

VDO Vacuum Degassing Oven



This manual contains important operating and safety information. Carefully read and understand the contents of this manual prior to the operation of this equipment.

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Information in this document is subject to change without notice and does not represent a commitment on the part of:

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For assistance with set-up or operation, contact the ATS Service Department. Please have this manual and product serial number readily available when you call.

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## Introduction

#### A.1 – Unpacking

Retain all cartons and packing materials until the unit is in operation. If damage has occurred during shipping, notify Applied Test Systems (ATS) and the carrier immediately. If it is necessary to file a damage claim, retain **ALL** the packing materials for inspection by the carrier.

### A.2 – Warranty Information

All new ATS systems are shipped with a warranty. Units have a warranty against defective parts and workmanship for one calendar year from the date of shipment. Please see APPENDIX A of this manual for complete details on the warranty.

### A.3 – After Sale Support

If there are any questions concerning the operation of the unit or software, contact the ATS Service Department at service@atspa.com.

Before emailing, please obtain the software revision number and the serial number from the unit's data tag. A sample data tag is illustrated below, and can be completed with the unit's information for easy reference. Please be prepared to give a complete description of the problem to the ATS Service Department.

APPLIED TEST SYSTEMS THE MARK OF RELIABILITY	NO.		
		AMP	VAC
		PH	ΗZ
DWG			
	0	· · ·	

iFigure A.3.1 - ATS Sample Data Tag

## B.1 – For Owners, Operators, and Maintenance

All ATS equipment is designed to be operated with the highest level of safety. This manual uses note, caution, and warning symbols throughout, to draw attention to important operational and safety information.

Read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions regarding the operation of the unit or instructions in this manual, contact the ATS Service Department at +1.724.283.1212.

Read and follow these important instructions. Failure to observe these instructions can result in permanent damage to the unit, significant property damage, personal injury or death.

## B.2 – Cautions & Warnings



Burn Hazard / Hot Surface



Electrical Shock / Electrocution. Dangerous high voltages present. Do not attempt to open the enclosure or gain access to areas where you are not instructed to do so. Refer any possible servicing to qualified service personnel only.



Hand Crush / Force From Above



Protective Earth (Ground) / Obey all national and local electric code requirements.



General Danger. Thoroughly understand the safety features and operation of the equipment. This manual will provide operators with safety concerns and general procedures. Be familiar with correct operating principals and use good judgment. Also, refer to the appropriate manuals for system component safety manuals.



No Access For Unauthorized Personal



Read Operator's Manual. Read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions regarding operation of the unit or instructions in this manual, contact our Service Department.



Disconnect power prior to performing maintenance. Turn off the unit and disconnect the line cord from the power source before performing any maintenance procedures.



Hot / Burn surface, use Personal Protective Equipment (PPE) when operating the VDO, and handling materials associated with the testing procedure.



Pinch Hazard



Do not open the panel



Unpack and operate on a stable surface.



Installation of electrical devices must be accomplished by competent personnel and done in accordance with any current local and national codes. Equipment grounding is a MUST.



Before energizing the electrical power to the Vacuum Degassing Oven, turn off all power switches and place all controls in an OFF position. Check that your power source is of the appropriate voltage and is surgeprotected. Use appropriate power adapters based upon your region.

## **B.3 – Caution & Warning Locations**



iiFigure B.3.1 - Overhead View of Labels



iiiFigure B.3.2 - Side View of Labels

## **System Overview**

## C.1 Equipment Parts

#### Front of Unit



ivFigure C.1.1 - Front of VDO Unit

- 1. Vacuum Gauge 4. Process Complete Indicator
- 2. Vacuum Lid with View Port
- 3. In Process Indicator
- 5. Vacuum Relief Valve
- 6. Controller

#### **Back of Unit**



vFigure C.1.2 - Back of VDO Unit

- 1. On / Off Switch
- 2. End of Test Alarm
- Voltage Selector Switch (Make sure voltage is correct as stated on the Data Tag; Elements may become damaged at wrong voltage)
- 4. AC Power Connection
- 5. Fan
- 6. Data Tag

#### **Interior Chamber**



viFigure C.1.3 - Tank Interior



viiFigure C.1.4 - Tank Exterior

- 1. O-Ring
- 2. Exhaust
- 3. RTD

- 4. Vacuum Pump Intake
- 5. Vacuum Verification Port
- 6. Vacuum Relief Valve

#### **Interior Controls**



viiiFigure C.1.5 - Controls

- 1. Power Control
- 2. Fan
- 3. Solenoid
- 4. Relay For Vacuum Pump
- 5. Pump Body
  6. SSR (Solid State Relay)
  For Heaters
  7. Watlow Temperature
  Controller
  8. Vacuum Gauge

### C.2 Product Description

The Vacuum Degassing Oven is designed for degassing pressure aged binder samples to precisely and accurately meet AASHTO R28, ASTM D-6521, and EN 14769 test standards.

#### **Major Components**

- Unit
- Lid
- Power Cord

#### Accessory Items

- Specimen Containers (4 included with unit)
- Specimen Removal Tool (included with unit)
- VDO Verification Kit consisting of a Temperature Monitor, RTD Probe, VDO Chamber Cover, Vacuum Gauge, Brass Extension Fitting Parts, and Calibration Fixture (*Figure C.2.1*).

### **Product Specifications**

Unit Design	Bench Top Unit
Specimen Capacity	4 eight ounce or 8 four ounce specimen containers
Product Dimensions	20.25 inches wide X 14.25 inches deep X 14 inches high
Weight	59 lbs.
Temperature Range	Ambient to 410° F (210° C)
Temperature Accuracy	0.2° F (± 0.1° C)
RTD Temperature Measurement	Class A RTD at maximum temperature $\pm$ 1° F ( $\pm$ 0.55° C)
Accuracy	
Over Temperature Protection	Disc Thermostat open on rise Auto reset, Open 425° F $\pm$ 15°
	F (218° C ± 8° C), Close 375° F ± 20° F (191° C ± 12° C)
Power Requirements	115 V / 60 Hz or 230 V / 50 / 60 Hz

## C.3 Environmental Conditions

The Vacuum Degassing Oven (VDO) should be kept in the following conditions, in an ideal setting:

- Temperature of 15° C to 35° C
- Relative humidity should not exceed 75%
- Air pressure of 75 kPa to 106 kPa
- No hard-frost, dew, percolating water rain, solar

irradiation, etc.

- Installation category II
- Pollution degree 2

## **Verification Kit**



ixFigure C.2.1 - VDO Verification Kit

- 1. Resistance Temperature Detector (RTD) Probe
- 2. Temperature Monitor
- 3. Calibration Fixture

4. Vacuum Gauge

5. Brass Extension Fitting Parts

6. VDO Calibration Cover

## Installation

## D.1 Assembling the VDO

Carefully remove the VDO from the packing crate and place it on a level work space. Make sure to remove any and all packing materials and / or accessories that may have been placed inside the vacuum chamber during shipment.

1. Place the O-Ring Gasket in the grove on the vacuum chamber flange. These may already be in place. See *Figures D.1.1 and D.1.2*.



xiFigure D.1.1 - O-Ring in Place



xFigure D.1.2 - Close Up of O-Ring



xiiFigure D.1.3 - O-Ring

- 2. The images above represent and show an O-Ring being placed onto the Vacuum Degassing Oven (VDO) into the slotted cut out. The O-Ring is in place to keep the vacuum within the spherical cylinder. Make sure the O-Ring is properly greased with a thin film coating. *Figure D.1.3* is an isolated picture of the O-Ring.
- 3. Replace the lid on the vacuum oven.

## D.2 Connecting and Powering Up

- Make sure the voltage select switch is set to the appropriate voltage that was purchased for the machine (selecting the incorrect voltage may cause damage to the elements), switch up is 115V, switch down is 230V.
- 2. Make sure the ON /OFF switch on the back of the unit is in the OFF position. Connect the power cord to the AC power connection below it.
- Plug the other end of the power cord into a standard outlet appropriate for the voltage purchased (110 – 125 VAC 60 Hz outlet, 10 amp or greater capacity; or use 230 – 240 VAC 50 / 60 Hz 5 amp capacity).
- Switch the ON / OFF switch upward to the on position. The controller on the front of the VDO should now be illuminated, indicating that the power is now on.



xiiiFigure D.2.1 - AC Power Connection and ON / OFF Switch

## D.3 Vacuum Adjustment

- Altitude conversion chart for negative pressure gauges. In order to achieve 15 kPa absolute pressure, use the chart on the following page to determine your corrected 15 kPa value. Utilize the conversion chart below to correct 15 kPa for your local altitude and barometric pressure.
- 2. After determining the corrected value, adjust the gauge installed on the VDO. Perform this by first removing the VDO top cover. Then rotate the gauge to align with 15 kPa.

For greatest accuracy, use the lab barometer or check with the local weather bureau for current (or average) barometric pressure in your location and reference that to the pressure indicated in the gray-shaded columns on the table below.

Applied Test Systems (ATS) assumes no responsibility to determining the proper ambient barometric pressure for your specific location and altitude.

Altitude (In Feet)	Inches of Mercury (Hg)	kPa	15 kPa
			In Hg Corrected
0	30	101.3	-25.49
500	29.4	99.5	-24.96
1,000	28.9	97.7	-24.43
1,500	28.3	96	-23.91
2,000	27.8	94.2	-23.39
2,500	27.3	92.5	-22.89
3,000	26.8	90.8	-22.39
3,500	26.3	89.1	-21.90
4,000	25.8	87.5	-21.41
4,500	25.4	85.9	-20.93
5,000	24.9	84.3	-20.46
5,500	24.4	82.7	-20.00
6,000	24	81.2	-19.55
6,500	23.5	79.7	-19.10
7,000	23.1	78.2	-18.66

## Verification

### E.1 Verify Temperature

In order to perform an accurate verification of the VDO temperature, it is recommended that customers purchase a VDO Verification kit from ATS. This kit contains the necessary parts to properly connect a calibrated thermometer to the temperature sensor of the VDO. It also includes the parts needed to provide the insulating material necessary to create a stable oven temperature to perform the verification process.

Should you choose to attempt a temperature verification of the VDO without the use of an ATS VDO Verification Kit, you should be aware of the following:

- It is necessary to have a good thermal coupling between the temperature sensor of the VDO and the temperature probe of the reference temperature measuring device being used to verify the temperature readout of the VDO. This is typically done by means of a brass block or other device suitable to create a stable thermal conductivity between the two devices.
- The VDO oven should have some type of insulating material covering the top of the oven to prevent excessive heat loss during the verification process.

The following temperature verification instructions assume that the customer is using an ATS VDO Verification Kit:

1. Place the smaller end of the VDO Temperature Calibration Fixture over the end of the RTD protruding from the bottom of the VDO oven (*Figures E.1.1 and E.1.2*). Secure the brass setscrew in the side of the calibration fixture to the RTD.



xvFigure E.1.2 - Calibration Fixture over RTD

xivFigure E.1.1 - VDO RTD

- 2. Place the probe of the calibrated thermometer through the hole in the calibration cover, and insert the probe tip into the larger end of the VDO calibration fixture as far as it will go. Tighten the thumb screw on the top of the calibration fixture against the RTD probe. See *Figures E.1.3* and *E.1.4*.
- 3. Carefully place the cover over the VDO oven, being careful not to dislodge the calibration fixture from the RTD of the VDO. Careful to not move O-ring out of place when putting the lid on. Wrap a rag or other suitable insulation around the end of the temperature probe protruding from the top of the cover to minimize heat loss from the VDO oven.



xviiFigure E.1.3 - Insert Probe into Fixture



xviFigure E.1.4 - **Placing Cover Over Oven** 

- From the VDO Watlow Temperature Controller, press the left FN button to begin heating the VDO to the setpoint temperature of 170°C. Allow at least 45 minutes to 1 hour for the VDO to heat and stabilize at the setpoint temperature of 170° C + / - 5 degrees C before taking any comparison readings.
- 5. Once the temperature of the VDO has stabilized, record a minimum of three comparison readings between the VDO displayed temperature and the temperature shown by the calibrated thermometer. The allowable difference in temperature between the two devices is + / 1.0° C. Allow a minimum of five minutes between readings. If any of the three readings differ by more than the allowable + / 1.0° C, wait a minimum of fifteen minutes to allow the temperature of the VDO to stabilize, and repeat the three readings.
- If a large temperature difference is noted (+ / 5° C or greater), recheck the physical coupling of the two RTD probes and repeat. If adjustments to the VDO temperature display are required, follow the instructions in Step 7.

- 7. From the main screen on the Watlow Temperature Controller, hit the right arrow key. This will take you into the Operations screen. From there, use the symbol to scroll down to the setup tab. Use the right arrow key to enter the tab. Next, enter into the Analog input screen. Scroll down till you see a tab called Calibration offset. Use the right arrow key to enter. This value can be changed using the + and keys. Change the value until the temperature display of the Watlow matches the calibrated thermometer within 0.1°C.
- 8. Allow the VDO temperature to stabilize at 170° C + / 1.0° C, and repeat the verification process.

### E.2 Verify Vacuum

The instructions that follow are based on the assumption that the customer is using a relative pressure vacuum gauge to verify the vacuum readout of the VDO. If an absolute pressure gauge is being used to perform the verification process, the reading from the reference gauge may be directly compared to the readout of the VDO.

- Obtain the current barometric pressure for your location, and correct this reading for the altitude above sea level of your location. Convert this reading to kPa as described earlier in this manual (Section D.3 – Vacuum Adjustment), and compare this value to the value displayed on the VDO main screen. These two values should agree within 1 kPa absolute, otherwise, an adjustment may be required. Note this value for reference, as it will be used in the next steps of the verification process.
- 2. Attach the two portions of the brass extension fitting by screwing one into the other, then attach to the base of the pressure vacuum gauge. Once assembled, attach the pressure vacuum gauge to the vacuum verification port on the top of the VDO (*Figure E.2.2*).



xviiiFigure E.2.1 - Vacuum Gauge



xixFigure E.2.2 - Vacuum Gauge attached to Vacuum

- 3. Once the vacuum gauge is connected to the top of the VDO, unlock the temperature controller so that the vacuum can be manually turned on. Turn on the vacuum pump by going into the operations tab and turning on "Event 1". Allow the pump to run until the vacuum does not drop any further and allow to stabilize. This should be close to 9-10 Kpa.
- 4. Once the vacuum has stabilized, use the vacuum relief valve to adjust the vacuum gauge to 15 Kpa. Allow 5 minutes to stabilize. This may take a few minor adjustments to ensure the vacuum will stay at 15 Kpa. If you notice the vacuum slowly drifting up or down, make a small adjustment and allow another 5 minutes to stabilize.
- 5. Now that the vacuum has stabilized, take 5 readings 5 minutes apart. Compare the vacuum gauge on the top of the VDO to the split screen on the front of the VDO. These readings should agree within 1 Kpa (standard for VDO is 15 Kpa ± 1 Kpa).
- 6. If the readings are outside of the allotted 1 Kpa tolerance, contact the service department at Applied Test Systems.

## F. Operation

## F.1 Operation of VDO

1. Press the "POWER" button located on the back of the VDO. The Front display will light up.



xxFigure F.1.1 - Power ON / OFF Switch

2. Press the left "Fn" button. This will preheat the unit to 170° C. This will take approximately 45 minutes to 1 hour.



xxiFigure F.1.2 - Left "Fn" Button on Controller

- 3. When the display reads 170° C. Lift the lid and carefully place your preheated specimens in the chamber.
- 4. Close the lid and then press the right "Fn" button. This will start the test.



xxiiFigure F.1.3 - **Right "Fn" Button on Controller** 

- 5. After the 10-minute soak, the vacuum pump will automatically turn on, the "DEGAS" light will turn on and the specimen will degas for 30 minutes.
- 6. At the end of 30 minutes when the process is complete, the pump will shut off, an audible alarm will sound along with test complete light.
- 7. The VDO is now ready to begin a new process.
- 8. Wearing high temperature gloves, carefully open the lid and remove asphalt samples from the Vacuum Degassing Oven (VDO) with specimen grips provided.



**WARNING:** Lid will be hot. Hot / Burn surface, use Personal Protective Equipment when operating VDO, and handling materials associated with the testing procedure.

## G. Troubleshooting

### G.1 Preface

Listed within this section are the most common troubleshooting errors that operators may encounter when using the VDO. Users may follow the steps provided to work through these basic errors.

Any additional issues or system errors should be brought to the attention of the Applied Test System (ATS) Service Department immediately by calling +1.724.283.1212 or emailing <u>service@atspa.com</u>.

DO NOT attempt to independently fix any other system errors. Any additional errors fixed independent of technical support at Applied Test Systems could result in damage to the equipment, or injury on the part of the operator.



WARNING: To prevent electrical shock, use extreme caution when removing covers or panels. Follow your company's electrical safety procedures thoroughly.

#### G.2 No Power

- 1. Verify that the system is plugged into the power source.
- 2. Verify that the breaker is on and in the upright position.
- 3. Verify that the outlet is rated for correct amperage.

### G.3 System Will Not Hold Vacuum

- 1. Check the O-Ring for damage and / or dirt. Also, inspect the bottom of the VDO lid for asphalt build-up or other debris and / or damage which could interfere with the O-Ring seal.
- 2. Set the vacuum gauge based on elevation (refer to Altitude and Atmospheric Pressure chart).
- 3. Verify that the filter is not plugged and is free of dirt.
- 4. Ensure the lid is properly aligned and completely closed.

5. Verify the valve is closed.

## G.4 Controller Error

1. Do not attempt to fix independently. Contact the ATS Service Department by calling +1.724.283.1212.

## G.5 Pump Error

1. Do not attempt to fix independently. Contact the ATS Service Department by calling +1.724.283.1212.

## H. Maintenance

## H.1 Cleaning and Preventative Maintenance

 Before cleaning the VDO, unplug the machine and allow it to cool. Any asphalt buildup or debris which could interfere with the lid making a tight seal with the VDO oven should be carefully removed, using a soft cloth and suitable cleaning solvent. Be very cautious of using any type of mechanical scraper or other tool when removing any asphalt material from the bottom of the VDO lid, as this could potentially damage the sealing surface for the O-Ring, preventing the VDO from applying a Vacuum to the Oven.



WARNING: Use Personal Protective Equipment as per the solvent being used.

WARNING: DO NOT USE FLAMABLE SOLVENTS TO CLEAN THIS MACHINE.

2. It is also recommended to periodically apply a coating of vacuum grease to the O-Ring and O-Ring groove on the VDO oven. The bottom of the VDO lid should be inspected at this time for any signs of visible damage.

## H.2 Spare Parts

- It is recommended that the customer purchase 1 or 2 spare O-Rings for use with the VDO. The ATS part number for this O-Ring is – 100111.
- It is recommended that the customer routinely grease the O-Ring on their VDO unit. The ATS part number for High Vacuum Grease is – 105442.
- 3. Resistance Temperature Detector (RTD) part number is 104755.

Your Applied Test Systems product has been manufactured and inspected by experienced craftsmen. Applied Test Systems warrants, for the original purchaser, each product to be free from defects in material and workmanship for a period of thirteen (13) months from date of shipment or twelve (12) months from date of installation – whichever comes first. This warranty does not apply to failures caused by normal usage, misuse, or repair or service by unauthorized personnel, nor does it cover limited life electrical components which deteriorate with age such as tubes, lamps, fuses, and heaters. Load cells are covered for manufactured defects only – incidents of over load or other customer misuse are not covered under warranty. The warranty does not extend to products not manufactured or assembled by Applied Test Systems.

This warranty is expressly limited to the repair, replacement, or adjustment of the product at Applied Test Systems' option. The product must be returned to the Applied Test Systems factory or an authorized repair center. Applied Test Systems shall not be liable for any labor, transportation, or installation costs that may arise in connection with the product or return.

### To obtain warranty service:

- 1. Applied Test Systems must be promptly notified in writing of the defect.
- 2. Upon receipt of written authorization, said defective equipment is returned as directed, with transportation charges prepaid by the buyer and –
- 3. Applied Test Systems examination of such equipment discloses to its satisfaction that the defect exists and was not caused by negligence, misuse, improper installation, accident, or unauthorized repair or alteration.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranty of merchantability or fitness for particular purpose. In no event shall Applied Test Systems be liable for direct, indirect, special, incidental, collateral, or consequential damages.

The aforementioned provisions do not extend the original warranty period of any article that has been either repaired or replaced by Applied Test Systems.

Applied Test Systems reserves the right to change published specifications.

# Appendix B: Wiring Diagram



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# Appendix C: Image Glossary

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