

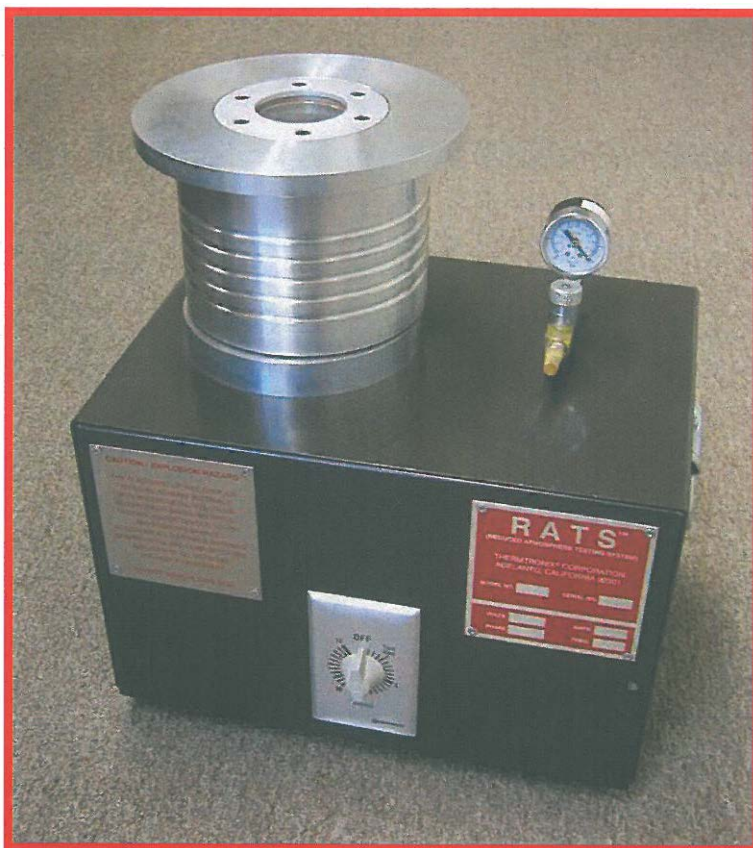
THERMTRONIX®
THE FUTURE IN ALUMINUM MELTING

RATS™

REDUCED ATMOSPHERE

TESTING SYSTEM

INSTRUCTION & SERVICE MANUAL



SAFETY FIRST

CAUTION – EXPLOSION HAZARD

THE PLACEMENT OF WET, DAMP OR
MOISTURE BEARING MATERIALS
INTO MOLTEN METAL WILL CAUSE
AN EXPLOSION WHICH MAY RESULT
IN DEATH AND/OR SERIOUS INJURY
AND PROPERTY DAMAGE.
BE CERTAIN ALL MATERIALS ENTERING
MOLTEN METAL ARE COMPLETELY DRY
AND FREE OF ALL MOISTURE.
PRE-HEAT IF NECESSARY.

DO NOT REMOVE THIS SIGN

**PLEASE NOTE THE ABOVE WARNING PLATE IS ATTACHED TO
EVERY REDUCED ATMOSPHERE TESTING SYSTEM.**

**BE CERTAIN THAT ALL EMPLOYEES WHO OPERATE THIS
EQUIPMENT HAVE READ AND UNDERSTAND THIS IMPORTANT
SAFETY INFORMATION.**

CONTENTS

	<u>PAGE</u>
Introduction.....	1
Section I	
Inspection and Set-up.....	2
Section II	
Testing Prior to Operation.....	3
Section III	
Normal Operation.....	5
Section IV	
Maintenance & Troubleshooting.....	7
Section V	
Parts List.....	8
Section VI	
Certification & Product Literature.....	10

INTRODUCTION

The "RATS™" Model 401 Reduced Atmosphere Testing System for aluminum alloys was designed by Thermtronix® specifically as a compact, portable, low cost quality control system for testing hydrogen gas levels in aluminum alloys.

The RATS™ Model 401 porosity tester allows for a simple, consistent, highly accurate, automatically timed seven minute test that can be performed AT THE FURNACE by shop personnel BEFORE THE METAL IS CAST, assuring consistent quality levels.

The heavy gauge steel enclosure with plated steel carrying handles protects all internal components while heavy rubber vibration dampening feet isolate the unit from the external vibration of surrounding equipment to further assure consistent test results.

You will find that this instruction and service manual goes into much greater detail than is required for routine operation and maintenance. Experience has shown that plant operating and maintenance personnel can obtain a good working knowledge of a RATS™ System with just a few operations and your Thermtronix® representative will be able to assist you by telephone or in person, if required, to answer any questions you may have and insure that you have a thorough understanding of the RATS™ Model 401 Reduced Atmosphere Testing System.

SECTION I - INSPECTION AND SET-UP

- A. Carefully inspect all parts of shipment for any possible damage which may have occurred in transit. Any visible signs of damage to the outside of shipment should be noted and acknowledged by the carriers driver or representative. Any concealed damage discovered during unpacking should be reported immediately to the freight carrier.

- B. Move the shipping carton to an area where you can carefully remove all packing material. It is suggested that the carton and packing materials be retained until after your RATS™ Model 401 is operating to assure that no parts have been accidentally discarded with these materials.

- C. The following parts are packaged and shipped with each RATS™ Model 401 Reduced Atmosphere Testing System:
 - a. One (1) factory assembled and tested RATS Model 401 unit with steel enclosure and power cord.
 - b. One (1) aluminum vacuum test chamber with o-ring.
 - c. Two (2) steel crucibles.
 - d. Two (2) high temperature insulating disks.
 - e. One (1) instruction & service manual.

- D. Every RATS™ Reduced Atmosphere Testing System is held to the highest quality standards throughout each step of the manufacturing process and system tested after final assembly prior to shipment. However, we suggest you follow the steps in Section II "Testing Prior to Operation" not only as a double check of our own high quality standards but also as an aid to familiarize yourself with the system operating characteristics and maintenance procedures.

SECTION II - TESTING PRIOR TO OPERATION

- A. Make certain that both the aluminum base plate, on top of the RATS™ unit, and the o-ring at the bottom of the vacuum test chamber are clean and free of any foreign matter. This is necessary to assure a good chamber seal and proper vacuum for consistent test results.
- B. Your RATS™ unit was supplied with two (2) high temperature insulating disks. Place one (1) of these disks in the 3" diameter recess of the aluminum base plate. The second insulating disk is a spare.
- C. Two (2) steel crucibles were supplied with your RATS™ unit. Place one (1) steel crucible on top of the aluminum base plate in the center of the insulating disk.

D. Make sure the adjusting valve (under the vacuum gauge) is fully clockwise (completely shut off) and place the vacuum test chamber on the aluminum base plate making certain the chamber is centered on the base plate.

E. Plug your RATS™ Model 401 unit into the proper electrical outlet. While placing a slight pressure on the top of the vacuum test chamber to form a seal, turn the mechanical timer to approximately seven (7) minutes.

F. Observe the vacuum gauge. Your RATS™ unit should pull approximately 28.5 inches of mercury in less than 15 seconds.

Note: This is a "sea level" measurement and will be slightly lower at higher altitudes.

G. The adjusting valve may now be set for the desired vacuum level. Typical is 28 inches for sand castings, 26 inches for permanent molds and lock in place. Whatever vacuum level you choose, locking the valve in place is an important step to assure consistent and repeatable test results.

SECTION III - NORMAL OPERATION

- A. First, as noted on the RATS™ warning plate, "CAUTION - EXPLOSION HAZARD", care must be taken that the steel crucible is completely dry and free of any moisture bearing substance. It is suggested that the steel crucible be carefully preheated before entering the molten aluminum bath. Many customers prefer to coat the steel crucible with a ladle wash to aid in the release of the sample.
- B. Place your RATS™ unit on a clean level surface as close as practical to the furnace from which samples are to be taken. This is necessary to assure the molten aluminum sample is tested before it begins to solidify.
- C. After preheating, dip the steel crucible into the molten aluminum bath filling to approximately 1/8 inch below the lip. While exercising general foundry safety practices not to spill the molten metal, immediately place the steel crucible with molten aluminum on the center of the high temperature insulating disk.
- D. Place the vacuum test chamber over the sample and set the timer for seven (7) minutes, while holding a slight pressure on top of the chamber, to assure a good seal.

- E. When the timer runs out in seven (7) minutes pull the quick release valve, behind the adjusting valve, to release the vacuum test chamber. Carefully remove the hot sample from the steel crucible. The sample may be chilled in water to facilitate cooling if desired. Observe the sample and note if gas levels were extremely high the sample will have "bubbled up" on top as gas escaped to the surface. A slight shrink on top of the sample is an indication of a lower and more acceptable gas level.

CAUTION: The sample may cause hot water to "spit". Due caution must be exercised to prevent scalding drops of water from contact with skin.

- F. When the sample can be safely handled have it cut in half, observing good safety practices, and sand one half on a belt sander to observe the hydrogen porosity levels as shown on bulletin number 403 (copy attached).

SECTION IV - MAINTENANCE AND TROUBLESHOOTING

- A. **DO NOT** attempt to restart motor under a partial vacuum.
This action may cause permanent motor damage. Always be certain to completely release vacuum before starting motor.
- B. Daily inspections should be made of the vacuum gauge and vacuum test chamber o-ring as well as all exposed fittings and filters to assure a good seal and proper vacuum.
- C. Make sure the carrying handles are secure and the vibration dampening rubber feet are in good repair.
- D. Inspect the electrical cord, confirm that it is in good condition and not frayed or burnt.
- E. See parts list in rear of this manual for a complete listing of factory authorized replacement parts.

SECTION V - REPLACEMENT PARTS LIST

<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>QTY</u>
Steel Crucible	400-0001	2
High Temperature Insulating Disk	400-0002	2
Vacuum Test Chamber O-Ring	400-0431	1
Vacuum Test Chamber with Site Port	400-6242	1
Site Port High Temperature Glass	400-8477	1
Site Port High Temperature O-Ring	400-9396	1
Vacuum Base Plate	400-6212	1
Vacuum Gauge	400-0005	1
Vacuum Adjusting Valve	400-0006	1
Vacuum Quick Release Valve	400-0007	1
Vacuum Inlet Filter Port	400-0008	1
Mechanical Timer Assembly	400-0009	1
120 Volt Power Cord	400-0010	1
Steel Carrying Handles	400-0011	2
Vacuum Pump / Motor Assembly	400-0012	1
Exhaust Muffler	400-0013	1
Rubber Feet	400-0014	4
Brass Fitting 1/8" 4-Way	400-0031	1
Brass Fitting 1/8"x1/4" Elbow	400-0032	1
Brass Fitting 1/8" Nipple	400-0033	1
Brass Fitting 1/4" Tee	400-0034	1
Brass Fitting 1/4"x1/4" Elbow	400-0035	1
Vacuum Tubing	400-0015	N/A
Steel Enclosure	400-0041	1

RATS™ MODEL 401 Tel:+760-246-4500 Fax:+760-246-4550



<u>Description</u>	<u>Part number</u>	<u>Description</u>	<u>Part number</u>
01) Nameplate-Caution	01) 400-0024	11) Mechanical Timer Assembly	11) 400-0009
02) High Temp. Insulating Disk	02) 400-0002	12) Vacuum Gauge	12) 400-0005
03) Vacuum Test Chamber O-Ring	03) 400-0431	13) Steel Crucible	13) 400-0001
04) 120 volt Power Cord	04) 400-0010	14) Vacuum Chamber w/Site Port	14) 400-6242
05) Steel Carrying Handles	05) 400-0011	15) Vacuum Base Plate	15) 400-6212
06) Vacuum Quick Release Valve	06) 400-0007	16) Vacuum Pump & Motor Assy.	16) 400-0012
07) Vacuum Inlet Filter Port	07) 400-0008	17) Pump Seal Kit (2 required)	17) 400-0045
08) Exhaust Muffler	08) 400-0013	18) Site Port High Temp. Glass	18) 400-8477
09) Vacuum Adjusting Valve	09) 400-0006	19) O-Ring Site Port High Temp.	19) 400-9396
10) Rubber Feet	10) 400-0014		

SECTION VI - CERTIFICATIONS AND PRODUCT LITERATURE

Gauge Certification

RATS™ Product Bulletin #403

THERMTRONIX®

RATS™

(REDUCED ATMOSPHERE TESTING SYSTEM)



RATS™ Model 401
Size = 9" x 10" x 14"
230mm x 255mm x 355mm
Weight = 45 lbs. (20kg)

ALUMINUM POROSITY TESTER

RATS™ MODEL 401 reduced atmosphere testing system is a compact table top quality control system ideally suited for fast, accurate, repeatable and reliable testing of molten aluminum. Designed for accurate monitoring of hydrogen gas levels in molten aluminum, this rugged foundry proven unit can be placed within a few feet of melting operations for continuous monitoring of quality levels. RATS™ permits a simple, consistent, highly accurate, automatically timed five minute test that can be performed by shop personnel and assures consistent quality levels **BEFORE** the metal is cast.

RATS™ Model 401 by **THERMTRONIX®** can prove a valuable addition to any SPC or Total Quality Control system where the desired objective is the production of **QUALITY** cast aluminum products.

Product Bulletin 405

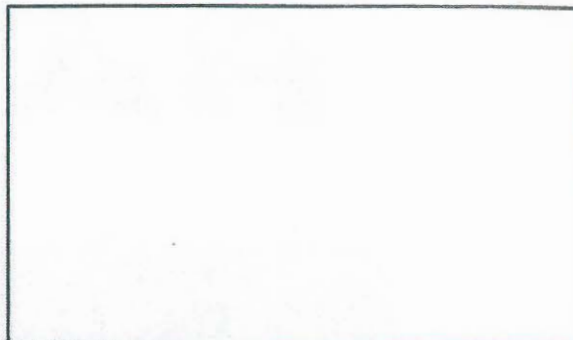
THERMTRONIX®

Hydrogen is a highly soluble gas in molten aluminum and the affinity for aluminum to absorb hydrogen increases with time and temperature. Hydrogen gas is formed when aluminum comes in contact with water vapor, a natural by-product of combustion with gas and fuel fired furnaces as well as naturally occurring in the atmosphere, especially on humid days. As aluminum solidifies the escaping hydrogen gas forms cavities or gas pockets causing hydrogen porosity, a major problem in all types of manufacturing facilities producing cast aluminum products.

RATS™ Model 401 reduced atmosphere testing system by **THERMTRONIX®** uses a true one-third horsepower two-cylinder, two-stage vacuum pump with features such as a permanent split capacitor motor, oil-less non-lube piston and cylinder with permanently lubricated ball bearings, stainless steel valves and lapped aluminum valve plates. The vacuum test chamber consists of a precision machined base, heavy wall aluminum chamber with a high temperature glass site port for viewing sample.

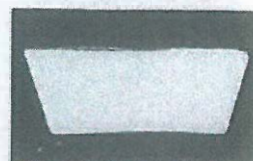
Brass fittings and filters eliminate corrosion and a fully adjustable brass needle valve with locking set screw allows precise calibration at 26" (660mm) or 28" (711mm) of Hg. A spring return brass push button permits quick release of vacuum chamber and a large clear dial vacuum gauge is calibrated for both 0-30" and 0-760mm Hg. A mechanical timer provides consistent, repeatable settings and automatically shuts unit down at the end of cycle. Model 401 includes a heavy gauge steel enclosure with plated steel carrying handles to protect all internal components while heavy rubber vibration dampening feet isolate unit from external vibration of surrounding equipment to further assure consistent test results.

REPRESENTED BY



The samples below demonstrate the dramatic effect of the **RATS™** reduced atmosphere testing system. All of the samples were taken from the same furnace at one time and have the same levels of hydrogen gas. The difference is the amount of reduced atmosphere at which each sample was tested.

0" (0mm) Hg.



22" (560mm) Hg.



26" (660mm) Hg.



28" (711mm) Hg.



Web Site <http://thermtronix.com>

Product Bulletin 405

THERMTRONIX®

THE FUTURE IN ALUMINUM MELTING

THE WORLDS LEADING MANUFACTURER OF

SOLUTIONS

TO YOUR QUALITY

ALUMINUM

MELTING REQUIREMENTS

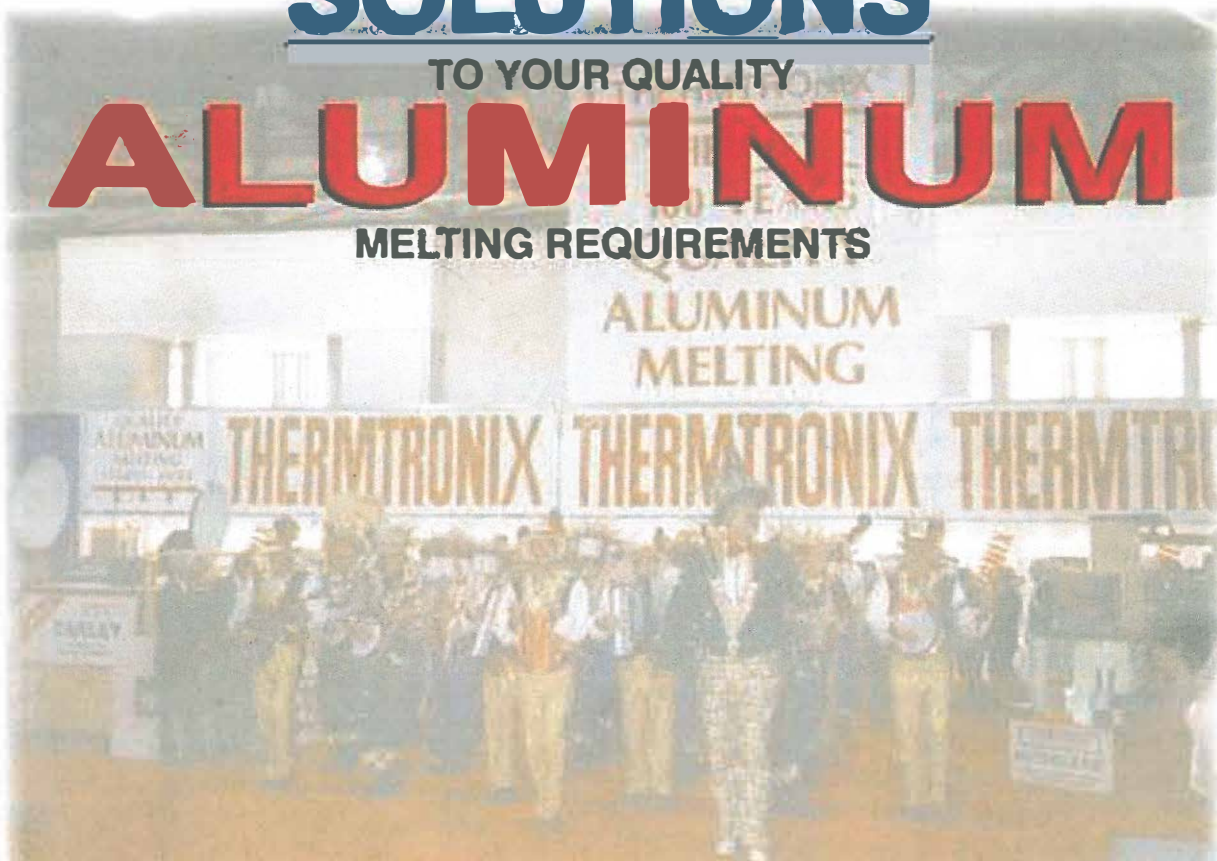


PHOTO COURTESY OF THE AMERICAN FOUNDRYMEN'S SOCIETY ON THE OCCASION OF THEIR 100TH CASTING CONGRESS IN PHILADELPHIA, PENNSYLVANIA

NO MATTER WHERE YOU ARE LOCATED IN THE WORLD THERMTRONIX® IS NO FURTHER AWAY THAN YOUR TELEPHONE, FAX OR E-MAIL. VISIT US ON THE WORLD WIDE WEB.

<http://www.thermtronix.com>

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INSTRUCTION & SERVICE MANUAL