

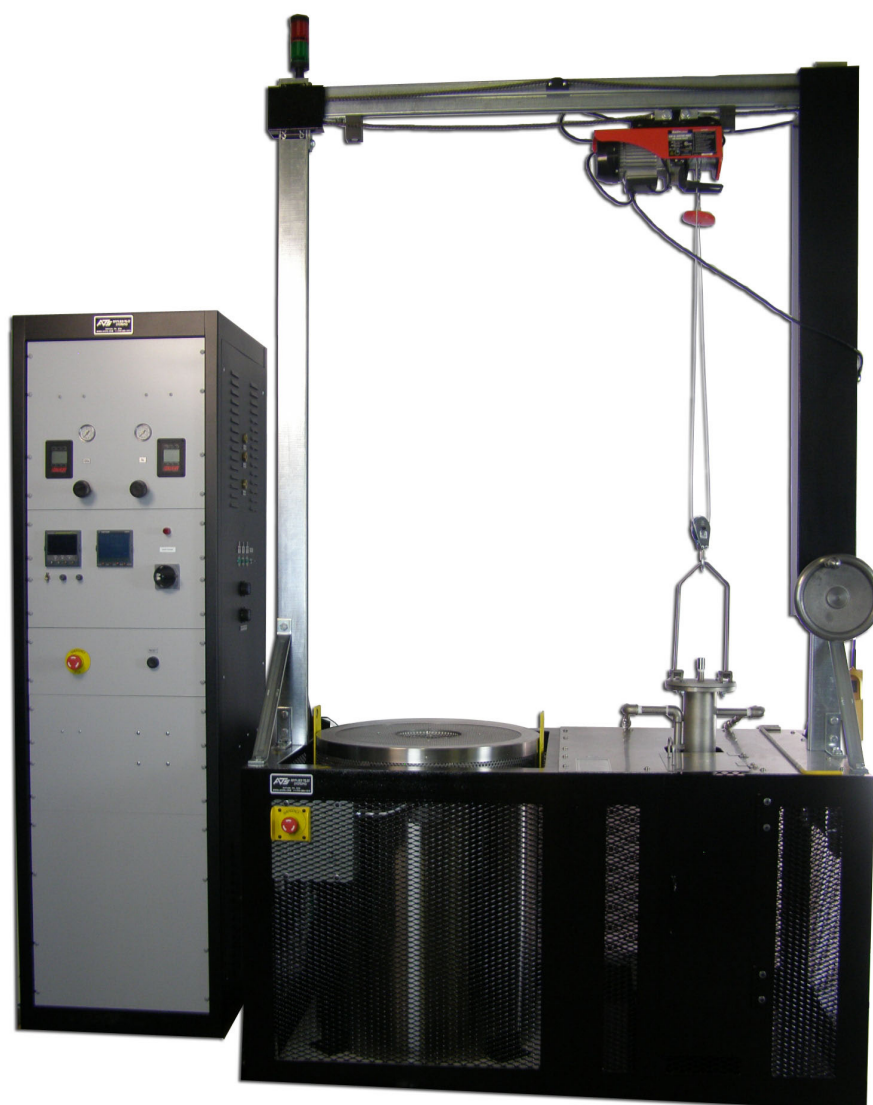


APPLIED TEST
SYSTEMS

Instruction Manual

THE MARK OF RELIABILITY

Coke Testing System



Coke Reactivity Index (CRI) & Coke Strength after Reaction (CSR)



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Preface

Unpacking

Retain all cartons and packing materials until the unit is operated and found to be in good condition. 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 the packing materials for inspection by the carrier.

Warranty

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

NOTE: Please see the warranty information included with the computer. It details information that will ensure proper transfer of the computer warranty from ATS to the appropriate company.

After-Sale Support

If there are any questions concerning the operation of the unit or software, contact the ATS Service Department at +1-724-283-1212. Before calling, please obtain the software revision number and the serial number from the unit’s data tag. A sample data tag is shown 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 ATS Service Engineers.

ATS

NO.

AMP

VAC

PH

HZ

Section 1: Introduction

1.1 General Description

The Applied Test Systems (ATS) Coke Testing System follows the ASTM Standard Test Method D 5341 that simulates the major weakening processes -- chemical reaction with carbon dioxide gas and physical abrasion -- encountered by coke lumps as they descend through a blast furnace. In accordance with the ASTM method, the ATS system produces coke/CO₂ reaction in a regulated atmosphere vessel within a high-temperature furnace. The reacted and cooled coke is then transferred to the strength-after-reaction tumbler where it is tumbled for a specified number of revolutions.

1.2 Specifications

The system includes the following components:

- High Temperature Furnace
- Stand with Hoist and Cooling Cage
- Control System with Gas and Overtemperature Control
- After-Reaction Tumbler

Section 2: Safety

All ATS equipment is designed to be operated with the highest level of safety. This manual and ATS endeavor to educate the operator about safety issues surrounding certain parts of the machinery by using equipment labeling. See page 9 of this manual for the location of safety labels.

2.1 For Owners, Operators, and Maintenance Personnel

Read and understand all instructions and safety precautions listed in this manual before installing or operating the unit. If there are any questions regarding operation of the unit or the instructions in this manual, contact the ATS Service Department at +1-724-283-1212.

In addition to the safety warnings listed on the equipment, warnings are posted throughout this manual. 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.



2.2 Warnings

The following statements are warning statements. Unlike caution statements, warning statements alert the operator to conditions that may injure personnel. Operators must be aware of these conditions in order to prevent injuries that may occur while operating this equipment.



WARNING: Disconnect power prior to performing maintenance. Turn off the unit and disconnect and lock out before performing any maintenance procedures.



WARNING: Hot/Burn surface, use personal protective gear when operating equipment and handling materials associated with the testing procedure.



WARNING: Pinch hazard.



WARNING: Do not open the panel.



WARNING: Unpack and operate on a stable surface.

2.3 Cautions

The following statements are caution statements. These statements alert the operator to conditions that may damage equipment. Operators must be aware of these conditions in order to ensure safe operation of this equipment.



CAUTION: 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** for both safety and proper operation.



CAUTION: Before energizing the electrical power to the equipment, turn off all power switches and place all controls in an OFF position. Check that the power source is surge-protected and is of the appropriate voltage and amperage. Use appropriate power adapters for the region.



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Section 3: Equipment Setup and Installation

Read and understand all instructions and safety precautions listed in this manual before installing or operating the unit. For questions regarding unit operation or installation, contact the ATS Service Department at +1-724-283-1212.

In addition to the safety information listed here, there are cautions and warnings throughout this manual. Failure to follow these instructions could result in permanent damage to the unit, significant property damage, personal injury, or death.



Read Operator's Manual



General Danger



Protective Earth (Ground)



Burn Hazard (Hot Surface)



Electrical Shock/Electrocution



Hand Crush Force From Above



European Directive CE Mark



No Access for Unauthorized Persons



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3.1 Safety Instructions

1. Read and follow all warning and caution statements in all related equipment manuals before attempting to operate this machine. If in doubt about any statement or sequence, contact ATS Service.
2. 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 for both safety and proper operation.
3. Before supplying electrical power to the unit, turn all power switches and controls in an OFF or NEUTRAL position.

3.2 Location of Safety Labels



3.3 Unpacking Equipment

Carefully unpack the equipment and inspect it for damage during shipment. Retain all cartons and packaging materials until the unit is operated and found to be in good condition. If damage has occurred during shipping, notify the carrier and ATS immediately. If it is necessary to file a damage claim, retain the packing materials for inspection by the carrier.

Customer Requirements:

Note that the customer must provide CO₂, N₂, and all lines to and from the system. The customer will also determine the feasibility of exhaust fans and the installation of a CO₂ detector.

Unpacking and Setup:

1. Carefully remove the shipping crate and packing materials. Do not discard the packing materials until all items on the invoice have been accounted for.
2. Use an overhead crane or forklift to remove the test system from the pallet and position it in the desired location.

NOTE: Use moving blankets between unit components, and follow accepted moving practices to avoid damage to the tester.

NOTE: Position the test system to allow ample room for maintenance.

3. If casters are supplied with the unit, install them in the cabinet base when it is lifted off the pallet.
4. Adjust the isolator mounts on the test frame to approximately level, ensuring even support.



CAUTION: Do not allow the isolator mount pads to slide on the floor while moving the tester. They are not designed to accept side loading. Damage to the pads may result.

5. Use an overhead crane or forklift to lower the hoist onto the bottom of the test system. Screw in the joints.

NOTE: The front of the system (that has the doors and the E-stop button) should show the crank on the right-hand side of the hoist frame. Ensure this is correct before bolting it to the bottom of the test system.



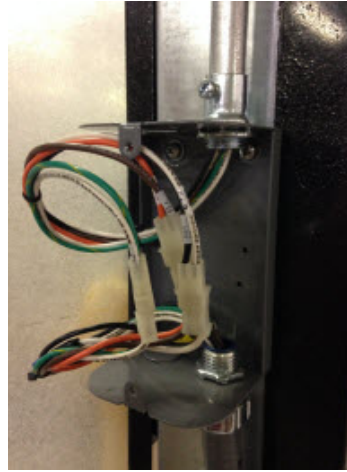
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6. To connect the electrical hoist to the bottom of the machine:

a. Open the box on the back of the hoist frame.



b. Use the quick connections to connect the wires.

c. Replace the cover on the box and bolt it closed.

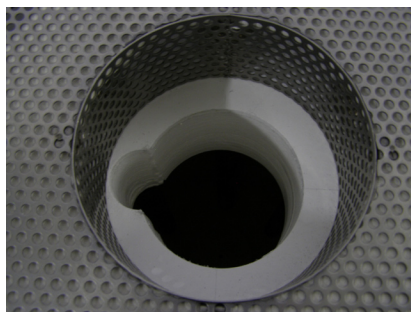


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7. Install the furnace using the yellow lifting lugs. Ensure that the top of the furnace is lined up with the side of the frame.



NOTE: Once the furnace is installed, it never needs to be removed.

NOTE: The lifting lugs do not need to be removed from the furnace.

8. Bolt the furnace to the bottom of the tester.

NOTE: The furnace will need a bake-out per manufacturer's instructions. See the furnace manual.

9. Install the vessel pedestal inside the furnace. Remove the "T" tool and store in a place where it can be accessed a later time.



10. Connect electrical power to the customer power terminal block. Proper grounding is a MUST.

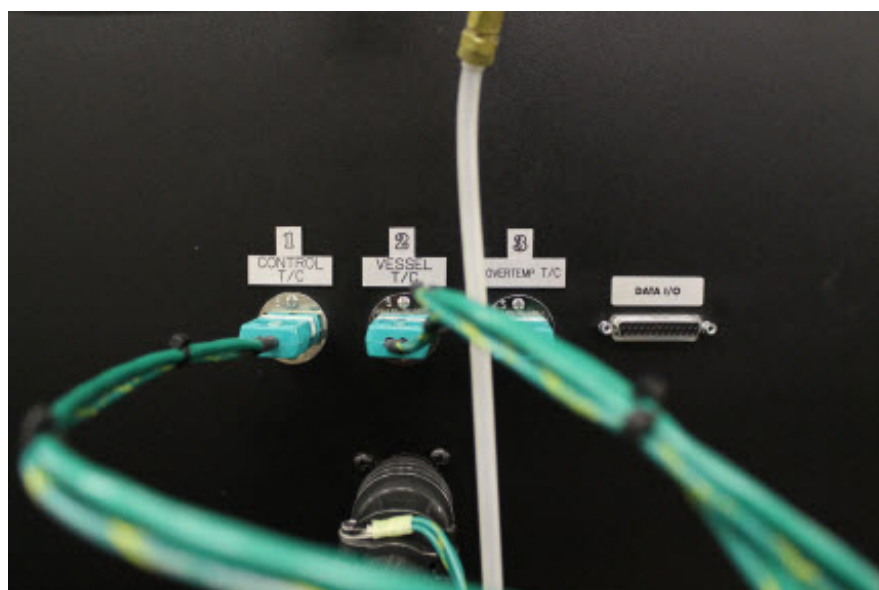
NOTE: Follow all local and national codes, and be sure to use the correct voltage and amperage. Refer to the equipment data tag for the individual unit information.

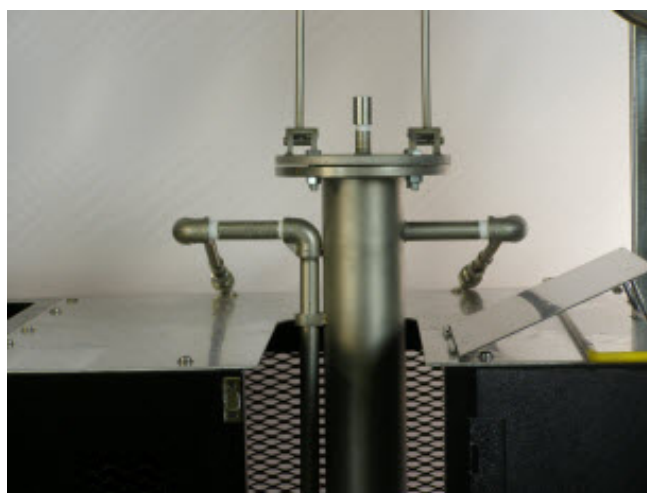
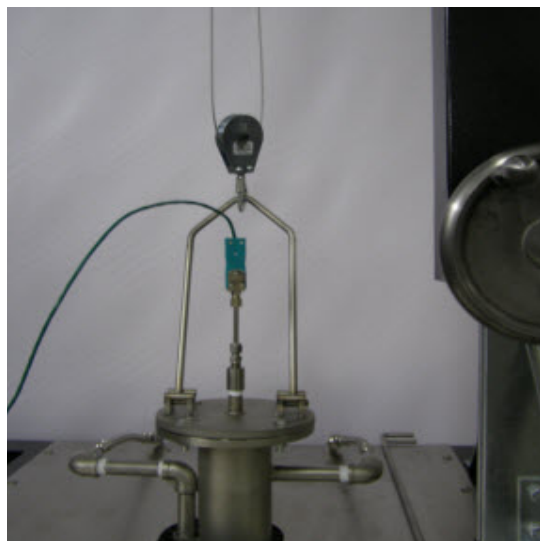


CAUTION: Turn all power switches to OFF and place all controls in a neutral position before supplying power to the machine.

11. The system's controller can be password-protected if desired. See the manufacturer's literature.

3.4 Installation and Operation Photos



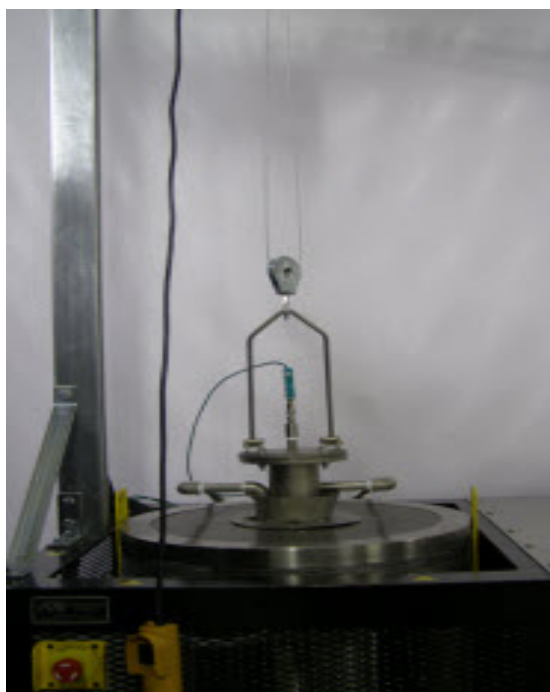




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Section 4: Operation

This section outlines the operation of the Coke System. The following steps are meant as a guide only. Test procedures can be varied to fit customer needs; however, the test procedures should always follow ASTM Standard Test Method D 5341.

Note that the system is ON when the signal light is blinking red. The system is ready for a test when the signal light turns green.

1. Preheat the furnace to 1100° C.
2. Set the FURNACE CONTROLLER to program 2 for preheat.
3. Observe furnace temperature reaching 1100° C.



WARNING: Avoid contact with the reactor and furnace during testing.

4. Prepare the dried sample material.
5. Screen and weigh the sample material to 200 grams.
6. Load the sample into the reactor vessel.
7. Load reactor with 200 grams of 3/4- by 7/8-inch coke.
8. Ensure the gasket is firmly seated on the top of the reactor.
9. Bolt top flange into place on the reactor.
10. Connect the hoses.
11. Turn on supply gas at the outside tank.
12. Verify that the nitrogen and carbon dioxide tank pressure is above 500 psi.
13. Turn on supply gas at the controller.
14. Snoop test all connections.
15. Repair leaking connections and retest prior to proceeding.
16. Connect the thermocouple.
17. Insert the reactor into the furnace.
18. Remove K-Wool from furnace opening.



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19. Raise reactor out of the cooling position, allowing enough clearance to clear obstructions.
20. Utilize the hand crank to position the reactor over the furnace opening.
21. Lower the reactor into the furnace until slack is observed in the hoist cable.
22. Start CSR test:
 - a. Set the FURNACE CONTROLLER to PROGRAM 1.
 - b. Ensure the test has started and is operating correctly.
 - c. Observe the chart on the FURNACE CONTROLLER to ensure temperature specifications are met.
23. Remove the reactor from the furnace.
24. Raise the reactor from the furnace.



WARNING: Avoid contact with the reactor or furnace during and after testing.

25. Move the overhead crane from the furnace position to the cooling position.
26. Lower the reactor into the cooling position. Use the retort guiding tool to guide the reactor.
27. Allow the furnace to cool to below 100° C before removing reactor from the cooling position.
28. Unload the sample from the reactor.
29. Turn nitrogen off at the controller.
30. Unbolt the flange and remove the gasket from the reactor.
31. Raise flange and thermocouple assembly.
32. Remove the reactor from the cooling position.
33. Remove reacted coke lumps, coke fines, and alumina balls from the reactor.



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34. Measuring Coke Reactivity Index (CRI):

- a. Gently slide the coke lumps from the reactor to the top of a 3/8-inch screen placed over a pan.
- b. Record the weight of the plus 3/8-inch coke lumps.
- c. Retain the plus 3/8-inch coke lumps for further testing.
- d. Pass a magnet over the coke fines to remove the scale material that has flaked off the reactor and record the weight of the coke fines.
- e. Retain the coke fines for further testing.

35. Coke Strength After Reactivity Index (CSR):

NOTE: See Section 6 for more information on using the After-Reaction Tumbler.

- a. Remove lid and carefully load the CSR tumbler with the reacted coke sample (both the lump and fine coke material).
- b. Secure the lid and place the tumbler in an upright position.
- c. Close the door to the cage.
- d. Start the tumbler.
- e. The tumbler will automatically shut down after 600 revolutions (thirty minutes).
- f. Move the drum to the upright position and remove lid.
- g. Slowly rotate drum to empty coke into a pan. Make sure all fines are removed from the drum by tapping with a rubber mallet in several locations.
- h. Gently slide the coke lumps from the tumbler to the top of a 3/8-inch screen placed over a pan and record the weight of the plus 3/8-inch coke lumps and minus 3/8-inch coke fines.

36. Discard all tested material.



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Section 5: After-Reaction Tumbler

To operate the After-Reaction Tumbler:



1. The circuit breaker should be in the "OFF" position.
2. Ensure power cord is connected to the appropriate power supply. See system data tag.
3. Press and hold the "Counter Reset" button and open the counter door. Using the thumbwheels, set counter to "0000." Close counter door. The system will not operate when the counter door is open.
4. Turn circuit breaker to the "ON/RESET" position. Press the reset button.

5. Press the "POSITION JOG" button until the tumbler lid is accessible from the cage door.

NOTE: As a safety feature, the system will not operate when the cage door is open.

6. Turn circuit breaker to the "OFF" position.

7. Open the cage door, remove tumbler lid, and place samples inside the tumbler. Replace tumbler lid and secure the four (4) locking knobs. Close cage door.

8. Press and hold the "COUNTER RESET" button and open counter door. Using the thumbwheels, set counter to the desired number of revolutions.

9. Press the "TIMER RESET" button to return the timer to 0.0 minutes.

10. When ready to begin testing, turn the circuit breaker to the "ON" position. Press the "ON" "RESET" button. During the tumbling process, the timer will display the elapsed time to the nearest 1/10th of a second and the counter will display the number of revolutions completed. When the counter target is reached, the system will stop.

11. Press the "POSITION JOG" button until the lid is accessible from the cage door.

12. Turn the circuit breaker to the "OFF" position.

13. Open the cage door, remove tumbler lid, and remove samples for further analysis.

NOTE: To stop the tumbler early, an operator can either open the cage door or hit the E-stop.

Section 6: Maintenance

1. Please refer to the manufacturer's literature for information on the following Coke System components:

Temperature Controller

Hoist and Flow Controllers

Power Controllers

Furnace

2. Grease the fittings on the pillow block bearings of the tumbler.
3. Periodically check that the pedestal is in place in the furnace.

Appendix A: Warranty

Warranty Statement

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. 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.



154 East Brook Lane | Butler, PA 16002 USA | +1-724-283-1212 | www.atspa.com