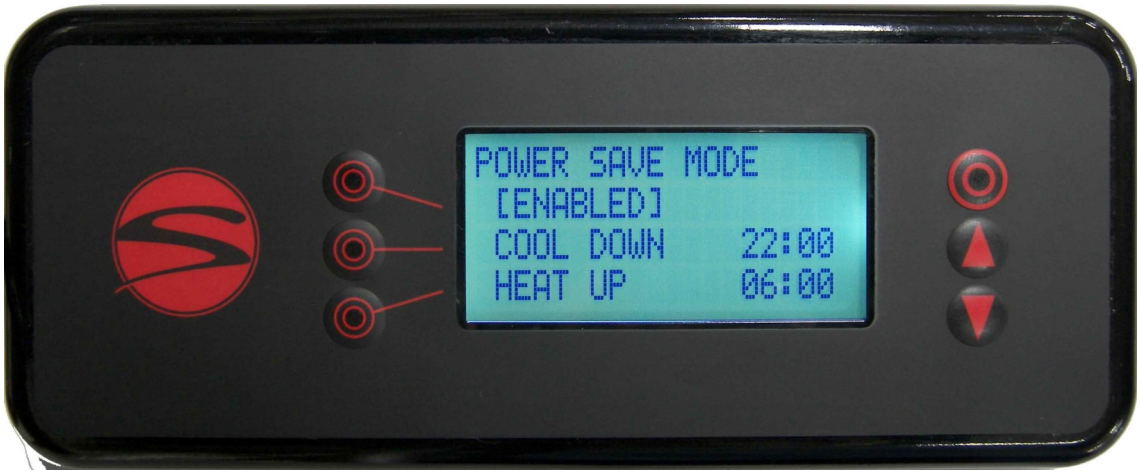
Line 3 and 4 allow the operator to set the current date.

The date and time are used for both the error log and the power saving mode. A small battery on the power board should keep the clock and calendar running if the machine loses power, but it will need to be re-placed eventually. Refer to the markings on the battery for replacement info.

To cycle to the next display screen, press the down button.

# PROGRAMMING

### Menu Level 2: Power Save Mode - Enabled




Line 2 of the Power Save Mode in this example is indicating the timers are [ENABLED], making adjustments to lines 3 and 4 available. If line 2 reads [DISABLED], no further settings will be available on this screen.

### Menu Level 2: Power Save Mode - Disabled


Line 3 indicates the settable time at which your power save mode will start, cooling the machine to lower heat levels overnight.

Line 4 indicates the settable time at which your power save mode will end, heating the machine back up to the set points.

Enabling the power save mode will drop the temperature in the brew groups to 180F (82.2C) and the steam tank to 220F (104.4C) when it is active. This will help conserve energy while preventing maintenance issues that occur when machines are turned off and on repeatedly.

While power save mode is active, there is a note on the display which states that the operator can exit power save mode at any time by pressing any button on the wired controller.

To cycle to the next display screen, press the down button.

# PROGRAMMING

## Menu Level 2: Error Log


Line 1 of the error log screen shows how many errors the machine has recorded, up to the 35 most recent errors, and which of these you are currently viewing. This example is showing the second of two errors.

Line 2 indicates the error code. If the error log is clear, this line will simply read 'NO ERRORS' as shown below.


Line 3 indicates the date and time that the last error has occurred. If no error has occurred, this line will be blank.

Line 4 gives the option to scroll through or clear the error log. To view older errors, press the 4th line button once, which will make [SCROLL] flash. Use the up and down buttons to change the viewed error. Press the 4th line button again and [CLEAR] will begin flashing instead of [SCROLL]. Press the 4th line button again to deselect both options.

## Menu Level 2: Error Log


To clear the Error Log, press the 4th line button 2 times so that [CLEAR] is flashing. Press an arrow button to select clear. The 4th line will ask you to confirm clearing the error log as shown below.

Change the flashing [NO] to [YES] to immediately clear the log. Press the 4th line button with [NO] still flashing to exit without clearing the log.

See page 37 for descriptions of the error codes you may see.

To cycle to the next display screen, press the down button.

## Menu Level 2: Return to Operations


This is the last screen in the second level of menus.

Pressing the 3rd line button will take you back to the temperature overview screen in the 1st level of menus.

**Access to the 3rd level of menus is only available from this screen.**

Menu level 3 contains machine configuration settings which do not change over the life of the machine. Technicians will need to access this level only if some major modification has been preformed, or if the main electronics board has been replaced.

**To access menu level 3, press and hold the home button. Press and release the 4th line button, then release the home button.**

# PROGRAMMING

## Menu Level 3: Configuration


This is the configuration screen.

Pressing a line button will flash the first adjustable value. Pressing it again will flash the next, and so on.

Model codes: H=MVP Hydra, S=MVP Single pump, C is not used at this time.

Bypass and boost values should reflect whether or not the machine has the appropriate hardware installed, not whether they are being used. Since bypass hardware is only compatible with Hydras, the value will change to “N” if the model value is not “H”

The serial number entered on this screen is shown during the machine boot-up sequence.

If any settings on this screen are changed, the machine will require a restart upon exiting this screen. When prompted, press the corresponding line button to restart or to cancel and revert to the previous settings.

To cycle to the next display screen or to lock in changes and restart, press the down button.

### Menu Level 3: Return


This screen allows the operator to return to either the first (operations) or second (settings) level menus.

To cycle to the next display screen, press the down button.

### Menu Level 3: PID Tune


The proportional-integral-derivative (PID) controller is a sequence of algorithms using a few finely tuned parameters to achieve and maintain a set temperature in each tank.

## Synesso strongly recommends AGAINST altering these values.

The default values are shown in the picture above.

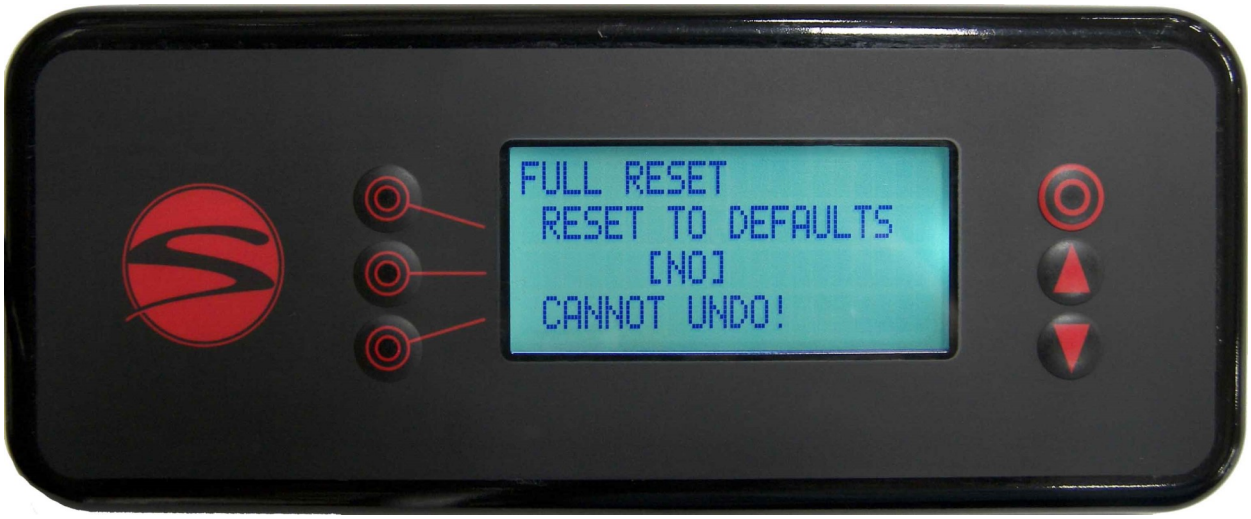
To cycle to the next screen, press the down button.

# PROGRAMMING

### Menu Level 3: Shot Timer Display Brightness


Shot timer display brightness can be adjusted on this screen. Use these settings to bring all shot timers to a uniform brightness. Values range from 0-15.

### Menu Level 3: Full Reset




A full factory reset can be achieved by pressing the line 3 button, then either the up or down arrow.

This option will undo ALL changes that have been made to the machine. This includes the Synesso™ programmed offsets, serial number and machine configuration information.

It is highly recommended that you make note of all Synesso™ programmed settings before doing a full reset of the machine.

**RESET CANNOT BE UNDONE. PLEASE BE CAREFUL!**

# MAINTENANCE

## DAILY MAINTENANCE

Proper and regularly scheduled cleaning and maintenance procedures are CRITICAL for trouble-free and optimum quality performance from your espresso machine.

**Backflushing**

This process forces water through the inlet tube and drain system. This should be performed on EACH brew group daily.

To backflush:

1. Replace the filter basket with the 'blind' basket, which has no filter holes.

2. Engage the portafilter, then follow the instructions on page 36 to use the auto backflush function.

3. When using an approved espresso industry detergent during backflushing, follow the manufacturer's instructions. It is extremely important to thoroughly rinse the blind filter basket and repeat backflushing several times with clean water to clear the system of any detergent residue. Failure to rinse can cause valve problems and bad flavor.

**NOTE: NEVER** remove the screen and screw when backflushing. Remove and clean them after backflushing is complete. Do not forget to reinstall.

**General machine cleaning**

1. Clean the surface of the machine using a soft damp cloth. Avoid using abrasive cleaners or cleansing pads. Take extra care on the mirror finish stainless steel surfaces. A "micro-fiber" towel is recommended to avoid scratches.

2. Make sure the steam wands and tips are free of milk build-up. It is always best to clean the steam wand and tip after each use. Approved espresso industry cleaners can be used to dissolve milk build-up. Tips can be removed to soak.

3. The drip tray, drip tray grates, and portafilters should be removed and cleaned every day. If you clean the portafilters in the dishwasher, first remove the filter baskets and springs before washing.

# MAINTENANCE

## MAINTENANCE SCHEDULE

**Daily**

1.Backflush each brew group without detergent throughout the day.

2.Backflush with an espresso industry approved detergent during the final cleaning of the night (or after a busy period), and then again without detergent to rinse.

3. Wipe down the entire machine with a soft cloth.

4.Remove portafilters, baskets and springs, drip tray and grates and clean thoroughly. These items are all dishwasher safe.

5. Slowly pour a pitcher of hot water down the drain to clear grounds debris and prevent blockage.

**Weekly**

1. Soak portafilters and the removed filter baskets in an approved espresso industry detergent and water solution overnight. Rinse thoroughly before reassembling and using your portafilters.

2. Carefully remove screens from each brew group using a short handled screwdriver and soak overnight in a similar solution as the portafilters.

3. Rinse screens thoroughly before installing and using. Make sure you install the screens before brewing any shots of espresso. Failure to do so may plug the drain lines with coffee grounds.

**Monthly**

1. Check your water filtration system and make sure the cartridges and filters are changed as needed. In areas of high mineral content, hard water, high particulate count or in very busy locations, the filtration systems will need to be checked more often.

**Quarterly**

1. Change portafilter gaskets and closely inspect diffuser screens and filter baskets, If these items are showing wear, please replace them as soon as possible. Change these items if they show damage or overuse.

2. Briefly inspect the machine for leaks or potential issues. Contact Synesso™or your local distributor or service agent to order parts and/or request service.

Synesso™recommends that you contact your distributor or service agent for periodic maintenance. The frequency of maintenance visits will depend on a variety of factors including how much use the machine receives, but at least one preventative maintenance visit a year is required. During this yearly service, all body panels must be removed and all connections both electrical and hydraulic must be inspected. Small problems can become large if not caught early.

# Pressure relief valve maintenance procedure

The following instructions are intended to ensure the proper function of the pressure relief valve (PRV). We suggest the procedure be performed as a part of the twice yearly periodic maintenance schedule.

Cool and depressurize the steam tank.
Remove the yellow tubing guard surrounding the PRV.
Check that the sealing face and rod move freely by pulling the test ring. There will be spring resistance, but the seal should open easily and travel smoothly. If the seal sticks or the spring feels gritty, the valve is scaled and should be replaced.
Replace the yellow tubing guard.
Disconnect the green fill probe wire from the upper level probe (located on the left side of the steam tank).
Allow steam tank to over-fill. Watch the steam tank pressure gauge. Once the water closes the vacuum breaker, the PRV should release water. Note the pressure displayed on the steam tank gauge when this occurs. The pressure at the point of release should be 50psi.
Replace the green fill probe wire. Drain the steam tank until the fill valve activates.
Reheat the steam tank.
Remove the yellow tube guard and check the PRV for leaks. Listen for hissing. Replace the PRV if it will not seal.
Replace yellow tube guard.

If you have a source of compressed air available, you can overpressure the steam tank using air instead of water:

Remove a steam wand tip. Pull the steam handle to the full on position.
Slowly add air to the steam tank. Watch the steam tank pressure gauge. The pressure at the point of release should be 50psi.
Complete the maintenance as shown above starting at 8.

An older gauge is potentially less reliable than when first manufactured. Additionally, a steam tank gauge that has exceeded its scale limit of 60psi may be damaged internally. If after experiencing high pressure, the gauge cannot return to the zero point, it has been damaged and should be replaced.

Gauge readings are less accurate the further they are from the center point of the readable scale. When measuring readings near 50psi on a 60psi max gauge, the results may be as much as 10% off in either direction. With that in mind, PRVs releasing at a gauge pressure anywhere between 45 and 55psi are acceptable.

The body of the PRV is mostly hollow, so open end wrenches and other pliers can cause the PRV to collapse or distort during removal or installation. Use only closed end wrenches on PRVs. Seal with red Loctite.

Assembled steam tanks are pressure tested up to 75psi at the factory before the PRV is installed.

# HOW HOT IS YOUR SHOT?

We at Synesso are often asked "How can I tell if my machine is at the right temperature?" The answer is more complex than you might think. Several important concepts factor into both the temperature you read on your machine and the set point you should choose.

The first major factor in temperature is the machine itself. Many people hold the belief that PID control automatically equates to accurate temperature at the puck. In practice, what you get with PID control is a machine capable of being much more precise than one without such. Accuracy is defined as coming as close as possible to a known standard. In this case, the temperature you might read from a calibrated external thermometer. Precision is defined as coming as close as possible to a pattern. In this case, a stable and repeatable temperature.

Why should we care more about precision than accuracy? The short answer is that there are temperature probes inside the machine, but not inside your puck. As water is dispensed, it loses heat energy to parts of the machine, the screen, the screw, the puck itself, even the portafilter and basket. We have designed our tanks and temperature probes to provide the best thermal information available to the PID controller, but after the water leaves the tank, the water is pretty much on its own. The only way to tell how much heat energy has been lost to the system is to measure the temperature of the water when it is actually inside the puck. Here at the Synesso factory, we use a specially modified portafilter, a tiny bead probe, and a trusted brand of meter to measure that in-puck temperature. Since our machines are designed to be very precise, we can then adjust the displayed temperature to reflect what you will actually receive on your puck. We refer to this adjustment between tank temperature and puck temperature an Offset. Offsets translate our precision to accuracy. Imprecise machines will not be able to settle on an offset as each shot will provide a different puck temperature. Imprecision makes accuracy impossible.

The exact procedure Synesso uses to determine the offset is as follows:

**Using a bottomless portafilter, dose 16-18 grams of coffee into our 14 gram basket with a thermal probe inserted 1/8th of an inch from the surface and in the middle of the puck. Pack and tamp the grounds in the basket as usual. The thermal probe is then wired to a FLUKE thermometer to measure the actual temperature of the water flowing through the puck while pouring a 2 ounce, 25 second shot. Temperatures measured for the first and last 5 seconds of the shot are discarded. The remaining 15 seconds are averaged together. This process is repeated a minimum of 3 times per brew group in order to get the most accurate reading.**

Some of our customers have purchased or recreated measurement tools similar to ours. There are also espresso machine calibration tools on the market. The key to using any of these is to develop a simple, consistent procedure which allows you to repeat the testing at any time, at any location, eliminating all variables except temperature, which you then measure. Keep in mind that different procedures will produce different temperature test results, likely resulting in different offsets than Synesso originally programmed into your machine. This is not an error. As long as your procedure produces consistent, high precision results, it is a valid procedure. Keep in mind that procedures that are closer to the act of actually extracting espresso will result in more accurate offsets.

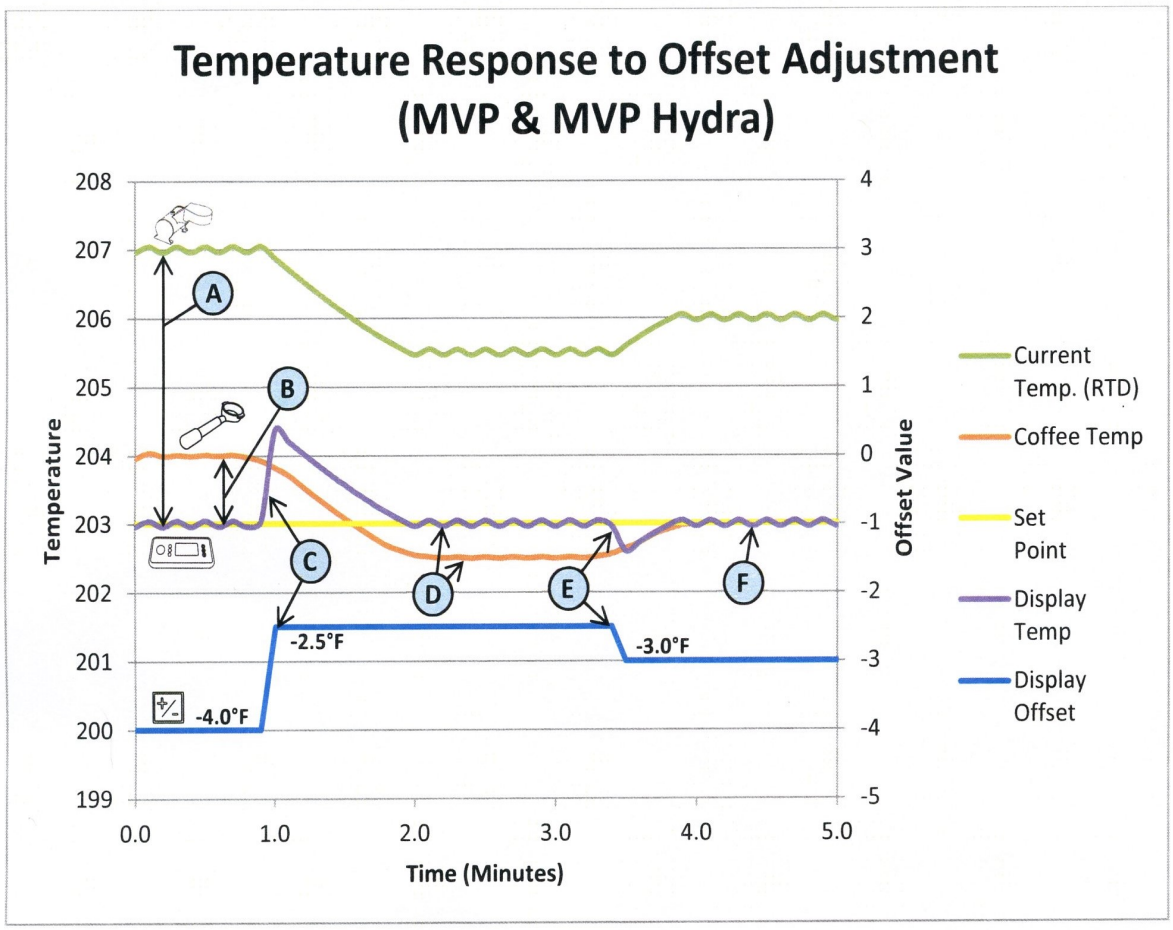
Remember, thermal accuracy is obtained through high precision and careful offset calibration.

## How to adjust offsets:

| Coffee too hot? Increase Offset: | |
|---|---|
| -4.0 | Starting offset |
| +1.5 | Add error amt. |
| -2.5 | New offset |

| Coffee too cool? Decrease Offset: | |
|---|---|
| -2.5 | Starting offset |
| -0.5 | Subtract error amt. |
| -3.0 | New offset |

## How the machine responds to adjustments:




A. The offset is the number added to the raw temperature reading inside the brew group to determine the temperature displayed by the machine.
B. When coffee test reads HIGHER than displayed temperature, INCREASE the offset value.
C. Increasing the offset immediately increases the displayed temp, causing machine to cool until it reaches the set point again. (The PID control loop always works to bring the displayed temperature back to the set point as quickly and smoothly as possible.)
D. In this example, the offset was increased too far! When coffee test reads LOWER than the displayed temperature, DECREASE the offset value.
E. Decreasing the offset immediately lowers the displayed temp, causing machine to heat up until it reaches the set point again.
F. When coffee test results match the displayed temperature, offset is correct!

# TROUBLESHOOTING GUIDE

This is a troubleshooting guide for some of the common issues that operators might encounter when using their machine. For more detailed assistance with technical issues, contact your distributor or local service agent.

**The machine may be reset by powering off for 10 seconds.**

## Brewing problems

The shot is pouring too slowly:

- Tamp pressure was too firm
- Too much coffee is in the basket
- The grind is too fine
- Diffusion screens are clogged; clean or replace
- Pump pressure is too low. Ensure that it is set between 8-9.5 bar
- Brew jet is clogged; when operating properly, 60ml should flow out within 8 seconds

The shot is pouring too quickly:

- Tamp pressure is too light
- Not enough coffee in the basket
- Grind is too coarse
- Portafilter baskets are worn or cracked; replace
- Brew temperature is too cold

Crema is thin with large bubbles and tastes astringent:

- Coffee is old
- Grinder burrs are dull
- Brew temperature may be set too low

Diffuser screen is loose:

- This is most likely caused by over filling the portafilter basket with coffee. This causes the expanding coffee puck to push against the diffuser and bend the screen-to-screw contact point away from the screw.

No pump pressure when water flows from the group:

- Check which brew stage the group is in (shot timer pressure graph shows three bars for pump pressure.)
    - In M mode, it takes several shifts left to reach full pump pressure (2 for MVP, 3 for MVP Hydra.)
    - In MP or VP mode, pre infusion and/or ramp up time may be set to run too long.
- Pump relay may have failed

The pump comes on, gauge reads full pressure, but no water comes out:

# TROUBLESHOOTING

- Diffuser screen/screw, or jet is clogged
- Soap residue not fully flushed after cleaning has glued the valve closed (tap the valve body gently).
- Brew solenoid has been sealed shut by dried soap or has failed.

## Brew Gauge

Brew Pressure gauge needle value changes often:

- This is normal. The lowest number (usually 3-5 bar) reflects the incoming line pressure. When brewing the needle reflects brew pressure (8.5-9 bar). When the brew tanks heat, the water expands and the expansion valve relieves the pressure at 11 or 12 Bar.

Brew Pressure is Low:

- Check pump to make sure pressure is properly set
- Water supply hose to the pump is kinked
- Water filter is plugged. Check and replace if necessary

Pump Motor Runs; No Brew Pressure:

- Failed pump, needs to be replaced
- Brew Solenoid is stuck (can be caused by soap residue not fully flushed after cleaning).
- Brew Solenoid has failed
- The line between the pump and the water supply has collapsed or is kinked
- Hose to the pump is kinked
- Water filter is plugged. Check and replace if necessary
- Water supply is inadequate

Readout for Brew Water Temperature Varies by a Few Degrees:

- The control must “see” the increment just above the set point before it sends a signal to turn off the heating element. This will allow the electronics to show a reading just above the set point. The energy from the heating element and the tube for the preheated incoming water are within 1” or 25mm from the location of the temperature sensing probe in the coffee tank. The water pick up tube for brew water is at the top of the brew group and is in the most temperature stable water in the tank. Meaning, the readout can show a temperature of a few degrees above your set point, and may fluctuate due to the heat from the element or heat exchanger, but your brew water is actually at the set point.

## Electronics

All zones read LOW:

- Check to make sure the element breaker is ON (element switch is to the left). Zones will read low until the temperature in that zone reaches 175° F. Please allow 20-30 minutes to heat up initially.

# TROUBLESHOOTING

## Steam Wand

Drip at the Steam Wand Tip:

- Steam valve seal is worn. Replace by installing steam valve rebuilt kit.
- Steam valve is filled with milk residue. Disassemble steam valve and clean.

Wand is Hard to Move or Sticky:

- Remove wand at the nut, clean and lubricate moving parts with food grade grease

## Steam

Sudden loss of steam pressure:

- Commonly caused from drawing large amounts of hot water while steaming milk. Allow the machine time to recover pressure. Check temperature settings on Steam 1 and 2 to make sure they are high enough for your application. Watch the steam gauge when the pressure drops; allow the heating elements to heat the incoming cold water. When it reads above 1.1 bar, hot water and steam may be dispensed again.
- Check the wired controller to make sure all temperatures, especially in the steam tank, are close to their set points.
- Check the element breaker on the electronics box to make sure the heating elements are ON (element switch is to the left).

Steam Tank is overfilling:

- Water is too soft; this occasionally happens with reverse osmosis water filtration systems. The water level (auto fill) probe needs a minimum mineral content in order to detect water.
- Debris caught in the water control valve or worn out valve.
- Calcium deposits on the fill probe are preventing the probe from detecting the water level.

Steam Valve Stem Seals Leak:

- Replace O-rings. Purchase Rebuild Kit

The Sight Glass shows over or under filled steam tank:

- Machine is not level. Check to make sure the surface that holds the machine is level. Slightly adjust leg height to level the machine.
- Water level is too high; use the hot water spout to drain water from the steam tank. Continue releasing hot water until the autofill system activates. Once autofill stops, recheck the water level.
- Debris is stuck in the water control fill valve.

| Category | Symptom | Possible Reasons & Solutions |
|---|---|---|
| **Brew Pressure or Flow** | Brew Gauge Reads 11 to 12 Bar when Machine is Not Brewing | This is normal. When the brew tanks heat, the water expands and the expansion valve is set to relieve excess water pressure at 11 to 12 Bar. |
| | Brew Pressure is Low | [SINGLE PUMP MACHINES ONLY] When brewing on one group and another group is activated some water will be diverted to the second (or third) group. This will slightly reduce available brew pressure.<br><br>Expansion valve may be set too loose. Check that the pressure in the brew system reaches 10-12 bar while heating from a cold state. If the pressure does not exceed brew pressure, the expansion valve will need to be tightened, cleaned, or rebuilt.<br><br>Check pump to make sure pressure is properly set.<br><br>Water supply hose to the pump may be kinked<br><br>Water filter may be plugged. Check and replace if necessary |

| Category | Symptom | Possible Reasons & Solutions |
|---|---|---|
| **Brew Pressure or Flow** | No Brew Pressure, Pump Motor is Running | Failed pump, needs to be replaced |
| | | The line between the pump and the water supply may be collapsed or kinked. |
| | | Water filter may be clogged and should be changed |
| | | Brew valve may have timed out.(BRBV0#) Turn brew group off to reset. |
| | No Brew Pressure, Pump Motor is | Brew Solenoid is stuck closed (may be caused by soap residue not fully flushed after cleaning) |
| | | Brew Solenoid coil may have failed. Check that coil magnetizes when group is in preinfuse and brew positions. |
| | | Jet may be plugged. See Jet Clearing Procedure |
| | | Water filter may be plugged. Check and Replace if necessary |
| | | Brew valve may have timed out.(BRBV0#) Turn brew group off to reset |
| | Slow Water Flow (more than 10 seconds to pour 2 ounces of water) | Debris is stuck in the water flow restrictor jet. See Jet Cleaning Procedure. |
| | | Water filter may be clogged and should be changed |
| | Brew Gauge Flutters or Vibrates | Water is in the gauge or tube. Remove the gauge and tube, blow out the water, and reinstall. Machines made after #240 use a thinner, longer gauge tube which eliminates flutter. If your machine is made before #240 and this issue becomes unacceptable, contact your dealer, service provider, or the Synesso™factory to purchase a retrofit tube |
| **Brew Temperature** | Readout for Brew Water Temperature Varies by a Few Degrees | The control must detect a temperature one increment (0.5°F on original machines, or 0.1°F on current machines) above the set point before it sends a signal to turn off the heating element. This will allow the electronics to show a reading just above the set point. The energy from the heating element and the tube for the preheated incoming water are within 1” (25mm) from the location of the temperature probe in the brew tank. The pick up tube for brew water is at the top of the brew group and is in the most temperature stable water in the tank. The readout can show a temperature of a few degrees above your set point, but your brew water is actually at the set point |

| Category | Symptom | Possible Reasons & Solutions |
|---|---|---|
| **Brew Temperature** | Brew Temperature Reads Low (error: BRUT0#) | Be sure to allow 20 - 40 minutes from the time the machine is powered up as the temperatures need to stabilize. Ambient temperature and airflow can change how quickly the machine reaches stability. |
| | | Check that the element breaker is in the ON position |
| | | Check that the fuse on the power board, as well as the relay, are both functioning properly |
| | | Check that the brew tank thermal overload switch has not been tripped |
| | | Check that the connection to the temperature probe is intact and secure |
| | | Make sure the set point has not been changed |
| | Brew Temperature Reads High (error: BROT0#) | Display temperature will climb during brewing as hot water from the steam tank heat exchanger enters the brew tank. This is normal, and the water dispensed will be at your set point, not the displayed temperature |
| | | Make sure the set point has not been changed |
| | | Check that the relay is functioning properly |
| | | Brew tank may be leaking. Check brew valve and fittings |
| **Steam Pressure** | Steam Pressure is set for 1.8 Bar or Higher | The machine can be set for steam pressure at over 2.0 Bar but there can be side effects in the brewing process. A small amount of water is preheated in the steam tank for brewing. If the temperature in the steam tank is set very high then this could allow for the preheated brew water to be too hot and cause some erratic brew temperature spikes. There are ways to make this work if it is absolutely necessary to have a very hot steam tank. Contact Synesso™for more info. |
| | Sudden loss of Steam Pressure | Too much hot water has been used for Tea, Americano, rinsing, or warming cups while still steaming milk. Allow the machine to recover. Check temperature setting on the steam tank to make sure they are high enough for your application. Watch steam gauge, when pressure drops, allow the heating elements to heat the cold water being introduced into the steam tank |
| | | Check to make sure all Set points, especially steam tank settings, are accurate and functioning |
| | | Check that the element breaker on the electrical box is in the ON position |
| | Steam Tank is not filling (error: STFP01) | Check for STFV01 error, which indicates the tank has been filling for over 5 minutes. If so, power cycle machine, check inlet hoses for kinks/pinches, check filter |
| | | Debris caught in the water control valve or worn out valve |

| Category | Symptom | Possible Reasons & Solutions |
|---|---|---|
| **Steam Pressure** | | Water level probe (auto fill) needs to be de-scaled or cleaned. This probe is located behind the left side panel |
| | | Make sure level probe (auto fill) is working. See Test Level Probe |
| | | Water is too hard. The water level (auto fill) probe requires a low level mineral content in order to detect the water and relay the information to the CPU. Do not use deionized water in the machine |
| | | On machines built prior to 01-01-2011, adjustment can be made to the level probe sensitivity control on the power board in the electronics box. See Probe Sensitivity Photo |
| | Steam Valve Stem Seals Leak | Replace O-Rings. Purchase Rebuild Kit. See Steam Valve Rebuild instructions for more info |
| | Auto Fill Valve (Solenoid) is turning OFF and On without Filling the Steam Tank | Check that the water to the machine has not been cut off or restricted |
| | | Confirm that auto fill delay is set to at least 5 seconds. |
| | | See Programming Guide |
| | | If the machine is installed on a boat or other mobile platform, increase the autofill delay as the water may “slosh” inside the tank and confuse the level probe |
| | | Working from a static tank and there is no pressure available to fill the steam tank. Dual inlet machines will need a line boost pump or custom plumbing to operate from a static tank with no line pressure |
| | | Machine is not level. Check to make sure the surface that holds the machine is level. Slightly adjust leg height to create a level machine |
| | The Sight Glass Shows that the Water Level in the Steam Tank is either too High or too Low | Water level probe (auto fill) needs to be de-scaled or cleaned. This probe is located behind the left side panel |
| | | On machines built prior to 01-01-2011, The manual fill switch located on the front of the electrical box may have been depressed. Use the hot water spout to drain the steam tank until the fill solenoid opens and the tank begins to refill |
| | | If you are working from a static tank then you must use a line pressure boost pump to provide the pressure needed to fill the steam tank. Contact your dealer, service provider, or the Synesso™factory for more information regarding static tank installations |

| Category | Symptom | Possible Reasons & Solutions |
|---|---|---|
| | | Machine is not level. Check to make sure the surface that holds the machine is level. Slightly adjust leg height to create a level machine |
| | | Debris is stuck in the water control fill valve. See Water Control Valves |
| | Steam Tank is Slow to Recover Pressure | Test first steam loop (S1) functionality:<br>• Turn off Loop 2 so only Loop 1 is active<br>• Turn up steam set point by a few degrees and confirm that the temperature rises to the new set point.<br>• If the temperature has risen, then S1 is functioning properly |
| | | Test S2 functionality. See S1 test above for instructions |
| | | If either zone is not working properly, then see “Cold Zone” and “Tanks will Not Heat to Full Temperature” in the Electronics section |
| | | Calcium and scale buildup can insulate and cause reduced efficiency in heating elements. If calcium and scale buildup is an issue, be sure to descale your machine on a regular basis |
| **Steam Wand** | Drip at the Steam Wand Tip | Steam valve seal is worn. Replace by installing steam valve rebuilt kit |
| | | Steam valve handle needs to be adjusted. See Steam Valve Handle Adjustment |
| | | Steam valve is filled with milk residue. Disassemble steam valve and clean |
| | Water bubbles out around wand pivot ball | Wand ball o-ring is worn, replace with new Teflon o-ring from steam valve rebuild kit |
| | Wand is Hard to Move or Sticky | Remove wand mounting nut, clean and lubricate wand ball with food grade grease, replace wand ball o-ring |
| | Steam Valve does not Open Fully | Steam valve handle needs to be adjusted. See Steam Valve Handle Adjustment |
| **Hot Water Tap** | No Water Flows When the Switch is | If there is pressure in the steam tank, and water to the machine is not restricted, this indicates the switch has failed. Replace the switch |
| | Only Cold Water Flows when Switch is On | Turn the mix valve clockwise until it stops. This will cut off all cold water flow. If no water flows with the mix valve off, the water control valve on the hot side of the mix valve has failed |
| | Only Hot Water Flows when Switch is On | Check that the mix valve is not fully closed. A fully closed mix valve will only allow steaming water out to the hot water tap |
| | | If the mix valve is open a full turn and a half and the water flow is still steaming and sputtering, the water control valve on the cold side of the mix valve has failed |

| Category | Symptom | Possible Reasons & Solutions |
|---|---|---|
| **Electronics** | All zones read LO | Check to make sure the element breaker is ON. Zones will read LO until the temperature in that zone reaches 175° F (79.4 C) |
| | An individual zone reads LO | Test the connections at the probe and display |
| | | Test thermal overload (over temperature) switch |
| | | On machines built prior to 01-01-2011, Test the fuse for that zone. Test continuity between the ends to check for a blown fuse. Test that voltage from ground to the fuse reads 110v |
| | | **[DISCONNECT POWER TO THE MACHINE FOR THIS TEST]** Test continuity from the heating element posts to ground, and the resistance between the posts |
| | | If all these tests prove to be ok and the LED for the relay (on the power board inside the electrical box) is ON, then the relay has failed |
| | An Individual Zone Reads HI or Above 250° F and the Corresponding Tank is Cooling | Test the connections to the probe |
| | | Test probe for failure with ohm meter and compare reading to neighboring probe |
| | Tanks will Not Heat to Full Temperature | Clean dust and debris from electronics box. Take a soft brush (clean paint brush) to loosen debris and use a small vacuum hose to remove loose debris |
| | Cold Zone | Solid State Relays can fail in either the ON or Off position |
| | | **TRAINED OR AUTHORIZED PERSONNEL ONLY:** |
| | | Relay has failed in the ON position: The heating elements will not turn off and they will overheat to a point where the thermal overload switch will trip and break the circuit to the element. With power ON, test for voltage at the fuse: |
| | | • If voltage is present and the LED at the control board is not lit, then the relay has failed ON |
| | | • If voltage is not present: **TURN THE POWER OFF TO THE MACHINE** and test element leads for continuity to ground and for resistance across the leads |
| | | Relay has failed in the OFF position: Heating element turns off because of lack of signal. No other parts should be affected. Remember, when testing for voltage, the solid state relay requires some load to function. A failed open heating element, a tripped switch or a failed fuse will make a solid state relay appear to have failed or be OFF. If the LED at the relay is ON and there is no power at the relay: |

| Category | Symptom | Possible Reasons & Solutions |
|---|---|---|
| | Cold Zone | • On machines built prior to 01-01-2011, Test the fuse<br>• Check the reset switch on the tank<br>• **TURN THE POWER OFF TO THE MACHINE** and test element leads for continuity to ground and for resistance across the leads |
| | Display is Blank, NO LEDS are lit | If the red power switch is in the ON position and is NOT lit, there is lack of power to the machine. Check your circuit breaker. Check the wall plug if applicable<br><br>If the red power switch is in the ON position and is lit, check that the lid of the electronics box is tightly secured to the box. There is pressure switch on the right side of the box which interrupts power to the electronics when the lid of the electronics box is loose or removed<br><br>On machines built prior to 01-01-2011, If the power switch is lit, the safety switch is properly engaged, and the display is still dark. Either the low voltage transformer has failed (see voltage output table below), or the wires from the transformer to the display have been disconnected.<br><br>On machines built prior to 01-01-2011, Proper transformer voltages (to ground):<br>• Blue: 110v<br>• Red: 110v<br>• Grey: 12-15v<br>• Black: 12-15v<br><br>The green wire is connected to ground and should have no voltage potential |
| **Heating Elements** | Testing Heating Elements | **DISCONNECT MACHINE FROM POWER SUPPLY BEFORE TESTING**<br><br>Test with an ohm meter across the element posts: |

| Voltage | Wattage | Ohms |
|---|---|---|
| 110v | 700 | 15 to 19 |
| 110v | 1000 | 11 to 13 |
| 220v | 700 | 64 to 72 |
| 220v | 2000 | 46 to 52 each loop |
| 220v | 4000 | 23 to 26 each loop |
| 220v | 5000 | 18 to 22 each loop |

Test the element post to the element body and you should not get a reading of any kind. If you get even a quick flash reading, remove element and inspect

| Category | Symptom | Possible Reasons & Solutions |
|---|---|---|
| **Leaks** | Hot Water Tap | If the drip is cold water, the water control valve on the cold side of the mix valve is leaking. Open and clean the cold water valve |
| | | If the drip is warm or hot water, the water control valve on the hot side of the mix valve is leaking. Open and clean the hot water valve |
| | Steam Wand | A small amount of water will naturally accumulate in the steam wand between uses if it is allowed to cool. This is normal for any machine. Make a habit of purging the steam wand of all accumulated liquids before and directly after steaming a pitcher of milk |
| | | If the steam wand constantly drips warm water and is warm to the touch even after an extended time without use, the valve will require a new seal. Obtain and install a steam valve rebuild kit from your dealer, service representative, or the Synesso™factory |
| | | Steam and/or water bubbling out from around the steam wand pivot ball indicates that the steam wand ball o-ring needs to be replaced. This o-ring is included in a steam valve rebuild kit. Machines produced before #510 will likely benefit from the new Teflon o-ring, which provides an improved seal and wear resistance |
| | | If water leaks from the space between the steam wand handle assembly and the side panel, o-rings on the brass pusher rod are worn and need to be replaced. These o-rings are included in the steam valve rebuild kit. The pusher rod can be accessed by removing the side panel and pulling the pusher out from the steam valve |
| | Brew Groups | A Leaking diffuser indicates the brew valve is not sealing properly. Open the valve and clean the sealing faces with a soft cloth. Inspect the valve for scale and calcium buildup |
| | | If water bypasses the portafilter gasket and leaks out around the portafilter when properly engaged and brewing, the portafilter gasket will need to be cleaned. Use a soft brush and scrub any grounds from the surface of the gasket. Rinse with hot water. If the issue persists, replace the portafilter gasket |
| | General | Dirty / brown water under the machine indicates the drain box is clogged or overloaded. Remove the right side panel and clear any obstructions in the drain box. Be sure the drain hose has an even, steady slope toward the floor drain. Kinks, dips, or flat runs will slow or stop the flow of waste water from the machine drain |
| | | A small amount of water may splash between frame panels during a steam wand purge, or when rinsing the drip pan. The water will then |
| | | Clean water under the machine or on top of the electrical box indicates an internal leak. Remove the side panels and fascias until the source of the leak is determined. Contact your dealer, service representative, or the Synesso™factory for more info on fixing your specific leak |

| Category | Symptom | Possible Reasons & Solutions |
|---|---|---|
| | Vacuum Breaker | Normal for the VB to sputter until the steam tank is near full pressure |
| | | If sputtering continues, replace it |
| Volumetric System | VMUFO# Error | The flow meter has detected flow when not brewing a shot. this can indicate a leak in the brew system. Check brew valves and visually inspect brew system |
| General | Coffee Crema is Thin with Large Bubbles & Tastes Astringent | Grinder burrs are dull. Replace immediately |
| | | Coffee is old |
| | | Brew temperature may be set too low |
| | Beeping Machine | Low Water error (STLW01). See page 37 and 42 “steam tank not filling” cycle power to clear 5 minute time out if required |
| | Portafilter | Portafilter “ears” will wear over time allowing the handle to swing further before the basket is fully engaged. Use of taller gaskets (8.5mm or even 9.0mm) will extend the usable life of the portafilter. Ask your dealer, service provider, or the Synesso™factory for more info |
| | Diffuser Screen is Loose | This is most likely caused by over filling the portafilter basket with coffee. This causes the expanding coffee puck to push against the diffuser and bend the screw contact point away from the screw |