

OXYGEN PROBE Troubleshooting Guide



MASTERING STRENGTH. WORLDWIDE.

CONNECT WITH US

MANUAL #: 511

Revision #	Revision Date	Revision Description	

THIS MANUAL IS SUPPLIED ELECTRONICALLY.

COPYRIGHT^(C)

No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual, or otherwise, without prior written permission of United Process Controls Inc. (UPC-Marathon).

The information contained in this document is STRICTLY CONFIDENTIAL and PROPRIETARY to UPC-Marathon, and shall not be: i) reproduced or disclosed in part or in whole, ii) used for any design or manufacturing of heat treating and/or control equipment, or any other purpose except for that which it is supplied under the terms of the Contract, unless the express written authorization is obtained from UPC-Marathon.

Drawings and photographs included in the documentation are the property of UPC-Marathon, and it is strictly forbidden to reproduce them, transmit them to a third party, or use them for manufacturing and/or design of equipment. Sub-licensing of any technical information contained in this Documentation is strictly forbidden under the terms of the Contract.

UPC-Marathon reserves the right to modify this document without prior notice.

TECHNICAL ASSISTANCE

For all questions or concerns regarding the operation of the **Oxygen Probe**, please consult the last page of this manual for contact information.

Table of Contents

N

1	SENSOR OXYGEN READING IS TOO HIGH	. 4
2	REFERENCE AIR CHECK	. 4
3	TEMPERATURE CHECKS	. 5
4	ERRATIC O2 READING	. 7
5	O2 READINGS APPEAR TOO LOW	. 7
6	CUSTOMER SUPPORT	. 9



NOTE

All of the following tests assume that the oxygen sensor is operating above 1100°F and the process that is being read is stable.

1 SENSOR OXYGEN READING IS TOO HIGH

Check	You Find	It Means	
Increase the furnace pressure for 1 - 2 min	Reading drops	 The sensor is being affected by air leakage through the wall or through the sensor, or by a blanket of dead air close to the wall. There are 4 possible solutions: Seal the furnace better Seal the sensor better Insert the sensor past the dead air (if the temperature is not too high) 	
		4. Install the sensor in a better location	
	Reading stays approx the same	Continue to next check	
Check sensor cell resistance (see App)	Resistance is low <50K ohms Resistance is high >50K ohms	Sensor is okay - go to next check Electrode is dead – Replace sensor	
Use a portable device to take a sample close to the hot tip of the MSI sensor (see App)	Readings agree within an acceptable range	Sensor is correct, but is not exposed to typical gas. Check other locations with a portable analyzer to determine the best location	
	Readings disagree outside of an acceptable range	If the portable analyzer is known to be correct, (calibrated) then the MSI sensor is suspect - Replace or contact MSI agent for assistance	

2 REFERENCE AIR CHECK

Check	You Find	It Means		
Remove the ref air	No air flow	This is the problem - reference air flow must be		
connection to the	through the	0.5 to 1.5 SCFH		
head - feel for air	tubing			
flow				

Check	You Find	It Means	
Reattach the air line to the sensor. Increase the ref air (but not higher than 2 SCFH	Air is flowing reading increases	Cell is broken - if ref air is cut off, reading will drop to correct reading for a while - Replace the sensor	
	Reading decreases to correct reading	There was not enough reference air. Leave the reference air at the higher flow rate. Sensor should be correct now.	
Turn off air flow	Reading decreases more than acceptable	Normal - return reference air to higher level	
Remove end cap of sensor only with permission from MSI technician. Examine ref air tube	Tube is missing or destroyed, or is disconnected at either end.	Replace or reconnect the tube - see sensor manual for instructions on where tube is to be reconnected	
	Tube is intact	This is not the problem - go to the next section	
Check the temperature display at the monitor	Temp is stable and seems to be realistic for this location	This is not the problem - go to the next section	
	Temperature is varying more than 50° up/down	There is either a short circuit (possibly inside the sensor) or the wrong wires are attached to the T/C terminals at the monitor. Check at the sensor to see if the T/C voltage is stable or varying. If stable, check for correct connections between the sensor and the monitor. If the temp is varying, then the T/C is shorted in the sensor and must be replaced.	

3 TEMPERATURE CHECKS

Check	You Find	It Means	
	Temp reads off- line or higher	T/C is open or broken. Sensor must be removed	

than seems realistic	
Temp reads 0° F	T/C is shorted and must be replaced. Sensor must be removed before new T/C is replaced (to prevent sensor thermal shock)

Wiring - two-part check

Note: the following checks must be done with furnace at temperature >1400° and atmosphere present.

Check	You Find	It Means	
Measure the sensor millivolt output at the monitor - leave the	Negative signal	Signal leads are reversed at monitor, switch sensor leads	
wires attached to the monitor during the check	Positive millivolt signal	Compare readings to chart, if low continue to step 2.	
Disconnect the wires at the head - measure the sensor millivolt output at the head terminals	Significantly higher output in 2) than 1)	There is a short: check for melted wire insulation between monitor and sensor, dust buildup on sensor, dust buildup on terminals, wires touching inside sensor head, loose connector.	
Visually inspect wiring between sensor terminal block (inside head) and monitor	Melting of insulation	Intermittent short - replace wiring	
Remove cap of sensor (only with permission from a MSI technician) Examine ref air tube	Tube is missing or destroyed, or is disconnected at end	Replace or reconnect the ref air tubing	
	Tube is intact	This is not a problem. Go to next check.	
Remove the sensor (this should be done if other checks do not resolve the problem)	Slag, glossy or carbon buildup at the end of the sensor	Furnace gases are not getting into the cell. You can try cleaning off, but it is usually necessary to replace the sensor.	

Ref air tube Ref air tube T/C shows signs of Combustion – Greatly dis- colored or a buildup	There may be oil or other combustibles in the ref air – check air and filters. Dirty air will destroy the inner electrode of the sensor
--	---

4 ERRATIC O2 READING

Check	You Find	It Means	
Take combustibles reading at the sensor location with a portable combustible analyzer	High or varying combustible amounts	Poor combustion or mixing, or sensor is located too close to the flame. Either fix the burners, or move the sensor further away from the burners.	
	Low or no combustibles	Go to next check	
Check	You Find	It Means	
Shut off Reference air	Readings drop or stabilize	Cell is probably broken - Replace sensor. Go to next step for confirmation	
	No change	Go to next step	
Increase reference air (<2.0) SCFH	Reading goes higher	Cell is broken - Replace sensor	
	Reading stays same	Go to next step	
	Reading stabilizes	There wasn't enough reference air - leave at higher level	
Increase furnace pressure	Reading goes down	Pressure is not quite high enough at sensor location – either increase pressure or move sensor to better location	

5 O2 READINGS APPEAR TOO LOW



Check	You Find	It Means	
Check for combustibles with analyzer	High combustibles	Sensor is correct	
	No combustibles	Go to next check.	
Check O2 with portable analyzer	Same reading as MSI sensor	Sensor is correct.	
	Higher O2 reading	Go to next check	
Check probe temperature reading at monitor	Temperature is correct for furnace	Go to next check	
	Temperature is significantly different than furnace	Either T/C is bad, too much ref air is cooling the T/C, or the wrong thermocouple type is selected in the monitor for the T/C type in the probe.	
Check sensor millivolt reading at monitor. Remove wires at sensor and check millivolt reading at sensor	Millivolt reading at monitor is significantly more than the sensor.	The wiring is not well shielded and is picking up stray voltage or the monitor is out of calibration	
	Readings are the same.	This is not the problem.	

6 CUSTOMER SUPPORT

Americas		Asia		Europe	
support.na@upc-marathon.com		service@mmichina.cn		support.eu@upc-marathon.com	
USA:	+1 414 462 8200	Shanghai	: +86 21 3463 0376	France:	+33 3 81 48 37 37
Canada:	+1 514 335-7191	Beijing:	+86 10 8217 6427	Germany:	+49 7161 94888-0
				Poland:	+48 32 296 66 00

Reach us at www.upc-marathon.com

UPC-Marathon brings together leading brands to the heat-treating industry including Atmosphere Engineering, Furnace Control, Marathon Monitors, Process-Electronic, and Waukee Engineering. We provide prime control solutions through our worldwide sales and services network with easy-to-access local support.

