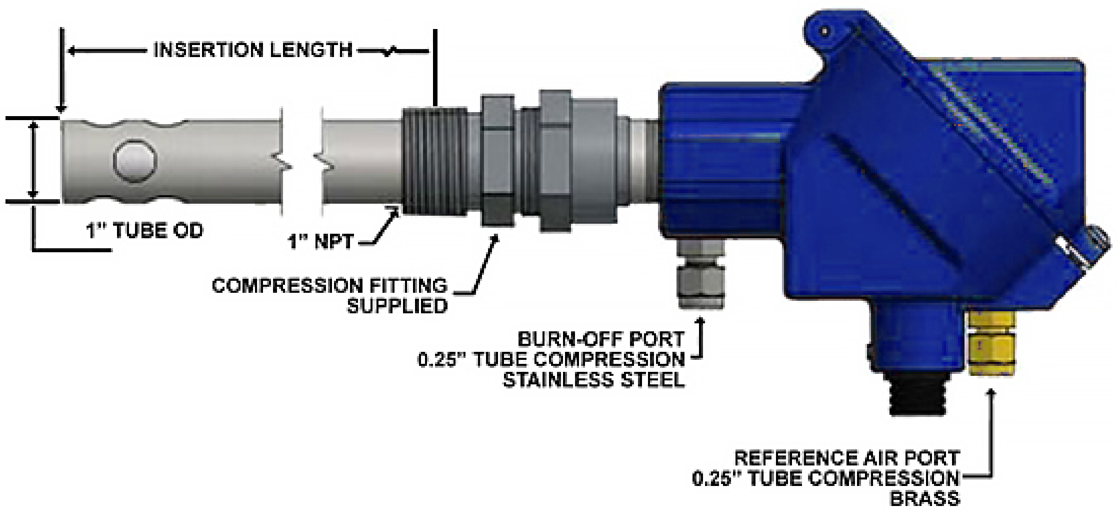
A^2
100% solid zirconia oxygen sensor
Revision 1



CONNECT WITH US

MANUAL #: 017

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Date: 17 February 2020

THIS MANUAL IS SUPPLIED ELECTRONICALLY.

DISCLAIMER:

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WARRANTY:

UPC warrants its goods as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to UPC during the period of coverage, UPC will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

PROBE REGISTRATION

Scan to register

Probes are covered by Usage Warranty as indicated from the date of installation.
Usage warranty is not effective until your probe is registered, and only if installation is made according to instructions supplied.

TECHNICAL ASSISTANCE

For all questions or concerns regarding the operation of the $\mathbf{A^2}$, please consult the last page of this manual for contact information.

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1 INTRODUCTION

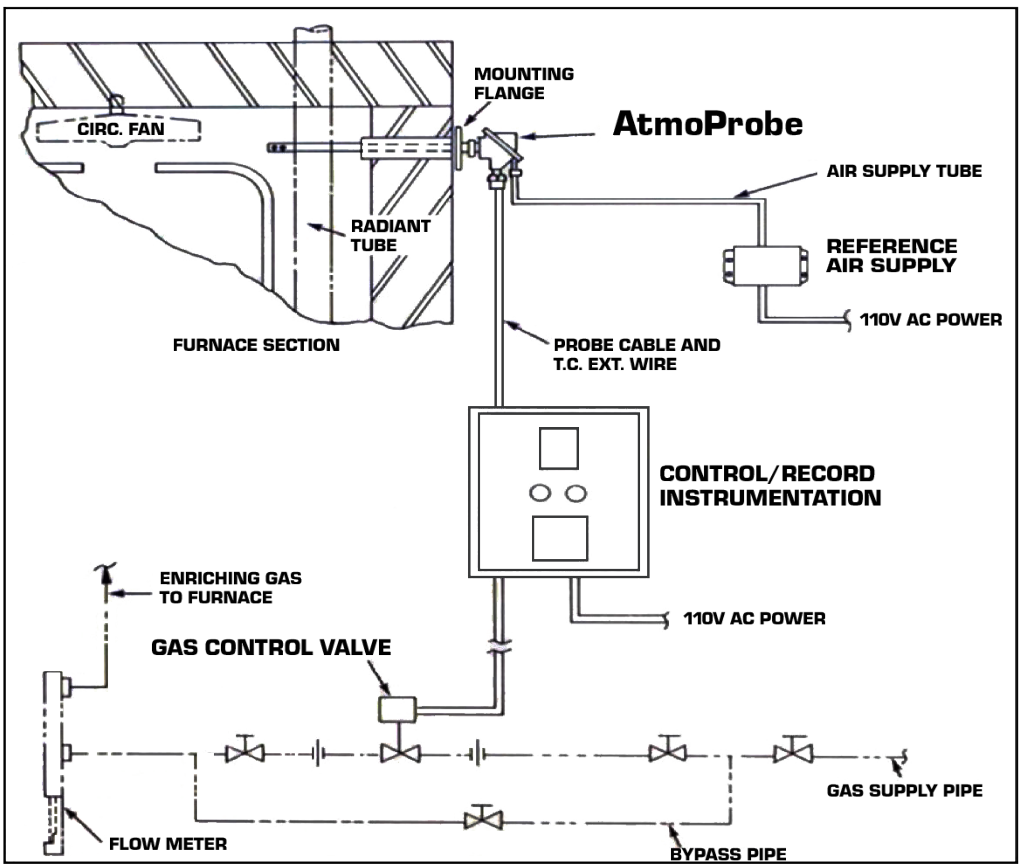
1.1 GENERAL

Congratulations, you have purchased the technologically most advanced solid zirconia sensor on the market. The A^2 sensor is manufactured by UPC and is intended to be used with appropriate carbon control systems to control the carbon potential of an endothermic or nitrogen/methanol-based heat treating atmosphere. A typical control system, as seen in Fig. 1, has three functional sections:

1) A^2 Zirconia Sensor, Probe Mounting flange and Reference air Supply;
2) Control and Recording Instrumentation; and
3) Enriching Gas control valve.

This manual pertains only to components in functional section 1.

Figure 1



1.2 PRINCIPLES OF OPERATION

The A^2 is a unique zirconia probe. Its design was based on our previous experience in the design and manufacture of "first generation" probes and their limitations in the heat treating industry. The A^2 is the result of extensive research and developmental testing. This probe represents a major breakthrough in probe design technology resulting in higher accuracy, longer service life and lower cost.

The A^2, located directly in the furnace hot zone, responds almost instantly to changes in the carburizing atmosphere and totally eliminates the need for troublesome gas sampling. Carbon potential control in heat treating using a Zirconia carbon probe is described in detail in Metals Handbook 9th Edition, Vol. 4; pgs. 417-431. Following is a brief summary of the principle of carbon potential control using an A^2.

- In a carburizing atmosphere containing CO and CO_2 gases, the carbon potential is a function of the ratio $(Pco)^2/Pco^2$ under constant temperature conditions.
- The A^2 provides a voltage output, from which the Pco^2/Pco^2 ratio in the carburizing atmosphere may be determined.

Therefore, the voltage output of the probe is related to the carbon potential and may be represented graphically in much the same manner as the relationship between dew point or percent CO_2 and weight percent carbon.

The experimental relationship between the voltage output of the A^2 and the weight percent carbon for constant temperatures between 1500°F and 1900°F was determined using the following procedure:

A specially designed holder was used to insert thin steel shim specimens into a carburizing furnace for a sufficient length of time to equilibrate with the furnace atmosphere. During this equilibration period, the furnace atmosphere was controlled so that the voltage output of the A^2 remained constant. After sufficient time, the shim specimen was quenched in water. The shim carbon content was then determined by chemical analysis. (See Operating Instructions, True carbon Test for specific details).

1.3 ACCURACY

The accuracy of any carbon probe depends upon many factors. Most influential is the electrode design, electrode materials used and the electrical leads that are attached to the electrodes. The Zirconia electrolyte component also has significant impact on accuracy.

The electrolyte is stabilized Zirconia in the form of a closed end tube. Electrodes are placed in contact with both the inner and outer surfaces at the bottom of the tube. Electrical leads bring the voltage signal from the electrodes to the outside of the probe to a connector. The design and materials used for the electrodes affect probe accuracy. Three of the most important requirements for probe electrodes are:

1. The electrodes must not impede the flow of the atmosphere to the electrode-electrolyte interface.
2. The electrodes must act as reversible oxygen electrodes.
3. The electrodes must not alter the composition of the furnace atmosphere.

The A^2 design specifically addresses the above points.

The alloy composition and design details of the outer electrodes in the A^2.

- The material (RA 333) acts as a reversible oxygen electrode.
- The material minimizes catalytic alteration of the gas composition at the electrolyte/electrode interface because of low nickel content.
- The open design maximizes the accessibility of the gas to the electrolyte-electrode interface.

The voltage output of the A^2 may be measured with a precision of about ± 0.2mV which would correspond to a change in weight percent carbon of approximately ± 0.0025. However, because of temperature irregularities in typical heat-treating furnaces, the resultant combined accuracy with which the A^2 controls carbon potential is approximately ± 0.03 weight percent carbon. When high accuracy control instrumentation is employed for both temperature and carbon, accuracy of ± 0.01 weight percent carbon can be achieved.

It should be noted that there is no loss of sensitivity at higher temperatures (i.e. 1700°F to 2000°F) with the A^2. For deeper case applications, high temperature carburizing offers significantly increased productivity and energy conservation as a result of shortened processing time. Another feature of the A^2 is that it is virtually maintenance free for the life of the probe. No calibration, no cleaning or adjustments are required.

1.4 SERVICE LIFE

The useful life of the A^2, in comparison to other probes, has been significantly increased. In other carbon probes the most common failure modes are electrode and/or lead wire failure. The A^2 uses heat resistant alloy electrode welded to a metal sheath, which acts as a lead wire. Failure of these components in the A^2 is virtually eliminated. Because of these significant improvements, the A^2 has an expected life time of about two years with normal use.

1.5 USER COST AND WARRANTY

By replacing Platinum alloys used in other probes, with base metal alloys, used in the A^2 and by simple and effective design, the cost of manufacturing and consequently your purchase price are lowered. The A^2 features a one-year non-prorated warranty. UPC guarantees that you will have an accurate, working probe for the entire 12-month warranty period as long as the probe is not physically damaged.

If this is a new installation of an A^2, carefully read the following steps:

- Probe Location
- Furnace Preparation

If the A^2 is used to replace another probe, proceed directly with Probe Installation.

2 INSTALLATION

2.1 PROBE LOCATION

The general guideline is that the probe should be exposed to the same gas atmosphere and temperature as the work is exposed to. Typically, the A^2 should be installed in the side of the furnace, near the center of the heat zone to be controlled. If possible, the horizontal location should correspond to the center line of the atmosphere fan. The vertical location of the probe should be at approximately a few inches above the maximum work load height. This will prevent the possibility of probe damage caused by the load, and also expose the probe to a fresh and moving furnace atmosphere. In furnaces with an internal muffle, such as an Ipsen IQ furnace, the probe should extend horizontally above the muffle arch in the sidewall to within 6-10 inches of the fan.

NOTE: Determine the proper probe length, at the location selected, to make sure that it will not interfere with the furnace load, muffle components, radiant tubes, fan blades, gas ports, or any other furnace component. Be careful not to locate the probe too close to a radiant tube or electric heat source. Thermal cycling of the heat source may make %C control difficult. Remember, the probe length is adjustable and the probe need not be inserted to the maximum length.

2.2 FURNACE PREPARATION

WARNING

Before proceeding, remove all combustible atmosphere from furnace, open all doors and cool to room temperature.

The above warning ensures that there can be no positive pressure or flammable gases inside the furnace. Failure to perform this step may result in injury to personnel.

After the location of the probe is determined to be acceptable, as described above, a port with a female 1” NPT thread and 1-3/8” I.D. clearance is required. The use of a “Furnace Flange” (See Fig. 1) Part No. F1.2-10, simplifies the task to prepare a port in the furnace.

The “Furnace Flange” has a precision 1-1/4” NPT thread machined into it and has an alloy pipe extension to line and support the furnace refractory. Use of this part is strongly recommended to minimize problems and to simplify the installation of the A^2.

1. Saw or torch-cut a 2-1/2” diameter hole in the steel shell of the furnace at the probe location determined above.
2. Using an insulation boring tool, bore a 2” diameter hole through the thermal insulation, concentric with the 2-1/2” hole in the steel sidewall and perpendicular to the sidewall. Remove boring tool and core of insulation.

3. Insert “Furnace Flange” into hole in furnace sidewall. Flange should fit flush against sidewall. If not, take necessary steps to remove interference material.
4. Using the “Furnace Flange” as a template, mark location of the four mounting holes on the furnace wall and remove the furnace flange.
5. Drill and tap the four holes with 3/8” NC thread.
6. Insert the “Furnace Flange” in the furnace sidewall hole.
7. Secure the flange to the furnace sidewall with four (4) 3/8” NC hex head bolts 1/2” long. A 1” pipe plug could be used to close hole in Furnace Flange, allowing normal furnace operation until A^2 is ready for installation.
8. We recommend the installation of a second “Furnace Flange,” same as described above, to be available for True Carbon accuracy shim tests or possibly for another probe. Shim tests are essential during troubleshooting or if there is a question about the accuracy of the probe. Location of the second port should be as close as possible to the probe location.

VERY IMPORTANT! In new furnaces or newly re-bricked furnaces, it is important that the refractory be fully dried and cured before the probe is installed. Binders and some mortar components released during curing can affect probe accuracy and shorten the probe life. It is strongly recommended to operate the furnace for at least 8 hours at 1700°F or higher with a reducing atmosphere (endothermic gas), to flush out potential detrimental refractory components.

2.3 PROBE INSTALLATION

Installation of the A^2 carbon probe should only be attempted after a proper furnace port is ready and all interconnecting wiring, reference air tubing and air supply are in place.

READ THESE INSTRUCTIONS COMPLETELY BEFORE ATTEMPTING THE INSTALLATION.

NOTE: If you plan to install the A^2 in a furnace port previously used for another probe or some other function, make certain that the threads are 1” NPT pipe thread, the hole I.D. is at lease 1-3/8” and that the hole is straight and open on the end.

WARNING

Before proceeding, remove all combustible atmosphere from furnace and open all doors. The furnace can be at normal operating.

The above warning ensures that there can be no positive pressure of flammable gases inside the furnace. Failure to perform this step may cause injury to personnel.

Use extreme care when handling and installing the A^2. It is susceptible to thermal and mechanical shock and may be damaged if mishandled.

1. Carefully remove the A^2 from the shipping box and inspect for damage by looking for broken ceramic pieces. It is not necessary to open the probe head cover for damage inspection. If damage is observed or is suspected, notify the carrier who delivered the probe.
2. Register your probe either online at **https://group-upc.com/services/new-probe-registration/**, or fill out the warranty card, retain your portion of it and send the other portion back to UPC.
3. Remove 1” NPT plug from center of furnace flange or port, which has been installed on furnace sidewall according to previous instructions.
4. Check the port I.D. for any obstruction and remove collected debris using compressed air or brush.
5. Remove compression fitting body from the A^2. Leave the nut and O-ring on the probe sheath. Put Teflon plumbers’ tape on pipe threaded end of compression fitting. Thread compression fitting into furnace flange. Tighten with wrench but do not exceed 20 ft-lb.

If furnace is 300°F or cooler, slide probe into compression fitting to the desired depth. Make sure seal rings or O-ring is between compression fitting body and nut. Hand tighten nut on probe sheath. Do not rotate probe while tightening nut.

NOTE: It is preferable that the furnace be at 300°F or cooler for probe insertion; however, if the temperature is above 300°F, the following instructions must be followed in the sequence given or thermal shock may damage the probe.

6. Measure 6 inches from the end of the probe sheath and mark with a felt tip pen. Mark the remainder of the A^2 in 1” graduations.
7. Carefully insert probe into compression fitting to the first mark on the probe sheath (6” mark). Make sure seal rings or O-ring is between compression fitting body and nut. Wait 5 minutes while the probe warms up.
8. Insert probe at the rate of about 1” per minute.
9. Repeat step 8 above until probe is installed to proper length. Hand tighten compression fitting nut on the probe sheath.
10. Connections for the probe signal and also integral thermocouple are made through the black electrical connector located at the underside of the probe cover.

Pin connections are as follows:

a. #1 White/Clear “Probe -mV”
b. #2 Black “Probe +mV”
c. #3 Red “T/C -mV”
d. #4 Black or Yellow “T/C +mV”

NOTE: The gray colored shielded cable contains the probe lead wires, the wire with black insulation is positive and the wire with clear insulation is negative. The thermocouple extension wires are contained in yellow vinyl covering for Type K thermocouple and in a green vinyl covering for Type S thermocouple. The red lead wire is negative for type K, or S thermocouples.

11. Reference air connection is made through the brass ¼” tube fitting adjacent to the electrical connector. Urethane, Teflon or copper tubing can be used. Remove nut and ferrules from brass body of air fitting. Hand tighten nut on air fitting, then turn ¾ turn with a wrench to set ferrules on the tubing, after that hand tightening of the nut is adequate.
CAUTION: Do not remove air fitting body from probe cover, because probe will malfunction.

Reference Air Flow should be 0.2-0.5 CFH clean air.
Reference Air flow should never exceed 1.0 CFH.

Note: It is not encouraged but sometimes it may be necessary to install a new probe while the furnace is at temperature and with an endothermic atmosphere. The new probe cannot be inserted into the port, if there is a flame present after the old probe is removed. In order to extinguish or eliminate this flame, the following is suggested:

Make a ball of soft refractory fiber material and place it in the opening of the furnace wall where the probe is going to be inserted. It is probably easier to place the fiber ball into the opening before the probe compression fitting is screwed into the threads. The fiber ball should fit the I.D. of the port, thereby eliminating any flames and reducing the volume of hot gases exiting from the opening. Do not proceed to the next step unless flames are completely extinguished. As you continue to install the probe, the fiber ball will be gradually pushed into the furnace interior.
Then follow installation steps 6-10.

2.4 START-UP PROCEDURE

1) Heat furnace to normal operation temperature, above 1500°F and introduce carrier gas atmosphere into heat chamber according to furnace operating instructions. Make sure circulating fan is operating. Enriching gas manual safety shut-off valve should be open, but the controller-operated valve should be closed. Do not add enriching gas to an empty furnace.
2) Ensure the 110V AC power is applied to the probe air reference pump and also to all recording and controlling instruments.
3) Allow about an hour for the furnace atmosphere and temperature to stabilize. Compare the average internal probe temperature to the average furnace control temperature. A difference of less than 20°F is acceptable, but usually it is less than 10°F. This means that the probe location is acceptable. If the difference is more the 20°F, refer to the Troubleshooting Section.
4) Select the desired carbon potential for the parts being carburized. Make certain that the controller is set up for the A^2. If that selection is not available, use Carb C or FCC or contact UPC.
5) Set the controller setpoint to the desired reading established in Step 4.
6) Put work into the furnace and allow the system to control. Follow manufacturer’s instructions for the specific control system that you are using.

3 OPERATION

3.1 SOOT BURNOUT

FURNACE & PROBE

Frequent or continuous operation of the A^2 at carbon potentials near the austenite saturation is not recommended because of soot formation in the furnace and on the probe. To determine the saturated austenite level, refer to the A^2 output vs. carbon potential graph included with this manual.

If, for whatever reason, soot buildup occurs in the furnace and on the A^2, the condition must be alleviated by a "burnout" of the furnace. It is best to burn out the probe and the furnace together. The A^2 is not damaged by a normal burnout in air. Caution must be exercised in selecting the combination of burnout temperature and amount of air addition to the furnace so that the probe temperature does not rise during the burnout. A rapid burnout could cause thermal shock damage to the probe and also damage the alloy and refractory in the furnace. If the temperature is observed to rise, shut off the air addition for 15 minutes and gradually restart it.

The A^2 can be used to monitor the progress of the burnout. When all the soot is burned out, the prove millivolt output will be less than 100 mV. This is the best assurance of a proper and complete burnout.

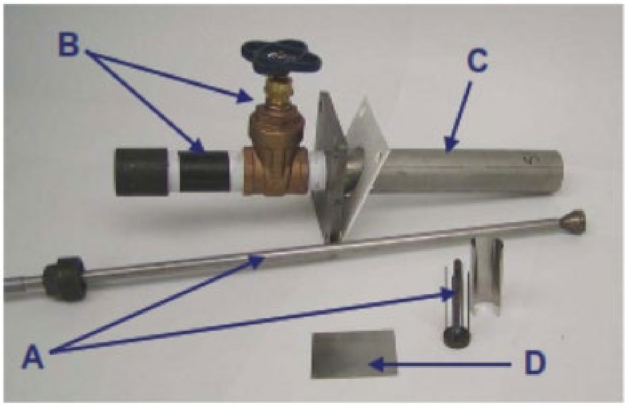
PROBE ONLY

An alternative method of soot removal from the probe is to use an air purge. In this case, an air source with a maximum adjustable air flow up to 5 CFH is needed. Do not confuse the reference air connector with the air burnout port. The reference air connector is brass and is located closest to the electrical connector, whereas the air burnout port is steel and is located closest to the furnace wall and is shipped capped. PLEASE NOTE, when the air purge system is not being used the air burnout port must be capped or closed off, to prevent air from leaking into the probe. The burnout frequency and the air flow rate need to be determined by actual usage. The air flow rate should be high enough to reduce the voltage output of the probe by approximately 200mV. In some cases, an air flow rate of 3 CFH for 1 to 3 minutes and a burnout frequency once every four hours has been found to be sufficient.

3.2 TRUE CARBON TEST

This test is performed to compare the true atmosphere carbon potential with that indicated by the A^2 and associated carbon control system. The indicated percent carbon is determined from either the graph or chart included with this manual.
The true carbon potential of the furnace atmosphere can be determined by inserting a steel shim sample into the furnace for a period of time and then determining carbon content of the shim by chemical analysis. For this test, an additional port adjacent to the A^2 (discussed in the

Installation Section, Furnace Preparation), a Shim- Holding Cartridge and a shim Cooling chamber will be necessary. All these items are available from UPC. (Refer to the Parts List section at the end of this manual.)



Part Numbers

A. Shim Holding Assembly	H36-1
B. Shim Cooling Chamber	V1.2-6
C. Mounting Flange	ASY-1.2F-10
D. 0.003" Shim Coupons	S-25

To perform the shim test, proceed as follows:

1. Use .003" thick shim sample of AISI 1010 material.
2. Cut shim samples to approximately 2-1/2" x 3" size. Make sure that this sample size is of adequate weight for your method of carbon analysis.
3. Roll shim sample into cylindrical shape of about ¾" diameter.
4. Slide the shim sample into the holding cartridge.
5. Before proceeding, make sure that:
   a. Furnace is operating above 1600°F
   b. There is some work in the furnace
   c. The doors have been closed and the circulation fan and atmosphere have been running for at least ½ hour, to have uniform temperature and carbon potential
   d. The Shim Cooling Chamber is attached to the furnace port and the valve on the Cooling Chamber is closed.

WARNING

Personnel operating shim test equipment, must wear fire protection gear, or personal injury may occur. Combustible carrier gas may ignite.

6. Insert the Shim Holder into the end of the Cooling Chamber and thread the pipe plug in place to close up the end of the Cooling chamber. Open the gate valve completely and slide the Shim Holder into the furnace approximately to the depth that the A² end is located. From the gate valve this is about 24".
7. Leave the shim sample in the furnace for 30 minutes if the furnace temperature is 1700°F, or 45 minutes if the temperature is between 1600°F and 1650°F.
8. Record average furnace temperature and average probe millivolt output during the test. If a direct reading carbon controller is used and millivolt reading of probe cannot be obtained, record wt% Carbon from controller.

9. Retract Shim Holder from furnace into the Cooling Chamber and allow cooling for 10 minutes with gate valve open.
10. Close gate valve and remove Shim Holder from Cooling Chamber by unscrewing pipe plug at the end.
11. Remove shim sample from holder. If the shim surface appears to have flaking oxidation, the carbon results will be questionable and the test should be repeated. If the shim has thin adherent oxidation, etch it in a weak solution of about 10% hydrochloric acid and water for several minutes to remove the oxidation.
12. Determine carbon content of the shim sample by using a Leco Carbon Analyzer or any other combustion carbon analysis method.
13. Compare the carbon content of the shim to either that predicted by the graph or chart using the temperature and millivolt readings made in Step 7, or with the Carbon from the controller. A difference of less than .03% carbon should be obtained with a good A^2 and a proper sampling technique. If the difference in % carbon is greater than 0.03%, refer to Troubleshooting Section (Carbon Control System Accuracy and Probe Thermocouple Accuracy) It should be noted that the relationship between the A^2 output and the carbon potential (Carbon) shown in the table and graph included with this manual, was determined for AISI 1010 steel. The type and concentration of alloying elements in the work can affect the amount of carbon transferred from the atmosphere to the work surface. For example, if an AISI 9310 steel is carburized at a setpoint of 0.90 wt% carbon, the surface carbon content of the 9310 steel would be 0.80 wt% carbon. Compensating the controller setpoint for the effect of alloy content is the responsibility of the operator or the metallurgist specifying the heat treat operation.

4 TROUBLESHOOTING

4.1 GENERAL

This section is to be used if an atmosphere control malfunction occurs or is suspected. The objective of the following test procedure is to determine which part of the system (e.g. probe, interconnecting cable or control instrumentation) is malfunctioning.

4.2 TEST EQUIPMENT

This section is to be used if an atmosphere control malfunction occurs or is suspected. The objective of the following test procedure is to determine which part of the system (e.g. probe, interconnecting cable or control instrumentation) is malfunctioning.

1. Digital voltmeter with resolution of at least 1 millivolt DC and minimum input impedance of 10^9 ohms. (10 mega Ohms)
2. Ohm meter, capable of measuring resistance to a minimum of 10^9 ohms.
3. 1 meg. Ohm resistor, any wattage.

4.3 TEST PROCEDURE

1. For the following procedure, the furnace should be at 1700°F with an atmosphere of endothermic gas at 40°F dew point or lower. The furnace may have a load in it, although it is not necessary. Put the control system in manual mode.
2. At the control panel, disconnect the shielded probe cable from the control system. Check the DC voltage between (+) and (-) lead wires. If the measured DC voltage is less than 1.0 v, the problem may be with the air pump. Check to see that reference air is flowing into the probe at the reference air connector on the probe cover. If the reference air system is functioning, and the voltage output is less than 1.0v, the problem is with the probe. Since field repair of the probe is not possible, contact UPC for instructions on having the probe repaired. If the measured voltage is between 1.0 and 1.2v, the problem may be in the connecting cable. To check the probe cable, disconnect the connector at the probe cover. Check each lead of the cable (resistance less than .5 ohms) and that there is no shorting to the other leads and/or to ground. If the cable fails the above test, replace or repair cable as needed. Reconnect cable connector at the probe cover. Measure the probe output voltage to the nearest millivolt at the control panel end of the cable. Without delay, put a 1 mega ohm resistor across the probe cable leads and measure the probe output voltage again. A normal probe will show a drop of less than 15mv. If the voltage drop is more than 15mv, contact UPC for instructions

4.4 CONTROL SYSTEM ACCURACY

If the carbon control system is controlling, but incorrect surface carbon content is suspected on carburized parts, check that the percent CO content of the carrier gas used is 20 ± 1%. For this check a properly calibrated infrared analyzer is recommended. This analyzer should measure %CO, %CO_2, %CH_4 and calculate %carbon, dew point, and expected oxygen millivolts from the measured gasses and user entered temperature. Contact your Atmosphere Engineering representative for further instruction.

Using direct carbon reading instrumentation, make sure the controller is set up for the A^2. To verify this, measure the probe output in millivolts. Using the table or graph supplied with this manual, look up the predicted percent carbon for the A^2 voltage at the furnace operating temperature. Compare this percent carbon value with the value read from the control instrument. If they are in agreement, proceed to test the A^2 using the true carbon level test described into the Operating Section (True Carbon Test).

4.5 THERMOCOUPLE ACCURACY

The accuracy of the temperature input with direct percent carbon instruments is especially important. We recommend that you make available an alternate temperature source for direct percent carbon reading instruments, other that the type K integral probe thermocouple. There could be several reasons for temperature discrepancies involving the integral A^2 thermocouple in comparison to the control thermocouple.

- The integral thermocouple drifted in accuracy with time. This is a normal phenomenon. This is not a problem in new and repaired probes and not a problem in probes with type S thermocouple.
- The furnace control thermocouple has drifted in accuracy. Normal replacement will remedy this condition.
- The probe location within the furnace is not suitable initially or may have become unsuitable due to sagging or changing heating units. (Radiant tube, ribbons or wires) since initial installation. If this condition is ascertained, the probe must be moved to a new location.

Step-by Step instruction to track down the various causes of a temperature discrepancy involving the probe thermocouple is not feasible here. A logical, systematic approach using a portable ice point compensation and a millivolt meter or an equivalent instrument will be necessary. If assistance is required, please contact UPC.

5 PROBE SPECIFICATIONS

Probe Models A2-6-20 (Alloy Sheath) and CA2-6-20 (High Temp. Ceramic Sheath)
(Other Models also available)

Carbon Potential Range .... 0.10% to 1.4%
Output in normal heat treating .... 1000 to 1200 mV DC
Standard Probe Operating Temperature .... 1450° to 1850°F
High Temp Probe Operating Temperature .... 1450° to 2000°F
Probe Cover Temp. Limit .... 200°F max.
Sensitivity .... .02 mV or .0025% C
Accuracy .... ± 3% C
Stability .... ± mV over probe life
Response Time .... Less than 1 second
Impedance .... Less than 2000 ohm
Probe Construction .... Stabilized Zirconia solid electrolyte; Base Metal Alloy Electrode; Spring Loaded Contacts

Probe Thermal Shock .... Some caution is advised, although outer sheath protects ceramic zirconia tube

Probe Life .... About 2 years with normal use
Warranty .... 1-year usage, non-prorated
Serviceability .... No field service required, for quick exchange for new
Reference Air Requirement .... 0.2 to 0.5 CFH filtered air
Burnout Air Requirement .... 2-3 CFH, 2-3 Min. duration

6 PART NUMBERS

MODEL # AND DESCRIPTION						
Part No.	T/C Type				Length in	Length mm
A2-6-20	-	K	S	R	20”	508
A2-6-26	-	K	S	R	26”	660
A2-6-32	-	K	S	R	32”	812
A2-6-38	-	K	S	R	38”	965
CA2-6-20	-	K	S	R	20”	508
CA2-6-26	-	K	S	R	26”	660
CA2-6-32	-	K	S	R	32”	812

7 ACCESSORIES

Description .... UPC Part No.
Probe Mounting Flange F1.2-10
Reference Air/Burnoff supply with Enclosure .... BO-REF
Probe Cable with Type “K” Extension Wire (20’) C20-K-0
Probe Cable with Type “S” Extension Wire (20’) C20-RS-0
Shim-Holding Cartridge (1” diam.) H36-1
Shim Cooling Chamber V1.2-6
Shim Coupons S-24

		
Mounting Flange	Ceramic Reheat well	Reference air and burn-off

8 CUSTOMER SUPPORT

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Canada: +1 514 335-7191	**Beijing:** +86 10 8217 6427	**Germany**: +49 7161 94888-0
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