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# RANSOM & RANDOLPH

Instruction Manual

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## Vulcan<sup>®</sup> single-stage

burnout furnace



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3535 Briarfield Boulevard, PO Box 1570 | Maumee, OH 43537 USA  
800.253.4502 | 419.865.9497 | 419.865.9997 (FAX) | [www.ransom-randolph.com](http://www.ransom-randolph.com)



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# VULCAN® SINGLE-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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# VULCAN<sup>®</sup> SINGLE-STAGE BURNOUT FURNACE

## 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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## 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

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	0:00-60:00 hrs.
Muffle Temperature Uniformity	±15°F (±8°C) at steady state

Electrical 50-60 Hz		
Item #	5355730001	5355730002
Volts	200-240 V	100-120 V
Amps	7.7-9.2 A	16 A
Watts	1540-2215 W	1920 W
Watts to Maintain 1832°F (1000°C) (Air Exchange setting at 0)	1050	1050

Dimensions (L x D x H)
17 x 15.8 x 16" (430 x 400 x 410mm)

Weight
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"><li>• High performance hybrid muffle</li><li>• Longer life, more durable than fiber construction</li><li>• Faster heating and cooling than full firebrick</li><li>• Integrated door safety switch</li><li>• Durable stainless steel front panel</li><li>• Digital temperature controller (programmable temperature, rate, hold time, alarm, °F/°C operation)</li></ul>



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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 20 Amps on the low voltage model and 10 Amps on the high voltage model. 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 20 A for 120 V and 10 A for 230 V.
- 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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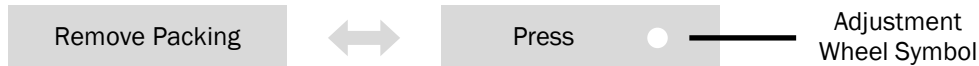
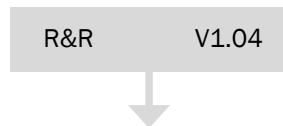
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## 4 General Operations

### 4.1 Function Operation

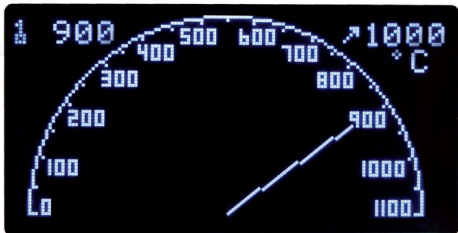
Display sequences at first power up:

- 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 furnace is now in operating condition, the display above shows current temperature at 900 °C ramping to 1000 °C.

### 4.2 Adjustment Wheel Operation

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



**NOTE:** If after a push or turn, the wheel is not active again within 7 seconds, the display reverts back to its previous state. 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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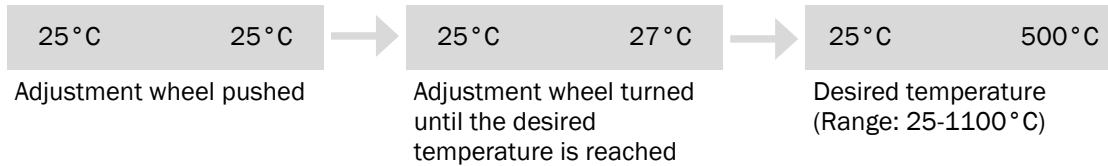
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## 4.3 Changing the Muffle Temperature

Push the adjustment wheel to change the programmed muffle temperature. To reach the muffle temperature screen directly from the main screen, push the adjustment wheel one time. The left side of the display shows the current temperature and the right side of the display accepts the new temperature to be controlled. Turn the adjustment wheel until the desired temperature is reached. A slow turn will change the value by 1; a fast turn will change the value by 10. Push the adjustment wheel to store the new muffle temperature.

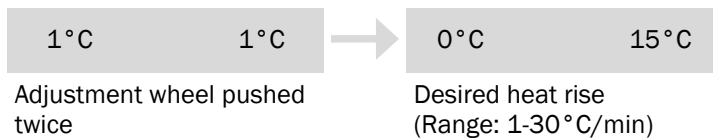


The display shows the actual furnace temperature and indicates the target temperature.



## 4.4 Changing the Heat Rise

After changing the muffle temperature, push the adjustment wheel to change the programmed heat rise. To reach the heat rise screen directly from the main screen, push the adjustment wheel two times. The left side of the display shows the current heat rise and the right side of the display accepts the new heat rise to be controlled. Turn the adjustment wheel until the desired heat rise is reached. A slow turn will change the value by 1; a fast turn will change the value by 10. Push the adjustment wheel to store the new heat rise. The display shows the actual furnace temperature and indicates the target temperature which is now controlled at 15 °C/min.



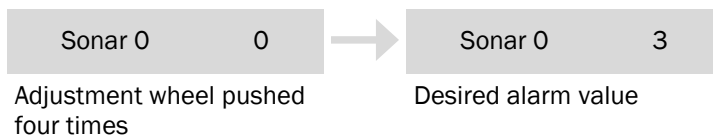
## 4.5 Activating the Hold Time

After changing the heat rise, push the adjustment wheel to activate the hold time. To reach the hold time screen directly from the main screen, push the adjustment wheel three times. The left side of the display shows the current hold time and the right side of the display accepts the new hold time (up to 60:00 hours) to be controlled. A slow turn will change the value by 1 minute. Push the adjustment wheel to store the new hold time.



## 4.6 Activating the Alarm

After activating the hold time, push the adjustment wheel to activate the alarm. To reach the alarm screen directly from the main screen, push the adjustment wheel four times. Turn the adjustment wheel until the desired alarm is reached. A value of 0 disables the alarm. Programming a value of 1 will emit a short beep every 4 seconds (increased values will elongate the beep time). Push the adjustment wheel to store the new alarm value.



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## 4.7 Changing the Temperature Unit

After activating the alarm, push the adjustment wheel to change the temperature unit. To reach the temperature unit screen directly from the main screen, push the adjustment wheel five times. Turn the adjustment wheel to change the temperature unit. Push the adjustment wheel to store the new temperature unit.



Adjustment wheel pushed five times

## 4.8 Diagnostics

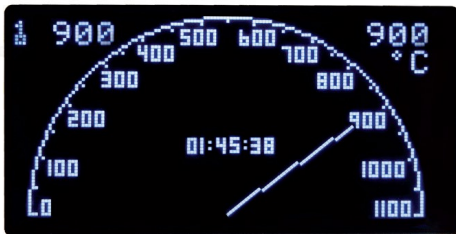
To reach the diagnostics screen directly from the main screen, push the adjustment wheel six times. The diagnostics screen will display error codes for troubleshooting. If the furnace is working properly, the screen will display “NO ERRORS”.

## 4.9 Starting/Stopping the Heating Cycle

After changing the temperature unit, push the adjustment wheel to start the heating cycle. To reach the heating cycle screen directly from the main screen, push the adjustment wheel seven times. The heating cycle screen changes the output state. Turn the adjustment wheel to change the output state between on and off. Push the adjustment wheel to turn the unit on/start the heating cycle. Once the unit is on, push the adjustment wheel to turn the unit off/stop the heating cycle.

## 4.10 Display at the Programmed Temperature

Once the furnace muffle reaches its programmed temperature the display shows the programmed hold time.



Hold time countdown

After opening the muffle door to retrieve the load, the display shows the actual temperature and the target temperature. The target temperature is again controlled by the programmed temperature.



The hold countdown continues to count down even though the temperature decreases after opening the muffle door.



### CAUTION

Use caution when removing materials from muffle.



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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"> <li>Rate programmed too low</li> <li>Large load</li> <li>Ramp rate may not be achieved at higher temperatures</li> </ul>	<ul style="list-style-type: none"> <li>Push the adjustment wheel twice and check the rate value</li> <li>Reduce load size or adjust ramp rate lower</li> <li>Adjust ramp rate lower based on heating chart</li> </ul>
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

## 6 Accessories and Replacement Parts

Description	Part #	Description	Part #
Clutch and Coupling Assembly*	9491056	Service Muffle Assy 130 120v*	9493422
Counterbalance Weight*	9491066	Service Muffle Assy 130 230v*	9493420
Crucible Former 2.0 Diameter	9357118	Shelf: Free Standing Model 550	9493327
Encoder*	SRM-02844	Switch*	1835.3118
Exhaust Port Plug, 1" Kit*	9491093A	Switch, Door*	9493338
Insulation, Door, 130	9493325	Thermocouple	TC-005
Insulation, Door, 550	9493365	Tongs, MFG*	9491010A
Motor; Spring*	9356001	Tray: Bottom Model 130	9353053
Rubber Foot	9390616	Tray: Bottom Model 550	9353057
Service Board Single-Stage*	DENTA	Vulcan 120 Volt Power Cord*	FP-02842
Service Muffle 550 120v*	9493471	Vulcan 240 Volt Power Cord Euro*	FP-02841
Service Muffle 550 230v*	9493423	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: 800.253.4502 (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.



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