

V.I.C.™ 12 Tabletop Perforated Flask Casting Machine

with The Assistant™
without The Assistant™
220-volt model

705-118/14
705-118
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 to learn the machine's benefits 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.



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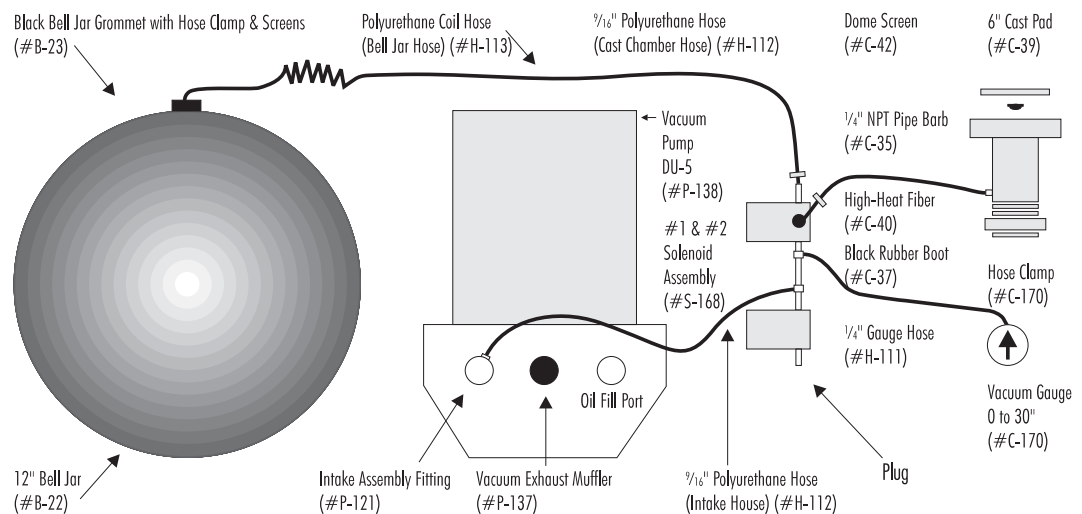
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To ensure safe operation and maximize your benefit from this machine, please read this entire manual before using your V.I.C. 12™.

Shipping List

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

Parts Diagram

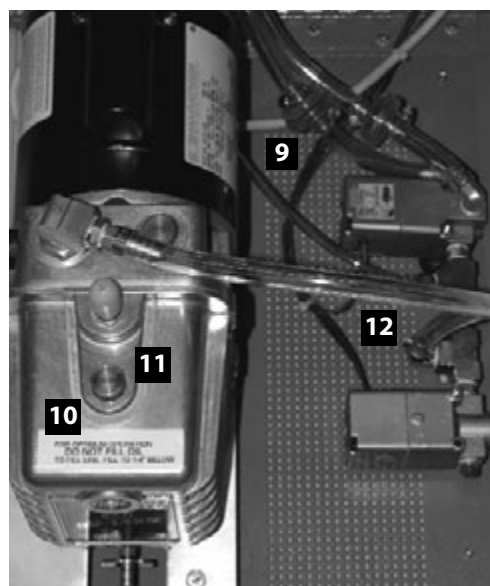
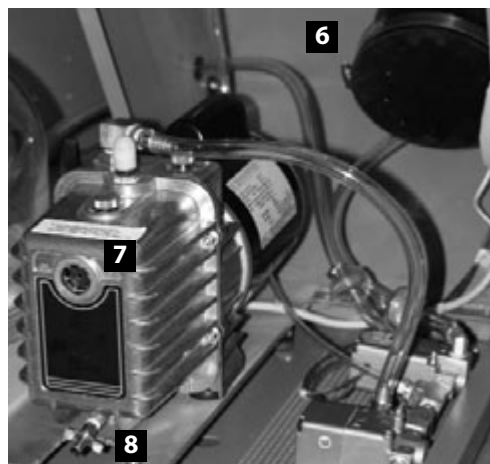


The diagram above identifies component parts of your V.I.C. 12 machine by part number. If you have a question about a component or need to replace a part on your V.I.C. 12 machine, call Rio Grande at 800.545.6566. Give the customer service representative the stock number of your V.I.C. 12 machine (see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



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 Easy-to-use rocker switch controls.
- 4 The Assistant™ crucible holder (optional) accurately controls metal-pouring to make casting easier and safer.
- 5 Easy-to-read vacuum gauge.
- 6 Convenient access to flask blowout trap and in-line filter system simplifies cleaning and maintenance.
- 7 Easy-access oil sight gauge on vacuum pump.
- 8 Oil drain port makes routine maintenance easy.
- 9 Maximum in-line filter protection from spilled metal and investment.
- 10 Powerful 5cfm vacuum pump (115V; 60Hz).
- 11 Easy-to-use top access oil fill port.
- 12 High-heat polyurethane hoses throughout the machine provide maximum protection from flask blowout damage.



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.

Your *Rio Grande Tools & Equipment* catalog 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.

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 there is a vacuum inside. When a bell jar breaks, it first implodes and then explodes, sending sharp pieces of 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.

Safety 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 (as small as 5 microns).

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 pump oil is included; reorder Rio vacuum pump oil #706-020. **CAUTION:** Do not overfill your pump with oil. An over-filled 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.



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



Fill pump to "full" mark on oil sight gauge.

Assembling The Assistant™ (optional feature)

Both the tabletop model and the perforated flask model of the V.I.C. 12 have predrilled holes for mounting blocks to accommodate an optional The Assistant™ crucible holder. If you chose this option, assemble it at this time.

To assemble: remove The Assistant from the package.

- 1 Attach mounting blocks on the side of the V.I.C.™ 12 with mounting screws.
- 2 Slide the rod down through the block on the side of the V.I.C. 12 machine.
- 3 Adjust if necessary. The rod should move freely up and down.
- 4 Adjust the height of the crucible by loosening the vertical adjusting knob and screw (on the side of the cabinet). Tighten all screws so the adjustment knob clamps and holds the rod in place.

Further instructions, specific to each model of the V.I.C. 12 casting machine, are found on the following pages.



CAUTION:

Do not operate vacuum pump until you have added the correct amount of pump oil.

NOTE:

Additional steps are covered in the general installation/setup instructions on pages 6 and 7.

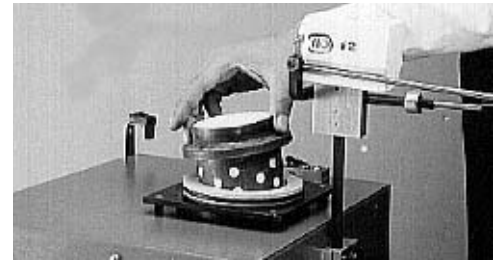
Perforated Flask Model Installation/Setup

The V.I.C. 12 perforated flask model can be adapted for tabletop casting (see below).

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 Select the proper gasket size for the diameter of the perforated flask you wish to use (3", 3½", 4" or 5"). Put the gasket onto the metal collar of the perforated flask casting chamber flange.



2 Insert an inverted, cold perforated flask into the chamber. The flask **must** have the correct-diameter casting gasket to align correctly with The Assistant™ crucible holder.



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



4 Adjust to the proper pour point by inserting a pencil or straw into the spout of the crucible. Loosen the crucible guide toggle and slide the crucible into position over the flask sprue hole.



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



6 After the correct position has been determined, tighten the screw to ensure proper alignment for casting.



7 Remove the cold flask from inside the casting chamber.

To adapt the Perforated Flask model for tabletop casting:



A Insert the 5"-diameter adapter ring into the metal collar of the casting chamber.



B Attach the metal Y-bracket (used for solid flask alignment when using the tabletop option). Place the white silicone casting pad (not shown) on the metal tabletop surface over the adapter ring. Follow steps 1–6 on this page for tabletop casting.

Investing

CAUTION: Always test the vacuum seal between the bell jar and gum rubber pad before starting to mix investment. Never push down on the top of the bell jar during vacuuming—this can cause the bell jar to break or implode. 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 apply pressure on the top!

Preparing to Invest

Prepare the flasks to be invested.

On solid flasks, use Wax Web™ for consistent castings (available through your *Rio Grande Tools & Equipment* catalog). **Please Note:** use Wax Web on solid flasks ONLY. Perforated flasks do not require Wax Web.



- 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 precaution, 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 at a ratio of 38, 39, or 40 (see page 8). This equates to 38 to 40 parts water per 100 parts powder by weight (38 to 40ml water per 100g investment, for example).

- 2 Colder mix water temperature will increase working time; warmer-temperature water will shorten working time. For best results, adjust water temperature to 75–80°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 pattern surface. This procedure should be done approximately 30 minutes prior to investing.
- 4 Place the pre-measured water into your mixing bowl and 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 on a medium speed.
- 6 When mixing is complete, place the bowl of investment 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 a boil 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 investment instructions for specific working times. Most gypsum-bonded jewelry investments allow 9 minutes for the full investing process.
- 8 Pour the investment along the inside of the flask, allowing it to flow up, around and over the patterns, leaving a minimum of 3/8" space at the sides of the patterns and 1/2" to 3/4" at the top and bottom.
- 9 Place the flask under vacuum and de-air for 1 1/2 to 2 minutes.
- 10 Top off the flask with the appropriate investment quantity.
- 11 Allow the invested flasks to sit undisturbed for a minimum of 1 1/2 to 2 hours.
- 12 Carefully remove the sprue base (Neusprue system lets you remove the sprue base without stressing the investment).
- 13 Place into a pre-heated burnout oven, sprue button end down.

continued, next page

Please Note:

It is important that you read the safety precautions on page 4 before you begin casting.

CAUTION:

Keep all investment-mixing tools clean and free from hardened investment. Hardened investment from a previous batch can change the setting time of the current batch, causing the investment to cure improperly.

Water to Investment Ratio (40:100 in grams)

Flask Height in Inches	Flask Diameter in Inches							
	3 1/2"		4"		5"		6"	
	Water	Investment	Water	Investment	Water	Investment	Water	Investment
4"	318	795	420	1051	648	1619	932	2330
5"	398	994	526	1314	810	2024	1165	2913
6"	477	1193	631	1577	971	2429	1398	3495
7"	557	1391	7357	1839	1133	2833	1631	4078
8"	636	1590	841	2102	1295	3238	1864	4660
9"	716	1789	946	2365	1457	3643	2097	5243
10"	795	1988	1051	2628	1619	4048	2330	5825

Please Note:

To determine the pounds of investment needed to fill a particular flask, divide the cubic inch content of the flask by 20.

To determine flask content in cubic inches:

Round flask =
 $.7854 \times \text{height} \times \text{diameter}^2$.

Square flask =
 $\text{width} \times \text{length} \times \text{height}$.

Water to Powder Ratios

POUNDS POWDER	GRAMS POWDER	Heavy Castings 38/100		Medium Castings 39/100		Fine Castings 40/100	
		Volume of Water		Volume of Water		Volume of Water	
		fl. oz. water	ml. water	fl. oz. water	ml. water	fl. oz. water	ml. water
1	454	6	172	6	177	6	181
2	907	12	345	12	345	12	363
3	1361	17	517	18	531	18	544
4	1814	23	689	24	708	25	726
5	2268	29	862	30	885	31	907
6	2722	35	1034	36	1061	37	1089
7	3176	41	1207	42	1238	43	1270
8	3629	47	1379	48	1415	49	1452
9	4082	52	1551	54	1592	55	1633
10	4536	58	1724	60	1769	61	1814
11	4990	64	1896	66	1946	67	1996
12	5443	70	2068	72	2123	74	2177
13	5897	76	2241	78	2300	80	2359
14	6350	82	2413	84	2477	86	2540
15	6804	87	2586	90	2664	92	2722
16	7258	93	2758	96	2830	98	2903
17	7711	99	2930	102	3007	104	3084
18	8165	106	3103	108	3184	110	3266
19	8618	111	3275	114	3361	117	3447
20	9072	117	3447	120	3538	123	3629
21	9526	122	3620	126	3715	129	3810
22	9979	128	3792	132	3892	135	3992
23	10433	134	3964	138	4069	141	4173
24	10886	140	4137	144	4246	147	4355
25	11340	146	4309	150	4423	153	4536

Investing Steps, continued

14 Follow burnout cycle.

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 and the surface will break. 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 is approximately 24.5" of mercury at 5000 feet above sea level.

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.

WARNING: Investment powder contains free silica. Inhaling silica is dangerous and may cause progressive, irreversible lung injury. Always wear an OSHA approved respirator during the investing process, and clean up investment completely from your work area. Use a well-ventilated space with a draft pulling air away from you when handling investment powder. Never use a vacuum cleaner unless it is designed to pick up respirable silica (< 5 microns).

Casting Torch-Melted Metal

Before Casting: The top edge of the 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 should be free from dirt and investment. Align the pad with the hole in the center of the table.

For casting perforated flasks, choose the appropriate diameter flask gasket and place on the casting chamber flange. The gasket should match the diameter of the perforated flask.

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 complete casting successfully, and make sure you have everything you need. Be sure to cast each flask as quickly as possible after removing it from the oven to prevent unnecessary heat loss.

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). Once the metal alloy has taken on oxygen molecules, copper and/or zinc oxides are formed, which have a very different composition and appearance than original casting alloy. We know these oxides as firescale. To minimize firescale on your cast models, keep the flame constantly on the molten metal, even 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.

Casting Steps

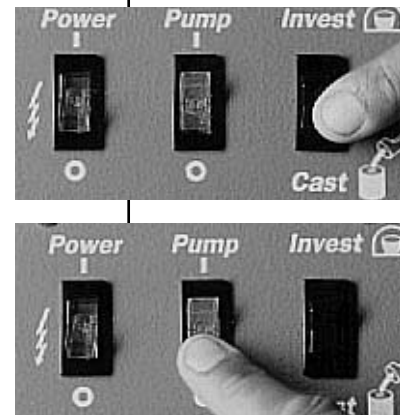
- 1 To season a new crucible, place a small amount of Matt's Casting Flux™ in a clean crucible, adjusted as covered in the SETUP section on page 6. Heat flux to form a thin glassy glaze inside the crucible. Repeat for each use, using a small quantity of Matt's casting flux. Too much will cause an excessive glassy slag buildup in the crucible.
- 2 Make sure that any remelt metal used is very clean and dry (free of oxides, invest-

ment, pickle residue and moisture).

- 3 Place the proper amount of metal in the preheated crucible for the pattern or patterns invested in the mold (wax weight x 11.4 + 15 grams* for silver; wax weight x 14 + 15 grams* for 14K gold).
*This is your button weight. If you are using NeuSprue™ system, your button is already included in your wax weight and does not need to be added in again.
- 4 Remove the mold 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 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.
- 5 With a good reducing flame (more gas than oxygen in the mix), heat the metal. Use a flame large enough that it will cover the whole melt.
- 6 When the metal starts to melt, turn on the vacuum pump and switch to the cast position.
- 7 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.
- 9 Use the torch to cover both the melt and the pour hole in the crucible. Tip the crucible to pour the metal smoothly into the sprue opening of the mold.
- 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.
- 13 Let the flask stand on a heat-resistant surface until the red color is completely gone from the button (you can use an

Please Note:

It is important that you read the safety precautions on page 4 before you begin casting.



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CAUTION:

Do not leave flasks to cool on the casting table. This will cause undue wear on the silicon casting pad.

Please Note: 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.

Casting Steps, continued

empty solid flask on the end of the mold flask to create a dark enclosure above the sprue button for viewing). Sterling, yellow gold and green gold can be quenched as soon as the red color is gone from the button. White and red gold should stand for an additional 15 minutes before quenching.

WARNING: Always wear appropriate safety glasses to protect your eyes during any metal melting and casting process. Always wear an appropriate respirator and have adequate ventilation when quenching a mold. Quickly place the whole mold under water until the investment cools and is eliminated. Investment powder 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. Call Rio Grande at 800.545.6566 and ask for a free MSDS about investment.

- 14 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 (order #705-168).

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

- 1 Pull the V.I.C. 12 machine toward the table edge.
- 2 Open the front of the V.I.C. 12 to expose the vacuum pump.



Oil Fill Port

- 3 Place a pint-size or larger container under the machine to catch the drained oil (3-foot hose at the bottom of the pump).
- 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. (Order 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 an oil recycler.

To Periodically Flush the Pump

- 1 Drain the oil.
- 2 Fill the machine 2/3 full with flushing oil (order #706-021).
- 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 (order # 706-020).
- 6 Dispose of used oil properly at an oil recycler.

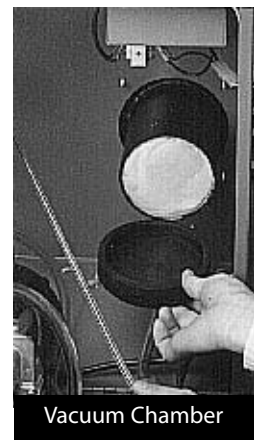


Oil Drain

Cleaning the Vacuum Chamber

Periodically (and especially 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 to open the front of the machine to access the bottom of the vacuum chamber (see the "Features" section at the front of this manual).



Vacuum Chamber

- 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, you'll find a soft ceramic-like fiber insulation material. If the ceramic fiber pad is damaged, replace it. If not, remove debris and re-install it back into the cap.
- 4** Make sure that the fiber insulation pad is in place at the bottom of the cap. Reposition the cap at the bottom of the vacuum chamber and retighten the clamp band to secure the assembly.

See your *Rio Grande Tools & Equipment* 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.

Accessories

Description	Packaging Size	Order #
Carbon Stirring Rods	pkg/5	705-120
Crucibles	each	704-046, 704-048, 704-049
Solid Stainless Steel Flasks	each	702-015/14 to 702-018/14; 702-022/14 to 702-025/14; 702-029/14 to 702-035/14; 702-039/14 to 702-044/14
Stainless Steel Perforated Flasks	each	702-184/N to 702-209/N
Flask Extenders for solid flasks	pkg/3	702-330 to 702-334
Flask Tongs	each	704-026
Investment, <i>Caster's Choice</i> ™ 5-, 10-, 25-, 50-, and 100-lb. boxes	each	702-255/5, 702-255/10, 705-255/25, 702-255/50, 702-255
Matt's Casting Flux™; 1 lb., 2 lb.	each	704-115, 704-099
Measuring Cylinders; 1000cc, 3000cc	each	702-113, 702-114
Mixing Bowls; quart or gallon size	each	702-131, 702-132
Mixing Spatula; 6"	each	702-141
Non-Asbestos Gloves; 14" or 18"	pair	704-104, 704-105
Rubber Gloves	pair	113-681
NeuSprue™ Sprue Bases	each	702-907 to 702-914
NeuSprue™	pkg/30 or 100	710-896/30 to 710-899/30 710-896 to 710-899
Slim NeuSprue™	pkg/30 or 100	710-980/30 to 710-983/30 710-980 to 710-983

Replacement Parts

Description	Packaging Size	Order #
Bell Jar, side-draw, 12"	each	702-156
High-Heat Fiber, 5" diameter	pkg/10	705-059
In-line Filter	pkg/3	705-169
Rio Flushing Oil; one quart	each	706-017
Rio Vacuum Pump Oil; one gallon	each	706-020
Rubber Boot, 5" diameter	each	705-064
Rubber Casting Pad, 6" diameter	each	705-163
Rubber Flask Flange Seal; 3", 3½", 4", 5"	each	705-164/3; 705-164/3.5; 705-164/4; 705-164/5
Table Filter Screen	pkg/10	705-168
Vacuum Pad for Investing, ¼" thick	each	702-171