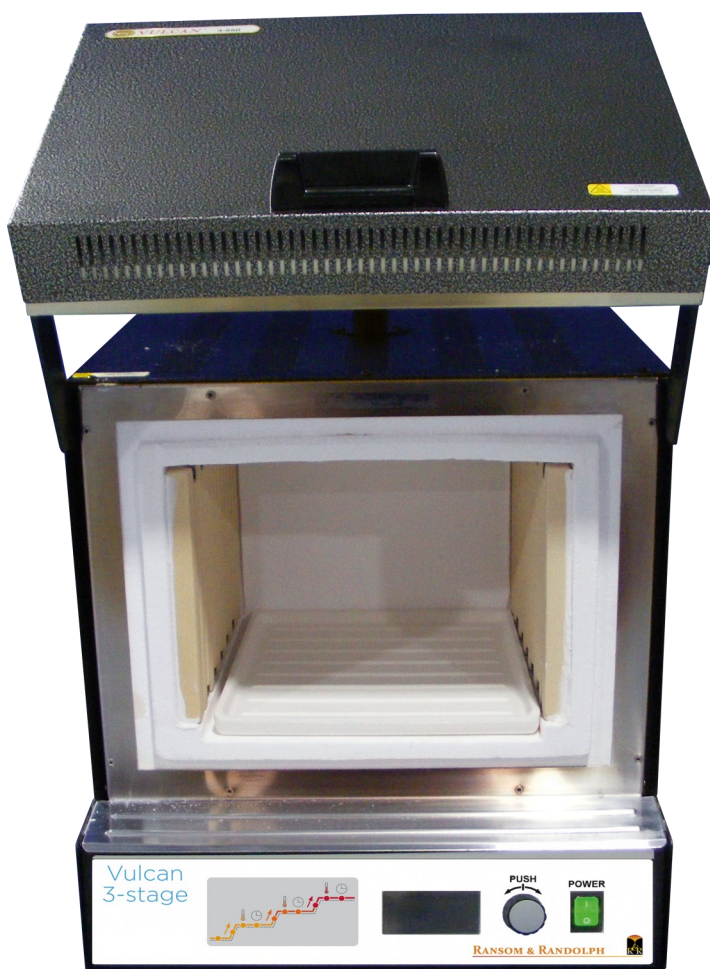

RANSOM & RANDOLPH

Instruction Manual

Vulcan[®] three-stage burnout furnace



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Investing with Innovation™

VULCAN® THREE-STAGE BURNOUT FURNACE

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For safe and proper use, carefully read this instruction manual and other documents accompanying the product.

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1 Safety and Responsibility



FOR PROFESSIONAL USE ONLY. Read the instruction manual for safe and proper use. Incorrect use may result in serious injury.

Illustrations in this instruction manual are meant to promote a basic understanding and may differ from the actual design of the unit, depending on the product type. If any errors are still present or if any information is missing, please notify us immediately.

The instruction manual is an integral part of the device and must be provided to the recipient of the unit if it is transferred or sold.

1.1 Intended Use

The Vulcan units are intended for preheating and burnout applications. This unit may only be set up, connected and operated in accordance with the “Technical Data” on page 8.

Any usage other than described above will lead to expire the warranty granted by Ransom & Randolph (R&R).





Examples of conceivable improper uses:

- Firing of unapproved materials
- Unsupervised operation
- Operation by non-qualified personnel

1.2 Operator Qualifications

Operators must be familiar with the tasks to be performed, e.g., dental technicians or other persons who are familiar with the usage of burnout furnaces of dental technology.

1.3 Warning Messages in this Manual

| Warning Sign & Signal Word | Significance | |
|---|-----------------|--|
|  DANGER | Personal injury | Indicates a hazardous situation which, if not avoided, will result in death or serious injury. |
|  WARNING | | Indicates a hazardous situation which, if not avoided, may result in death or serious injury. |
|  CAUTION | | Indicates a hazardous situation which, if not avoided, may result in moderate or slight injury. |
|  NOTICE | Property damage | Indicates a situation which, if not avoided, may result in damage to components, the installation or its functions or to property in its vicinity. |



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1.4 Operator Obligations

- Ensuring the proper use of the unit according to this manual and prevention of misuse
- Obtaining the required operating license from the competent authorities and following all applicable laws and regulations, e.g. with regard to:
 - Personal safety
 - Material safety
 - Waste disposal
- Operation of the unit by qualified personnel
- Operation of the unit by personnel to be trained, instructed, or undergoing training only to be carried out under the constant supervision of qualified personnel
- Definition of the responsibilities of staff members for commissioning, operation, cleaning, troubleshooting and maintenance
- Verified availability, legibility and completeness of the instruction manual at the point of use
- Staff instructions according to the requirements laid down in the instruction manual
- Compliance with all warnings and safety instructions
- Compliance with service instructions shown on the unit's display
- Service and repair work carried out by R&R qualified personnel or authorized by R&R
- Exclusive use of original spare parts
- R&R recommends a technical inspection of the unit to be performed by R&R every 12 months in order to maintain the unit's firing quality at a high level



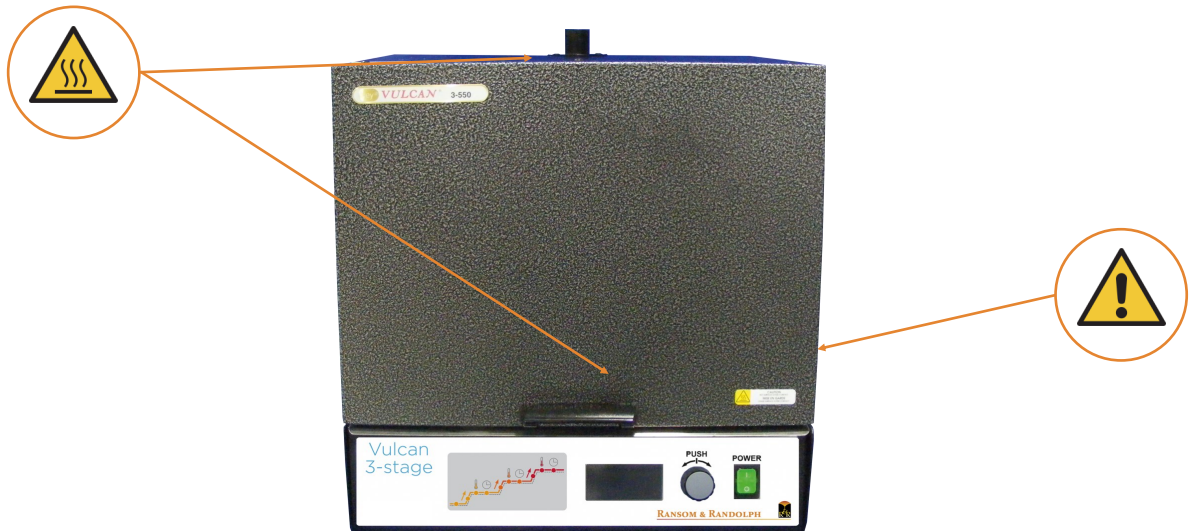
CAUTION. Burn hazards when touching hot surfaces.

Do not touch surfaces.



WARNING. Deadly electrical voltage.

Use only supplied power cords for connecting power to unit.



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1.5 Safe Handling of Ceramic Fibers

The thermal insulation of the firing chamber contains ceramic fibers that are classified as carcinogenic. These ceramic fibers are firmly enclosed in the heat insulation and pose no danger to operators when using the unit as intended.

OSHA AND CALIFORNIA PROPOSITION 65: MUFFLE DUST EXPOSURE

In keeping with the policy of R&R to build safe products, comply with all national and state statutes and keep you, the valued customer informed; the services of a certified industrial hygienist firm were employed to test and evaluate the lab operator's exposure to respirable refractory ceramic fiber (RCF) and cristobalite (a form of crystalline silica) present in the furnace muffle.

The findings of this test revealed that levels of exposure during the normal operation of this equipment, as outlined in the operator's manual, were far less than the permissible exposure limit set by the Federal Government.

When it becomes necessary to replace the muffle, the person doing this work is recommended to wear a HEPA filter respirator and protective gloves as a precautionary matter.

Seal used muffle in a plastic bag and dispose of in accordance with local, state and federal regulations.

This product and many similar products on the market today contain crystalline silica and ceramic fibers. In addition, there are thread lockers that contain a small amount of cumene. These products are used on the internal components of the furnace and are not contacted during normal use of the equipment.

As a result, it is necessary under the statutes of California Proposition 65 that R&R includes the following statement: *"This product contains substance(s) known to the State of California to cause cancer."*

Safety Data Sheets (SDS) for RCF materials supplied upon request.

1.6 Safety Instructions for Intended Use

- Repairs to the unit must only be carried out by an R&R authorized service technician
- Visible fiber deposits on opening accessible parts of the unit must be removed, e.g. wipe off with damp cloth or vacuum off using HEPA filtered vacuum
- Blowing off with compressed air or sweeping with brooms or brushes in dry condition is prohibited
- If there are more visible fiber deposits in the device than usual, contact R&R technical customer service
- The use of damaged components containing ceramic fibers must not be continued, e.g. firing chamber insulation material

1.7 Safety Instructions for Transport and Storage



WARNING

Severe crushing and impact hazard due to falling loads.

The unit may cause injury if dropped.

- Always have two people lift the device together.
- Transport the unit in its original packaging.



CAUTION

Damage due to improper storage.

- Store the unit in its original packaging.
- Store parts under the prescribed ambient conditions, **"Technical Data", page 8.**



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1.8 Safety Instructions for Commissioning



WARNING

Fire hazard

Flammable substances can pose a fire hazard to the entire work area.

- Use unit indoors only
- Place the unit only on a fireproof, stable and level surface
- Keep the unit away from flammable or explosive objects
- Place the unit at least 12" from walls or other objects and 20" from ceilings
- Do not cover the unit or place objects on top of the unit
- Do not place the unit in the immediate vicinity of sources of heat to prevent over heating of the unit



WARNING

Electrical shock can cause serious injury or death

- Connect the unit to a protected main outlet according to the technical data on page 8
- The electrical service provided must be a dedicated line of the proper size according to local electrical codes. Do not use power strips or extension cords
- Do not use damaged power cords
- Do not bend or squeeze the main cords
- Do not expose main cord to liquids
- Make sure the main cord is readily accessible so the unit can be disconnected easily and quickly in the event of an emergency
- Keep the unit away from moisture, e.g., do not place liquids on top of unit
- In case of malfunction, switch off power switch and disconnect main power cord
- Do not attempt to maintain the unit until you have read and understand this operation manual
- Disconnect the line cord before attempting to service the unit
- Do not operate the unit controls with tongs or other tools
- Do not use solvents or liquid cleaners on the control panel



CAUTION

BURN HAZARD IS PRESENT WHEN DOOR IS OPENED. USE CAUTION AFTER OPENING DOOR. SURFACES MAY BE HOT!



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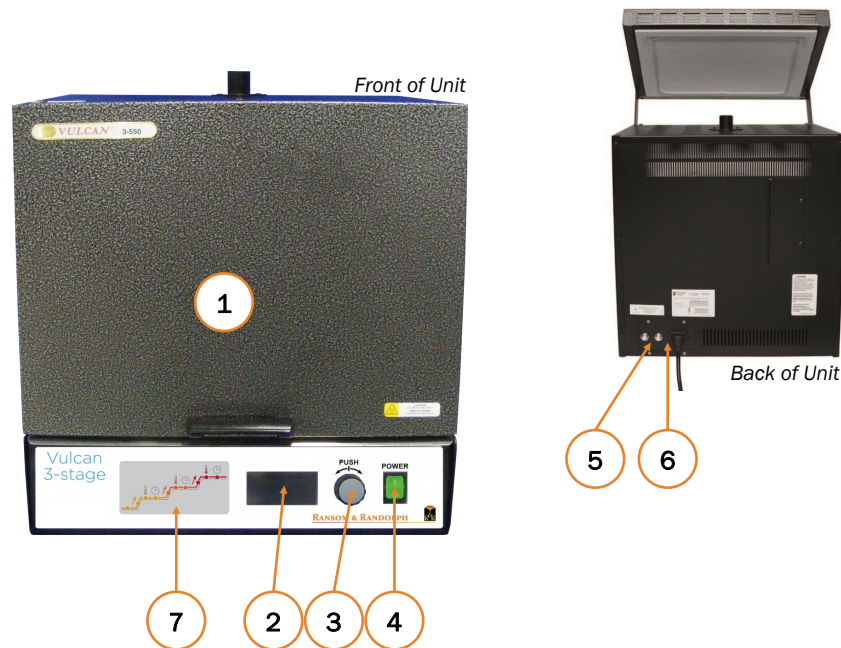
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1.9 Description of Unit



1 = Oven Door
2 = Display
3 = Control Knob

4 = ON/OFF Switch
5 = Circuit Breaker
6 = IEC Socket Main Power

7 = Program Parameter LEDs

| Symbol Table | |
|--------------|-------------------------|
| | Alternating Current |
| | On (Supply) |
| | Off (Supply) |
| | Caution, Hot Surface |
| | Protective Conductor |
| | Caution, Risk of Danger |



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2 Technical Data

| Parameters | |
|-----------------------------------|------------------------------|
| Wide Operating Temperature Range | 77-2012°F (25-1100°C) |
| Ambient Storage Temperature Range | 41-104°F (5+40°C) |
| Programmable Heat Rate | 1-54°F/min (1-30°C/min) |
| Programmable Hold Time | 0:00-99:59 hours |
| Muffle Temperature Uniformity | ±15°F (±8°C) at steady state |

| Electrical 50-60 Hz | | | | |
|--|------------|------------|------------|-------------|
| Model | 5355740001 | 5355740002 | 5355740003 | 5355740004 |
| Volts | 200-240 V | 100-120 V | 200-240 V | 100-120 V |
| Amps | 4.4 A | 12 A | 10 A | 14.7-16.0 A |
| Watts | 1060 W | 1440 W | 2400 W | 1470-1920 W |
| Watts to Maintain 1832°F (1000°C) (Air Exchange setting at 0) | 525 | 525 | 1050 | 1050 |

| Dimensions (L x D x H) | | |
|------------------------|---|---|
| | 13 x 11.5 x 13.8" (330 x 290 x 350 mm) | 17 x 15.8 x 16" (430 x 400 x 410 mm) |

| Weight | | |
|--------|---|---|
| | Furnace: 25 lbs. (11 kg) Shipping: 35 lbs. (16 kg) | Furnace: 45 lbs. (20 kg) Shipping: 60 lbs. (27 kg) |

| Operating Temperature (Ambient) | |
|---------------------------------|--|
| 41-104°F (5-40°C) | |

| Features | |
|---|--|
| <ul style="list-style-type: none"> • High performance hybrid muffle • Longer life, more durable than fiber construction • Faster heating and cooling than full firebrick • Integrated door safety switch • Durable stainless steel front panel • Three-stage digital controller (nine multi-stage programs, rate, hold time, delay start, alarm, °F/°C operation) | |



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3 Installation Instructions

Shipping damage should be reported to the carrier as soon as detected.

The unit package contains the following:

- One furnace complete with power cord
- Instruction manual
- Ceramic floor tray (shipped in the muffle)
- Two exhaust port plugs (for heat treating applications only)

3.1 Unpacking

Save the box and other packing material for future use in transporting the unit.

- Open the box
- Remove packaging supports
- Remove plastic bag
- **IMPORTANT!** The furnace is shipped with packing material inside the muffle. Remove this material before connecting power to the furnace

3.2 Installation

- Remove all packing material from in and around the furnace and muffle. The furnace should be located at least 12-20" away from walls, shelves, ceilings and heat sensitive materials. Open the furnace door and remove the packing material from inside the furnace. **NOTE:** The furnace front panel will show some discoloration around the muffle due to the calibration and burn in cycles performed at the factory.
- The furnace should not be located directly under shelves and other airflow restrictions.
- Connect the line cord packaged in the rear of the furnace to the socket in rear of furnace. Plug the other end into a properly grounded outlet.
- Combustion, Burnout or Reaction Processes
Position the furnace under a vent hood or connect the exhaust port to a ventilation system to prevent exposure to the exhaust fumes. The furnace exhaust port 1" (25 mm) OD by 1" (25 mm) long/can be ducted into the exhaust hood for more effective ventilation. Stainless steel flexible metal tubing can be used for this ducting.
- Heat Treating or Non-Reaction Processes
Position the furnace under a vent hood. Plug the exhaust port with the ball plugs provided in the furnace accessory kit. This will reduce heat loss and electricity requirements.
- Connect the furnace to a power circuit or receptacle with an over current protection (circuit breaker or fuse) rating of 15 Amps for 5355740001 & 5355740002, 10 Amps for 5355740003 and 20 Amps for 5355740004. The furnace should be the only load on this circuit.
- Turn on the furnace lighted power switch (right-hand side of the control panel).



NOTICE

- Operating the furnace without the ceramic floor tray may damage the furnace.



WARNING

- Do not use extension cords with this equipment.
- Plug the power cord into a circuit rated a minimum of 15 Amps for 5355740001 & 5355740002, 10 Amps for 5355740003 and 20 Amps for 5355740004.
- Do not position the unit in a way that blocks access to the power cord inlet socket or the wall outlet.



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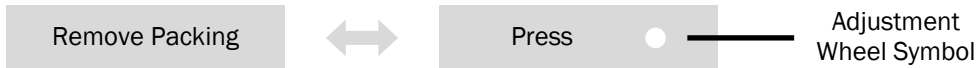
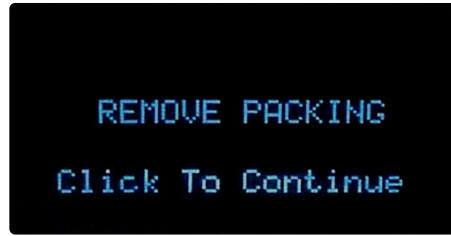
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4 General Operations

4.1 Function Operation

Display sequences at first power up:

- Plug the power cord into a wall outlet
- Turn on the front panel power switch
- The furnace control will go through a self-diagnostic test



The display shows the “Remove Packing” reminder and alternately the “Click To Continue” command.


- Remove the packaging material if not done so already and push the adjustment wheel.



- The unit is now ready for initial setup.

4.2 Adjustment Wheel Operation

The turning of the adjustment wheel is only detected by the control electronics after it has been pushed.

 **NOTE:** Follow the examples below on how to program a new value (turning the adjustment wheel clockwise will increase the value, while turning the adjustment wheel counterclockwise will decrease the value).



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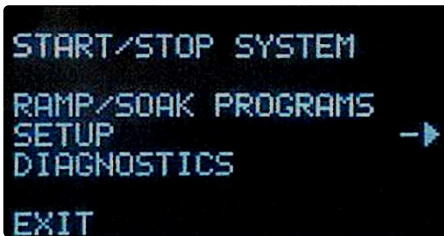
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4.3 Initial Set Up

Press knob once to pull up the START/STOP SYSTEM screen. Rotate knob until arrow aligns with SET UP and press knob.



There are 5 parameters that can be set up on this screen:



- **SONAR:** Alarm volume 0-5
- **ALARM TEMP:** Max temperature alarm set point
- **OFFSET:** This is set at factory and can be used to calibrate unit to an external digital thermometer
- **UNITS:** Temperature units F or C
- **TIME:** Set clock (to change from am to pm, you need to move hours past 12)

To set the parameters, rotate the knob to move the arrow to the desired parameter. Press the knob to select the parameter. Rotate the knob to change parameter. Press the knob to save parameter. Continue this process to set the balance of the parameters. The time must be set for other features to work properly. When you are finished setting the parameters, rotate the knob to move the arrow to SAVE and press the knob to save values. Rotate the knob to move the arrow to EXIT and press the knob. You will return to the START/STOP SYSTEM screen.

4.4 Setting Programs

On the START/STOP SYSTEM screen, rotate the knob to align the arrow with the RAMP/SOAK PROGRAMS and press the knob. The arrow will be pointing to RAMP/SOAK PRGM 1.



Pressing the knob will cause the arrow to start blinking and allow you to select from nine three-stage programs and one single-stage program by turning the knob.



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Select one of the programs by pressing the knob. The arrow will stop blinking to indicate that the program has been selected.

Each program has three stages that allow the following parameters to be set:

- **RMP:** ramp temperature rise per minute
- **TMP:** desired temperature to be reached in the stage
- **HLD:** the length of time you want the set temperature to be held

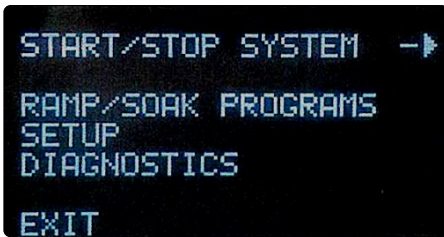
Once the parameters in each stage are reached, the unit will move to the next stage.

To change parameters, rotate the knob to move the arrow to the desired parameter. Press the knob to select the parameter. Turn the knob to change the value. Press the knob to save the value. Continue this process until all of the values have been set. Rotate the knob to move the arrow to SAVE at the bottom of the screen and press the knob to save the program. Rotate the knob to move the arrow to EXIT and press knob. You will be returned to the START/STOP SYSTEM screen.

To create additional programs, press the knob to return to the RAMP/SOAK PROGRAMS and follow previous procedure.

4.5 Starting the Oven

If you are not on the START/STOP SYSTEM screen, turn the knob to move the arrow to EXIT and press the knob. When the START/STOP SYSTEM screen is displayed, the arrow should be aligned with START/STOP SYSTEM.



Press the knob to move to the STATUS: HEATING SCREEN.



There are four parameters on this screen and two start options:

- **MODE:** choice of nine three-stage programs and one fixed temperature
- **LINK:** allows you to link two three-stage programs, creating six stages
- **DELAY:** permits setting a delayed start time
- **END:** can set to turn off or hold temperature, with or without audible



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Start Options:

- **DELAYED:** starts oven at predetermined time
- **START or STOP:** turns oven on and off
- **MODE:** rotate the knob to move the arrow down to mode. Press knob to select MODE. Rotate knob to one of the programs or FIXED TEMP. Press knob to select.
- **LINK:** this parameter is used to combine two three-stage programs to make a six stage program. Rotate knob to move arrow to LINK. Press knob to select. Turn knob to select program to combine with program listed in mode above. Set to OFF if you do not want to combine programs or have FIXED TEMP selected for MODE.
- **DELAY:** this parameter is used to set delayed start. Rotate knob to move arrow to DELAY. Press knob to select. Rotate knob to change start hour. press knob to move to start minutes. Press knob to select.
 - **Note:** you need to move the hour past 12 to change am/pm. Delay start will only work when DELAY is selected at bottom of screen.
- **END:** Use the knob to move the arrow to END. Press knob to select. Rotate the knob to select how you would like the unit to turn off at the end of the program. Press knob to select.

4.6 Turning the Oven On and Off

Rotate the knob to move the arrow to the bottom of the STATUS: HEATING screen. Select DELAY if you want to delay the start of the program, otherwise select START to turn on the Oven.



Oven On



Oven Off

To turn the oven off from the temperature display, press the knob twice and rotate the knob to move the arrow to STOP and press the knob.



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5 Maintenance/Error Messages



WARNING

This equipment contains dangerous voltages. Service and repair work should be carried out by R&R qualified personnel or authorized by R&R.

To keep the equipment in good working order you should follow the guidelines below.

- Examine the equipment regularly for mechanical damage
- Do not use solvents or liquid cleaners on the control panel

5.1 Cleaning

- Clean the unit as needed
- Vacuum with HEPA filter dust and dirt from the furnace rather than blowing. This will minimize the amount of air born dust particles
- Clean exterior surfaces with a soft, damp cloth using a mild detergent and water after unit has cooled
- DO NOT IMMERSE IN WATER!

5.2 Temperature Calibration

Every Vulcan furnace is calibrated in the factory at 1000 °C. Under normal use the furnace should not require calibration. The electronics used in the Vulcan furnaces are very stable and will have minimal drifts over the life of the furnace. Thermocouple replacement could be a potential requirement for calibration if high accuracy is required.

For example:

A furnace is operating at a stable temperature and a separate thermocouple is inserted in the furnace and a digital thermometer measures the muffle temperature. The display shows 875 °C which is the programmed temperature but the digital thermometer reads 868 °C (need +7 °C offset adjustment).

Make sure the power switch is in the off position. Press and hold the knob in while turning on the power switch. Hold the knob in for approximately 10 seconds until the offset screen is displayed. Release the knob. Turn the knob to the desired offset. Press the knob to store the offset and return to the main display.



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5.3 Troubleshooting

Service of this equipment should be done only by qualified personnel. Failure to comply may result in personnel injury and/or property damage.

| Problem | Cause | Solution |
|--|---|--|
| No power to unit | Power switch No line voltage | Place switch in ON position Check line voltage |
| Slow heating (Ramp rate not achieved) | <ul style="list-style-type: none"> Rate programmed too low Large load Ramp rate may not be achieved at higher temperatures | <ul style="list-style-type: none"> Push the adjustment wheel twice and check the rate value Reduce load size or adjust ramp rate lower Adjust ramp rate lower based on heating chart |
| Door too loose or tight | Force drag on door arms | Adjust the Hex screw on the upper rear corners to tighten or loosen |
| Displays "Error Code 1" | Open thermocouple | Call R&R Service Department |
| Displays "Error Code 2" | Shorted thermocouple | Call R&R Service Department |
| Displays "Error Code 4" | Backwards thermocouple | Call R&R Service Department |
| Displays "Error Code 8" | Circuit board over temperature | Call R&R Service Department |
| Displays "Error Code 16" | The muffle temperature exceeded 1150 °C | Call R&R Service Department |
| Error Message is Displayed | Power Interruption or Unknown | Perform a system reset: <ul style="list-style-type: none"> Turn off via Start/Stop System Exit to main screen Turn off power using green switch Wait 20 seconds Turn unit back on using green switch Turn On via Start/Stop System |

6 Accessories and Replacement Parts

| Description | Part # | Description | Part # |
|-------------------------------|------------|----------------------------------|-----------|
| Clutch and Coupling Assembly* | 9491056 | Service Muffle 550 230v* | 9493423 |
| Counterbalance Weight* | 9491066 | Service Muffle Assy 130 120v* | 9493422 |
| Crucible Former 2.0 Diameter | 9357118 | Service Muffle Assy 130 230v* | 9493420 |
| Encoder* | SRM-02844 | Shelf: Free Standing Model 550 | 9493327 |
| Exhaust Port Plug, 1" Kit* | 9491093A | Switch* | 1835.3118 |
| Insulation, Door, 130 | 9493325 | Switch, Door* | 9493338 |
| Insulation, Door, 550 | 9493365 | Thermocouple | TC-005 |
| Membrane Switch 3-130* | FP-02899 | Tongs, MFG* | 9491010A |
| Membrane Switch 3-550* | FP-02881 | Tray: Bottom Model 130 | 9353053 |
| Motor; Spring* | 9356001 | Tray: Bottom Model 550 | 9353057 |
| Rubber Foot | 9390616 | Vulcan 120 Volt Power Cord* | FP-02842 |
| Service Board Three-Stage* | DENT3STAGE | Vulcan 240 Volt Power Cord Euro* | FP-02841 |
| Service Muffle 550 120v* | 9493471 | Vulcan 240 Volt Power Cord* | FP-02839 |

*Covered under warranty



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7 Disposal

The unit and all its accessories must be disposed of according to applicable regulations through the intermediary of a certified waste disposer. Dispose of all electronic components in accordance with the legal requirements.

Contact R&R for country specific information.



CAUTION

Improper disposal may result in environmental damage

- Do not dispose of the unit, electronic or other components, accessories, or packaging with normal household waste at the end of their useful lives.
- Contact the competent authorities for information about correct and environmentally sound recycling or disposal of the unit and its packaging.



WARNING

- Parts of the packaging material (e.g., foils or polyethylene) may pose a suffocation hazard. Disposal of the packaging and all its parts out of the reach of children.

The packaging materials have been selected with environmental considerations in mind that are fabricated from recyclable materials.

The packaging material can be returned to the raw material state after use, salvaging valuable raw materials.

- The external packaging is made of cardboard
- The filler material is made of polyurethane foam
- The protective bags are made of polyethylene

Depending on national regulations, dispose of the packaging materials in an environmentally responsible manner, separated by materials.

8 Product Service



WARNING

This equipment is designed with safety features to protect the operator and must not be modified in any form. Only qualified individuals should repair this piece of equipment. Failure to observe these precautions may result in burns or electrical shock.

Three methods of product service are available:

- Telephone assistance available at the number listed below
- Return the unit for servicing using the instructions below
- Call R&R at the phone number below and obtain a service manual for a nominal fee



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8.1 Before Returning the Unit

- Call R&R for an Return Authorization Number (RAN) and appropriate shipping address. This is used to track and identify your unit. Equipment received without this number may not be identifiable.
- Equipment damaged in shipment as a result of improper packing may not be paid by the carrier.

R&R will not be responsible for damages resulting from improper packaging. Repair shipments must be prepaid, a copy of the equipment RAN must be included inside the package to quickly process the repair.

To secure a RAN for equipment repair, contact us at:

Phone: 800.800.7496 (US Customers)
419.865.9497 (International Customers)
Fax: 419.865.9997
Email: CustomerService@ransom-randolph.com

9 Warranty

LIMITED WARRANTY: Seller warrants each new product sold to be free from defects in material and workmanship under normal use and service. The obligation and liability of Seller under this warranty is limited to the repair or replacement at its factory, at the option of the Seller, of any such product, which proves to be defective within one (1) year after delivery, and is found to be defective in material or workmanship by Seller inspection. This warranty shall not apply to any product which has been subject to misuse; negligence; or accident; or misapplied; or modified; or repaired by unauthorized persons; or improperly installed.

Seller disclaims any liability arising from any failure of its products which is caused by, in whole or in part, the use in or with products or component parts not manufactured by seller, or by an alleged defect related to design, labeling or manufacturing specification supplied by buyer.

Seller's liability for all claims, whether based on breach of contract, negligence, product liability, or otherwise relating to the products, shall not exceed the dollar amounts paid by buyer under this contract. In no event will seller be liable for any punitive, special, incidental or consequential damages (including without limitation, loss of use, loss of profit and claims of third parties), however caused, whether by the negligence of seller or otherwise.

INSPECTION: Buyer shall inspect the product upon receipt. The buyer shall notify R&R in writing of any claims of defects in material and workmanship within thirty days after the buyer discovers or should have discovered the facts upon which such a claim is based. Failure of the buyer to give written notice of such a claim within this time period shall be deemed to be a waiver of such claim.

DISCLAIMER: The provisions of the above warranty are R&R's sole obligation and exclude all other remedies or warranties, expressed or implied, including those related to MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: Under no circumstances shall R&R be liable to the buyer for any incidental, consequential or special damages, losses or expenses.

LIMITATION OF ACTIONS: The buyer must initiate any action with respect to claims under the warranty described in the first paragraph within one year after the cause of action has accrued.



RANSOM & RANDOLPH

3535 Briarfield Boulevard | Maumee, OH 43537 USA
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