



For your bench. At your side.

V.I.C.™ 12 Tabletop Casting Machine

for Solid & Perforated Flasks

without The Assistant™	705-118
with The Assistant™	705-118/14
220-volt model	705-118/220

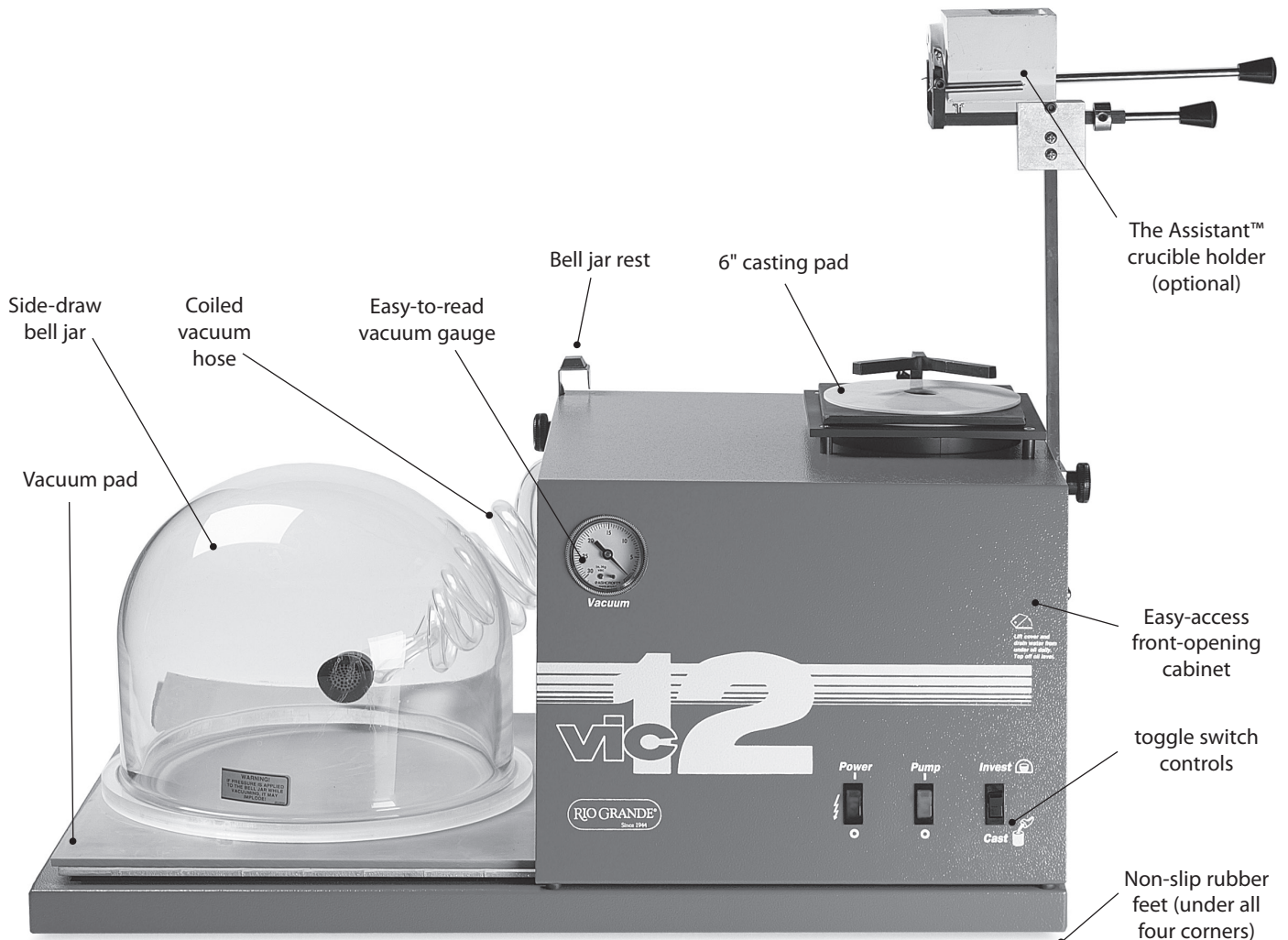
Introduction

Congratulations on your decision to buy the V.I.C.™ 12 vacuum investing and casting machine. You will soon enjoy the benefits of a complete vacuum casting and investing system that offers the latest in technology and convenience.

Vacuum casting is an efficient, flexible casting method, and the V.I.C. 12 allows you to cast small and large parts, easily interchanging flask sizes. Using the V.I.C. 12 is faster and

safer than centrifugal casting and results in better control over your investing and casting processes.

Carefully read this handbook before you begin operating it. Your V.I.C. 12 is built to last and requires only minimal maintenance. Please follow the recommended maintenance procedures in this handbook to ensure optimum performance and service life.



Important!

To ensure safe operation and to maximize the benefits of this machines, read and understand the information in this handbook before using your V.I.C.™ 12. When using your V.I.C. 12, follow all safety precautions as recommended in this handbook.

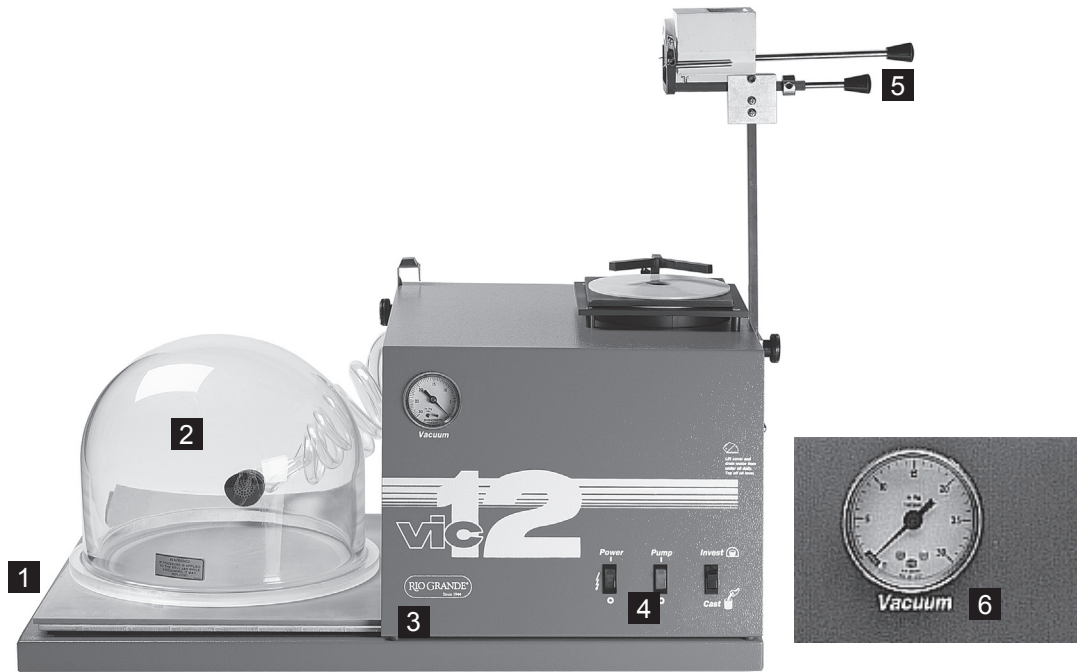
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Shipping List

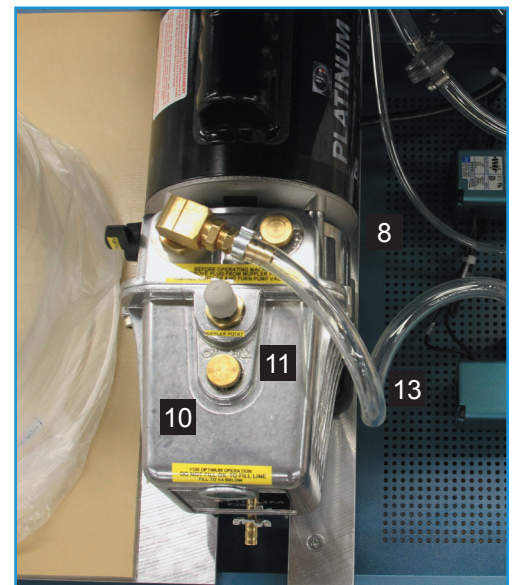
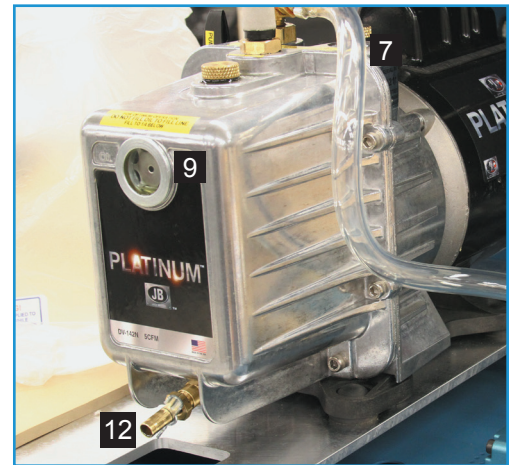
- V.I.C.™ 12 casting machine with one side-draw bell jar
- 6"-diameter, high-heat white silicon rubber casting pad
- Perforated flask adapters and gaskets
- Conversion tabletop pad, steel casting plate and silicone rubber casting pad for regular flasks
- Gum rubber investment pad
- Quart of vacuum pump oil
- Installation and operation handbook
- The Assistant™ crucible holder with Rio #2 ceramic crucible and a paper crucible target (if this optional was ordered)

The diagram at left identifies component parts of your V.I.C. 12 machine by part number. If you have a question about a component or need to replace a part on your V.I.C. 12 machine, visit riogrande.com or call Rio Grande at 800.545.6566. Give the customer service representative the stock number of your V.I.C. 12 machine (see front), followed by the part number you need. You'll find a list of replacement parts and accessories on page 12.



Features

1. Vibrating vacuum table helps eliminate air bubbles from the investment.
2. Side-draw bell jar holds more flasks, protects the vacuum line from clogging if investment spills and protects pump from investment debris.
3. The V.I.C.[™] 12 is designed for safety and easy cleanup. Constructed of sturdy steel with easy-access housing and a side-draw bell jar—unique to this machine—the first-quality manufactured components will provide years of reliable use.
4. Easy-to-use rocker switch controls.
5. The Assistant[™] crucible holder (optional) accurately controls metal-pouring to make casting easier and safer.
6. Easy-to-read vacuum gauge.
7. Convenient access to flask blowout trap and in-line filter system simplifies cleaning and maintenance.
8. Maximum in-line filter protection from spilled metal and investment.
9. Easy-access oil sight gauge on vacuum pump.
10. Powerful 5cfm vacuum pump (115V; 60Hz).
11. Easy-to-use top access oil fill port.
12. Oil drain port makes routine maintenance easy.
13. High-heat polyurethane hoses throughout the machine provide maximum protection from flask blowout damage.



General Safety Precautions

Investing and casting are processes that require forethought and precautions. Planning for every step of the investing and casting processes in your shop is a responsibility you owe to yourself and your co-workers. Safety precautions and protective attire are a must for investing, melting and casting.

- Wear protective clothing and eyewear when investing and casting. Proper safety precautions should always be taken.
- Molten metal will cause severe burns and can start fires. Make sure no flammable materials are near the casting area.
- Plan a place to put the hot flask after casting where you nor anyone else can accidentally come in contact with it. Remember, flasks with temperatures of several hundred degrees look the same as cold flasks.
- If you have a helper, plan the actions both of you will take during your casting process before you begin.
- Keep close watch on the torch flame. It can burn something or someone from quite a distance. Take care not to melt your bell jar. If you do, replace it right away. The bell jar may not be safe if it has been cracked, scratched or damaged by a torch flame or molten metal.

- Never push on the top of the bell jar while it is under vacuum. When a bell jar breaks, it first implodes and then explodes, sending sharp pieces of shattered plastic around the room. To ensure a good seal, check to make sure the pad under the bell jar is clean and free of dirt or debris, then gently press the rim of the bell jar securely against the rubber investing pad when vacuum is first applied.

WARNING: Investment powder contains free silica. Inhaling silica is dangerous and may cause progressive, irreversible lung injury over time. Always wear an appropriate respirator when investing and quenching flasks, and completely clean up investment from your work area. Wear an OSHA approved respirator during investing processes and work in a well-ventilated space with a draft that pulls air away from you when handling investment powder. Never use a vacuum cleaner unless it is designed to pick up respirable silica (particles as fine as 5 microns). See warning below; read, understand and follow all safety recommendations offered on the MSDS available with your investment product.

Please Note: Your Rio Grande Tools & Equipment catalog and the Rio website (riogrande.com) offers the proper safety accessories—including eyewear, gloves, aprons, masks, and respirators for investing, metal-melting and casting, as well as safety equipment for your entire shop.

WARNING!

Investment contains a blend of crystalline silica. Prolonged inhalation of this product may be harmful. IARC reports that there is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica in forms of quartz or cristobalite from occupational sources. Symptoms may not appear until permanent lung damage has occurred. Persons who use this product should have periodic physical examinations for silica exposure. Work areas should be periodically tested to determine the amount of airborne crystalline silica compared to OSHA and MSHA accepted standards.

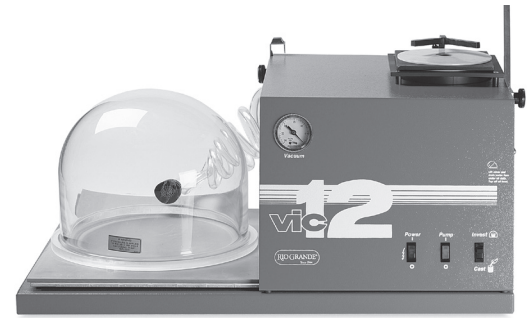
ALWAYS wear NIOSH-approved breathing protection for crystalline silica dust when working with product or when possible exposure to product dust exists. Users must comply with all applicable health and safety regulations relating to the safe handling of crystalline silica. See MSDS for information.

California Prop 65 Warning: This product contains crystalline silica, a chemical known to the State of California to cause cancer.

Basic Installation/Set-Up

1. Remove all shipping materials and place the V.I.C. 12 on a sturdy work surface.
2. Tilt open the main cabinet.
3. Remove oil fill cap and fill the pump with vacuum oil to the “full” mark on the oil sight gauge (about half-way up the glass). Your first pint of vacuum oil is included; re-order Rio vacuum pump oil at riogrande.com or see your *Rio Grande Tools & Equipment* catalog.
Important: Do not overfill your pump with oil. An overfilled pump can result in oil being drawn into the pump lines.
4. Replace the oil fill cap. Close the main cabinet cover.
5. Plug your V.I.C. 12 casting machine into a grounded 115-volt AC outlet (or plug into a grounded 220-volt AC outlet if you’ve purchased a 220-volt machine) to operate.

Important: Do not operate the vacuum pump until you have filled it the correct amount of pump oil.



Place V.I.C. 12 on a sturdy surface.

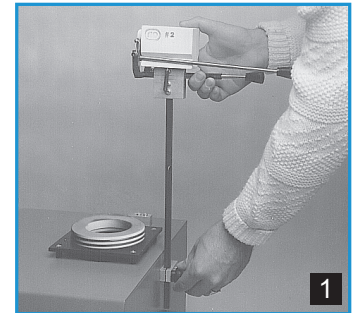


Fill pump to just below “full” mark on oil sight gauge.

Assembling The Rio Assistant™ (optional)

The V.I.C. 12 casting machine has pre-drilled holes designed to accommodate the mounting blocks of the Rio Assistant™ crucible holder. If you chose this option, assemble it at this time. To assemble:

1. Remove The Assistant™ from the package.
2. Attach the mounting blocks on the side of the V.I.C.™ 12 with mounting screws (provided). The upper block has an adjustment knob for the support rod.
3. Slide the support rod down through the block on the side of the V.I.C. 12 machine.
4. The rod should move freely up and down; adjust it if necessary.
5. Adjust the height of the crucible by loosening the vertical adjusting knob (on the side of the cabinet). Tighten all screws so the adjustment knob clamps and holds the rod in place.



Flask Installation/Set-Up

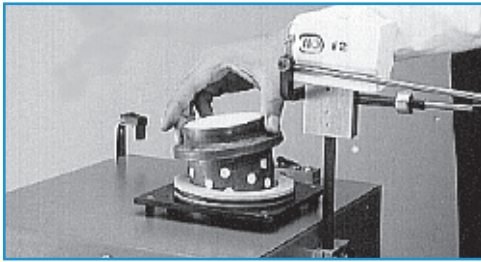
With or without The Assistant™, you will need to set up your machine to accommodate the flask style (solid or perforated) that you will be using:



1. For a solid flask, insert the 5"-diameter adapter ring into the metal collar of the casting chamber.
2. Attach the metal Y-bracket (used to align solid flasks). Place the white silicone casting pad (not shown) on the metal tabletop surface over the adapter ring.
3. For a perforated flask, select the gasket size corresponding to the diameter of the flask you will use. Put the gasket onto the metal collar of the casting chamber flange.

Flask Installation/Aligning The Assistant™

⚠ WARNING! Always wear eye protection when melting metal. Molten metal emits strong infrared light waves that can cause eye damage. A tiny splash of molten metal can also cause severe eye damage.



1. Insert a cool, invested perforated flask into, or set a solid flask on top of, the casting chamber. The flask must have the correct-diameter casting gasket to align correctly with The Assistant™ crucible holder.



4. Check the alignment by tilting the crucible to a 90° angle. The pencil or straw should go into the sprue hole in the flask.



2. Move the horizontal arm until the crucible is aligned above the flask. Loosen the knob on the vertical arm and position The Assistant™ directly over the sprue hole in the flask. Tighten both knobs.



5. Once the correct position has been achieved, tighten the screw knobs securely.



3. Align pour spout by laying a pencil or straw in the spout. Loosen the crucible guide toggle and slide the crucible into position over the flask sprue hole.



6. Remove the cold flask from the casting machine.

Investing Procedure

Important: Read the safety precautions on this page and on page 4 before you begin casting.

WARNING: Never push down on the top of the bell jar during vacuuming—this can cause the bell jar to break or implode. Always test the vacuum seal between the bell jar and gum rubber pad before starting to mix investment. To test the vacuum, make sure the rim of the bell jar and investing pad are smooth and free from particles or dirt. Moisten rim of the bell jar with a clean sponge. Place the bell jar on the vacuum table with the rubber pad. If needed, apply slight pressure only around the rim of the bell jar—never on the top.

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ALWAYS wear NIOSH-approved breathing protection for crystalline silica dust when working with product or when possible exposure to product dust exists. Users must comply with all applicable health and safety regulations relating to the safe handling of crystalline silica.

See MSDS for information.

California Prop 65 Warning: This product contains crystalline silica, a chemical known to the State of California to cause cancer.

Preparing to Invest

CAUTION: Keep all investment-mixing tools clean and free from hardened investment, which can cause wet investment to cure improperly.

Prepare the flasks to be invested. On solid flasks, use Wax Web™ (available at riogrande.com and through your Rio Grande *Tools & Equipment* catalog) to ensure help consistent castings.

Please Note: Use Wax Web only with solid flasks.

1. For solid flasks, roll the Wax Web into a cylinder, and position it flush with the top



of the solid flask. The Wax Web should extend no more than 70% or 80% down the inside of the flask.

2. Secure the Wax Web to the solid flask with bobby pins, or melt it at several points with a heated wax tool. Remove the bobby pins when investment is setting up.
3. As you build your sprue tree, always allow at least 1/2" between the top of the wax patterns and the top level of investment in the flask (more for large or heavy items).

Please Note: Because a 1/8" gap is always left between the investment level and the top of a solid flask, the top of your sprue tree should never be closer than 5/8" to the top of your solid flask. Always leave yourself at least 1/2" between the top of your perforated flask and the last wax pattern—this step, and tightly controlled investing procedures, will help prevent flask blowouts. See your Tools & Equipment catalog for information.

Investing with the V.I.C. 12

1. Weigh the investment powder and measure the mix water according to the manufacturer's directions for the investment powder you're using).
2. Colder mix-water temperature increases working time; warmer water temperature will shortens working time. For best results, water temperature should be between 75°F and 80°F (24–29°C).
3. Dipping the wax trees into a suitable debubbler solution or using a spray-on debubbler will greatly reduce air bubbles on castings and promote better adhesion of the investment to the wax patterns. This procedure should be done approximately 30 minutes prior to investing.
4. Place the pre-measured water into your mixing bowl and then add pre-weighed investment.
5. Hand-mix until the powder is completely wetted (if you are using a mechanical mixer, mix on low speed for one minute). Continue mixing for two minutes at a medium speed.
6. When mixing is complete, place the investment bowl on the investing platform. Position the bell jar squarely over the bowl, move toggle switch to the Invest position, and turn the power on.
7. Vacuum investment until proper vacuum is achieved (when the investment rises to bubble and collapses, continue to vacuum for one additional minute). This operation should take 90 seconds. Release the vacuum by turning off the vacuum pump switch. Consult your

How To Determine Metal Weight for Wax Trees

Knowing how to determine the correct metal weight for each wax tree before you cast ensures that you melt the right amount of metal for your cast, making your casting process more cost-effective and more reliable.

SPECIFIC GRAVITIES:

24KY = 19.32

18KY = 15.58

14KY = 13.07

10KY = 11.57

Fine silver = 10.49

Sterling = 10.36

Platinum = 21.54

Caster's brass chunks = 8.4

Caster's white bronze chunks = 8.1

Ancient bronze = 8.8

Yellow bronze = 8.4

Manganese bronze = 8.3

Nickel silver = 8.8

Alpaca = 8.6

PROCEDURE:

Step 1

First, weigh your wax models along with main and gate sprues. Then add an additional 10% to account for your button.

Step 2

Multiply that total by the specific gravity of the metal you're casting (see table above for a general guideline).

Step 3

Example: For a 5-gram wax model, add 0.5 (10% of 5g) to get a total wax weight of 5.5g. For a 14KY gold casting, multiply 5.5g x 13.07 s.g. The amount of 14KY gold needed for this tree is 71.89 grams.

investment instructions for specific working times. Most gypsum-bonded jewelry investments allow 9 minutes for the full investing process.

Please Note: The vacuum gauge should indicate full vacuum in less than one minute. Investment in the bowl will crest at this time and begin to release air bubbles that break the surface. The precise mercury reading indicating full vacuum depends on your altitude. At sea level, full vacuum occurs at 29" of mercury. The gauge registers approximately 0.9" less mercury for each 1000 feet of altitude. For example, full vacuum will be approximately 24.5" of mercury at 5000 feet above sea level.

8. Pour the investment along the inside of the flask, allowing it to flow up, around and over the patterns, leaving a minimum of $\frac{3}{8}$ " space at the sides of the patterns and $\frac{1}{2}$ " to $\frac{3}{4}$ " at the top.
9. Place the flask under vacuum and de-air for 1½ to 2 minutes.
10. Top off the flask if necessary with the appropriate quantity of investment to bring it to proper level.
11. Allow the invested flask to sit undisturbed for a minimum of 1½ to 2 hours.
12. Carefully remove the sprue base (The NeuSprue®

system lets you remove the base with no stress to the investment).

13. Place into a pre-heated burnout oven, sprue button end down.
14. Follow burnout cycle.

Please Note: After investing several flasks, it is normal for some moisture from the investment to collect in the vacuum pump oil. Overnight, the moisture will separate from the oil and settle in the bottom of the pump. Each day, drain the water and any foamy oil from the pump and add new oil to the full mark on the sight gauge before running the pump. To do this, position the V.I.C. 12 on the edge of the work table. Lift the cover to expose the pump. Open the drain valve and drain until clear oil starts to run out. Close the spout and check the oil level; refill if needed to the full mark.

Casting Torch-Melted Metal

WARNING: Read the safety precautions on page 4 before you begin casting.

Before Casting:

- The rim of the solid flask should be clean and free from investment to allow for a proper seal against the casting pad and to prevent loose investment from being pulled into the pump.
- To protect the bell jar, place it on the bell jar stand away from the casting area.
- For casting solid flasks, place the white casting pad on the casting table plate; both must be free of dirt and investment. Align the pad with the hole in the center of the table.
- For casting perforated flasks, choose the flask gasket matching the diameter of the flask and place it on the casting chamber flange.

Important Notes:

- When casting, be organized. Have your tools in place and ready to use. Plan in advance the exact sequence of events necessary to successfully complete your cast, and make sure you have everything you need.
- Be sure to cast each flask as quickly as possible (within 3–5 minutes) after removing it from the oven to prevent unnecessary heat loss.

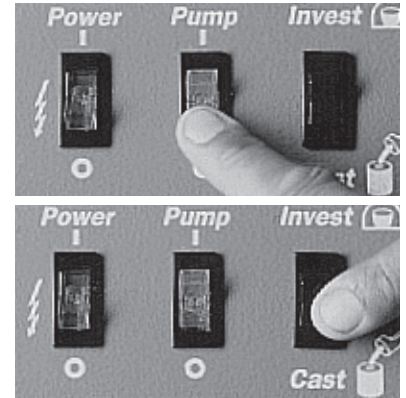
WARNING: Always wear appropriate safety glasses to protect your eyes during any metal melting, casting and quenching process.

Casting Steps

1. To season a new crucible, place a small amount of Matt's Casting Flux™ in a clean crucible, adjusted as covered in the SETUP section on page 6. Heat flux to form a thin glassy glaze inside the crucible. Repeat as necessary, using a small quantity of Matt's casting flux. Too much will cause an excessive glassy slag buildup in the crucible.
2. Make sure that any remelt metal used is very clean and dry (free of oxides, investment, pickle residue and moisture).
3. Place the proper amount of metal in the preheated crucible for the pattern or patterns invested in the mold.

4. Remove the flask from oven and place it on the casting pad (or perforated flask chamber) of the casting machine with sprue opening up.

5. Turn the pump on to test for a good vacuum seal between the gasket and the flask, then release the vacuum and turn the pump off. If a good vacuum is not achieved, check to ensure that the rim of the flask is clean and free from investment debris.



6. With a good reducing flame (mix is more gas than oxygen), heat the metal. Use a flame large enough that it will cover the whole melt.
7. When the metal starts to melt, turn on the vacuum pump and switch to the cast position. Check the vacuum gauge to make sure the vacuum has resealed.
8. Bring the metal to the desired casting temperature and stir it with a carbon stirring rod through the flame of the torch.
 - Once the metal heating starts, do not remove the torch from the melt for any reason. If exposed to air, hot or molten metal will readily oxidize (bond with oxygen from the atmosphere). Oxidation causes the formation of copper and/or zinc oxides which have a very different composition and appearance than original casting alloy. We know these oxides as 'firescale,' and it is difficult or impossible to remove after casting.
9. Use the torch to cover both the melt and the pour hole in the crucible. Tip the crucible to pour the metal quickly and smoothly into the sprue opening of the mold.
 - To minimize firescale on your cast models, keep the flame constantly on the molten metal as it is poured into the flask. Stir the melt with a carbon stirring rod before casting. Use the flame to protect the metal from oxidizing as it is poured into the flask.
10. Play the torch flame on the end of sprue button until the button solidifies.
11. Maintain a vacuum on the flask for 30–45 seconds while the metal in the flask solidifies.
12. Release the vacuum by turning off the vacuum pump switch, then remove the flask.

- Let the flask stand on a heat-resistant surface until the red color is completely gone from the button (you can use an empty solid flask on the end of the mold flask to create a dark enclosure above the sprue button that will allow you to judge its color).

IMPORTANT: Do not leave flasks to cool on the casting table as this will cause undue wear on the silicon casting pad.

- Quench the flask. Red gold should be quenched immediately after it is removed from the casting pad. Sterling, yellow gold and green gold can be quenched as soon as the red color is gone from the button. White gold should stand for an additional 15 minutes before quenching.

⚠ WARNING! Always wear an appropriate respirator and ensure adequate ventilation when quenching a flask. Quickly place the entire flask under water until the investment cools and is eliminated; the investment particles in the steam at the water's surface will become airborne if the mold is held partly out of the water. Airborne silica in investment powder can cause silicosis of the lungs. Visit riogrande.com for a free MSDS about investment.

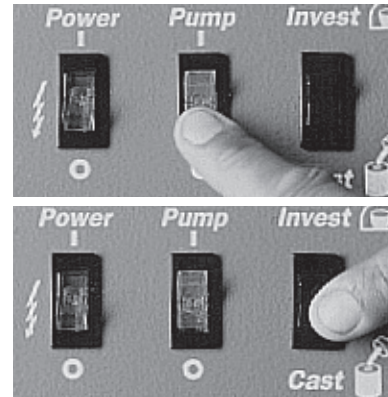
- When using the solid flask casting table, remove the screen over the vacuum port and clean out any investment and debris. Replacement table screens are available if needed.

Casting with a Melting Furnace

If you will be using a melting furnace to melt your metal, most of the steps will be the same.

- The crucibles in furnaces is usually graphite and will not need to be seasoned.
- Place the necessary amount of metal for the pattern or patterns invested in the mold into the preheated crucible.
- Set the furnace and allow the metal to begin heating.
- When the metal reaches casting temperature, remove the flask from oven and place it on the casting pad (or perforated flask chamber) of the casting machine with sprue opening up.

- Turn the pump on to test for a good vacuum seal between the gasket and the flask, then turn the pump off. If a good vacuum is not achieved, check to ensure that the rim of the flask is clean and free from investment debris.



- Turn on the vacuum pump and switch to the cast position. Check the vacuum gauge to make sure the vacuum has resealed.
- Use tongs to lift the crucible (or simply tilt the furnace if it has that feature) and pour the metal quickly and smoothly into the sprue opening of the mold.
- Maintain a vacuum on the flask for 30–45 seconds while the metal in the flask solidifies.
- Release the vacuum by turning off the vacuum pump switch, then remove the flask.
- Let the flask stand on a heat-resistant surface until the red color is completely gone from the button (you can use an empty solid flask on the end of the mold flask to create a dark enclosure above the sprue button that will allow you to judge its color).

IMPORTANT: Do not leave flasks to cool on the casting table as this will cause undue wear on the silicon casting pad.

Maintenance

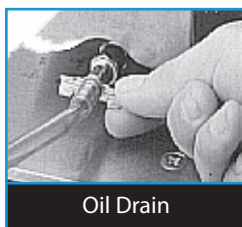
Proper maintenance is essential to ensure the best performance and longest service life from your vacuum pump. After prolonged use, the vacuum pump oil will become dirty and begin to break down. This will affect its vacuum performance. The recommended time for replacing vacuum pump oil is every 30 hours of use. For longer pump life, we also recommend flushing your vacuum pump with flushing oil at every oil change.

This process flushes dirt out of your pump and keeps it running cleaner to give you more reliable performance.

Changing the Oil

IMPORTANT: Do not attempt to invest or cast with your machine while it's filled with flushing oil. Flushing oil is too lightweight for casting; it is used only for cleaning.

1. Set the V.I.C. 12 machine near the table edge.
2. Open the front of the V.I.C. 12 to expose the vacuum pump.
3. Place a pint-size or larger container under the machine to catch the drained oil
4. Open the drain valve.
5. After the oil has drained, close the valve.
6. Refill machine with fresh vacuum oil through the oil fill port on the pump (use Rio vacuum pump oil, #706-020.) Check that the oil level reaches the FULL mark on the sight glass. **Please Note:** Do not overfill the pump.
7. Dispose of used oil properly at a recycler.

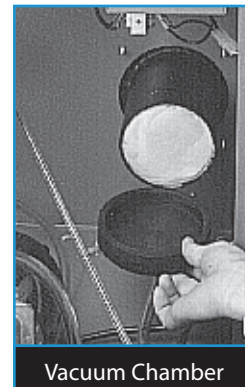


Oil Drain

Cleaning the Vacuum Chamber

Periodically (and always after a flask blowout), clean the accumulated investment and metal from the bottom of the vacuum chamber.

1. Remove all casting gasket rings from the top of the chamber.
2. Lift up the front of the machine to access the bottom of the vacuum chamber (see the "Features" section; #7 on page 3).
3. Remove the adjustable clamp band from the black rubber cap at the bottom of the vacuum chamber. In the cap or immediately inside the vacuum chamber, is a soft fiber ceramic-like insulation material. If the fiber pad is damaged, replace it. If not, remove debris and re-install it in the cap.
4. With the fiber insulation pad in place at the bottom of the cap, reinstall the cap at the bottom of the vacuum chamber and tighten the clamp band to secure the assembly.



Vacuum Chamber

To Periodically Flush the Pump

Flush the pump after 90 (approximately) hours of use.

1. Drain the oil.
2. Fill the machine $\frac{2}{3}$ -full with flushing oil.
3. Turn machine on and allow it to run 3–4 minutes to flush the system.
4. Drain flushing oil completely. Please Note: Do not cast or invest while your machine is filled with flushing oil; your machine will be irreparably damaged.
5. Refill with Rio vacuum pump oil.
6. Dispose of used oil properly at a recycler.



Oil Fill Port

Accessories

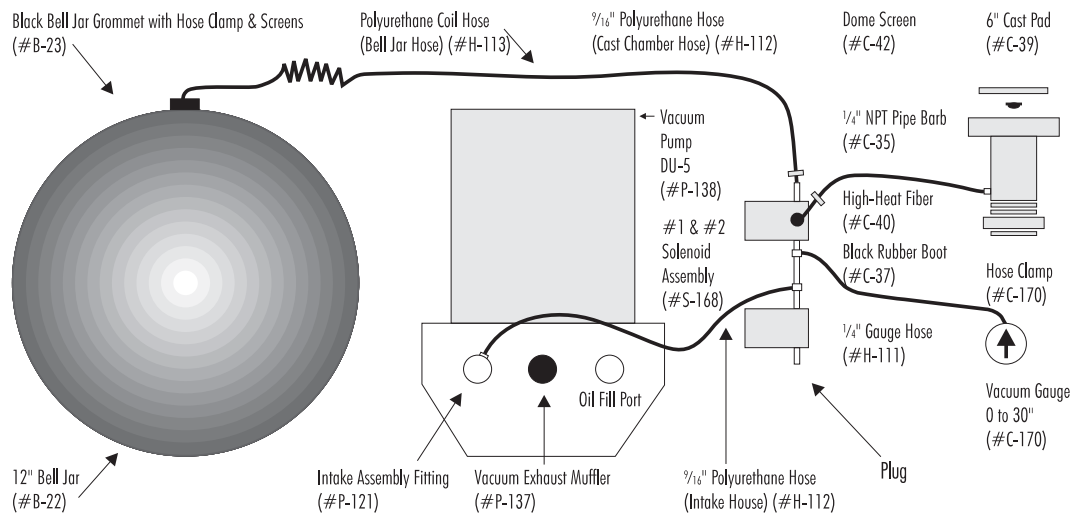
See our website or your catalog for more information and pricing on these supplies. Your catalog includes a handy order number index that provides a page number reference for each order number.

Description	Order #
The Assistant™	705-140
Carbon stirring rods	705-120
Crucibles	704-046, 704-048, 704-049
Wax Web™	702-200 to 702-203

Replacement Parts

Description	Order #
Bell Jar, side-draw, 12"	702-156
High-Heat Fiber, 5" diameter	705-058
In-line Filter	705-169
Rio Flushing Oil; one quart	706-017
Rio Vacuum Pump Oil; one gallon	706-020
Rubber Boot, 5" diameter	705-064
Rubber Casting Pad, 6" diameter	705-163
Rubber Flask Flange Seal; 3", 3½", 4", 5"	705-164/3; 705-164/3.5; 705-164/4; 705-164/5
Table Filter Screen	705-168
Vacuum Pad for Investing, ¼" thick	702-171

Parts Diagram



The diagram above identifies component parts of your V.I.C. 12 machine by part number. If you have a question about a component or need to replace a part on your V.I.C. 12 machine, call Rio Grande at 800.545.6566. Give the customer service representative the stock number of your V.I.C. 12 machine (see front), followed by the part number you need. You'll find a list of replacement parts and accessories on page 11.