SuperSystems
incorporated

BAZOOKA PROBE™

OPERATIONS MANUAL

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Table of Contents

Introduction 4
Features 4
Specifications and Typical Probe Measurements 5
Installation 5
Maintenance 6
Control Systems 6
Troubleshooting 8
Warranty 9
Revision History 10

Introduction

Thank you for selecting the Bazooka Probe™ for your atmosphere control applications.

The Bazooka Probe™ represents a dramatic change in sampling oxygen sensor technology. It has been designed primarily for use in measuring systems as applied to endothermic generators, but is also useful in applications where high temperatures may have adverse effects on both life and performance, such as sintering.

The Bazooka Probe™ is derived from the original Gold Probe™ with the same patented electrode construction. It is the product of a team of design and application engineers, each with over twenty years of atmosphere control experience. The SSi engineering team has long recognized that the sensor is the most critical component in the atmosphere control system and has traditionally been the weakest link. Now, reliability, repeatability, and accuracy are assured with the inclusion of the Bazooka Probe™.

WARNING!

Follow all proper safety precautions. Use proper eye protection and hand protection at all times.

Features

The Bazooka Probe™ channels a small sample to the patented probe measuring point. From there, the sample enters an integral micro isolating well which then vents the sample to the combustion chamber of the generator, or the interior hot wall, in the case of furnaces.

There is no cool area where soot can be deposited.

There is a tiny buffering volume separating the probe from the sample exit, so response is fast.

Flow restriction is negligible, so a sampling pump is not usually necessary.

See the *Warranty* section for more information on rebuild and warranty options.

The Bazooka is a direct replacement for most existing sensors.

The 1" NPT sealing gland is easily plumbed into existing installations.

Specifications and Typical Probe Measurements

The specifications for the Bazooka Probe™ are as follows.

Useful %C range	0°F to 100°F (-17.8°C to 37.8°C) Dew Point (0.1 to 1.6%C)
Temperature range	1350°F to 1700°F (732.2°C to 926.7°C)
Stability	±1 mvdc
Impedance	Less than 10 kohms at 1700°F (926.7°C)
Useful output	0 mvdc to 1250 mvdc

Typical measurements for Bazooka Probes™ are as follows:

Part Number	Description	Typical Length	Insertion Maximum	Mounting
1713100	Bazooka Probe™, GP133, Type R T/C	23.0" (58.4cm)	16.2" (41.1cm)	1" NPT
1713800	Bazooka Probe™, GP133, Type S T/C	23.0" (58.4cm)	16.2" (41.1cm)	1" NPT
1713900	Bazooka Probe™, GP133, Type K T/C	23.0" (58.4cm)	16.2" (41.1cm)	1" NPT
1711800	Bazooka Probe™, GP205, Type S T/C	29.2" (74.2cm)	22.4" (56.9cm)	1" NPT
1711900	Bazooka Probe™, GP205, Type K T/C	29.2" (74.2cm)	22.4" (56.9cm)	1" NPT
1712800	Bazooka Probe™, GP277, Type S T/C	36.4" (94.5cm)	29.6" (75.2cm)	1" NPT
1712900	Bazooka Probe™, GP277, Type K T/C	36.4" (94.5cm)	29.6" (75.2cm)	1" NPT

Installation

Fig. 1 shows a suggested installation utilizing a 1" coupling welded to the generator wall. The hole through the insulation must be at least 1 ¼" in diameter and axially aligned with the coupling to avoid interference with the Bazooka™ well which has an O.D. of 1.050". For existing installations with larger fittings, use a bushing to reduce the diameter to the 1" female required by the probe gland. Provide for about 1 SCFH of reference air, 6-10 SCFH of burnoff air, and 2 – 3 SCFH of sample from the endo manifold or sample from individual retorts. The probe should be inserted to a depth such that, at equilibrium, the probe temperature is between 1400°F (760°C) and 1700°F (926.7°C), preferably at 1550°F (843.3°C).

IMPORTANT!

Zirconia is thermal shock sensitive. Insert into hot atmosphere no faster than 2" (51mm) per minute (after first 4 inches or 101 millimeters).

Temperatures above 1500 °F (815.6°C) will prevent sooting from the sample atmosphere.

1550 °F (843.3 °C) is an optimal temperature to ensure that the sheath is not exposed to excessive temperatures, and this temperature will provide optimal life of the sheath and its components.

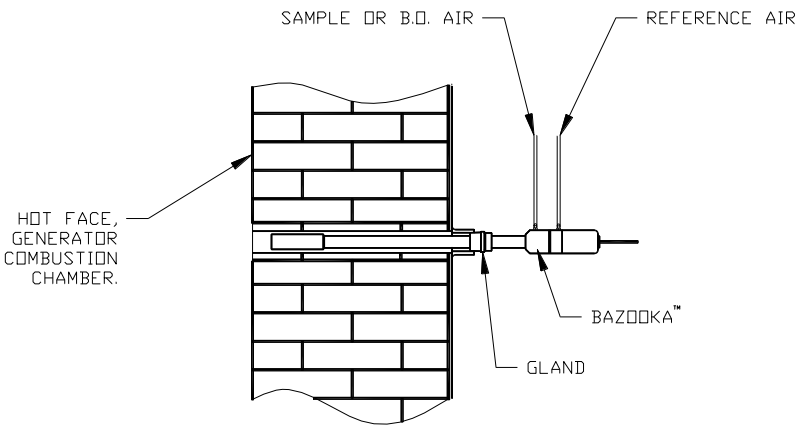

FIG.1- INSTALLATION

Maintenance

Maintenance of the Bazooka™ probe follows the same general rules as for the Gold Probe™/ Periodic burnoff is required to prevent buildup of carbon in the sensing region of the probe. Simple systems to provide the appropriate probe conditioning programs are available from SSi. For generators, the normal burnoff cycle is 24 hours when operating at 40º dew point. Lower set points will usually require more frequent burnoffs. Burnoff frequency can be determined by the time required to burn off to a sensor reading near zero mV.

Typical burnoff times are 60-90 seconds at 6-10 SCFH of burnoff air with 90 seconds allowed for probe recovery. However, burnoff may require up to 20 SCFH. Sample flow rates (from the Rx gas manifold) are typically 2 SCFH.

Control Systems

If you are using the Bazooka Probe™ for the first time as a replacement in an existing system, you will find that the performance is as good as or better than you are accustomed to. If you plan on a new system to upgrade your controls, you can rely on Super Systems to supply you exactly what you need, from the simplest on/off controls to the most sophisticated programmable PID control with computer interface.

Fig 2. Shows a typical generator control system with a separate conditioning box available as a standard system from Super Systems. SSi is positioned to provide a "plug and play" system that is operator friendly. Components such as valves, flow meters, cable and tubing are generally ordered with each system so that these items are available when the system is installed. For details, please contact SSi or your SSi representative.

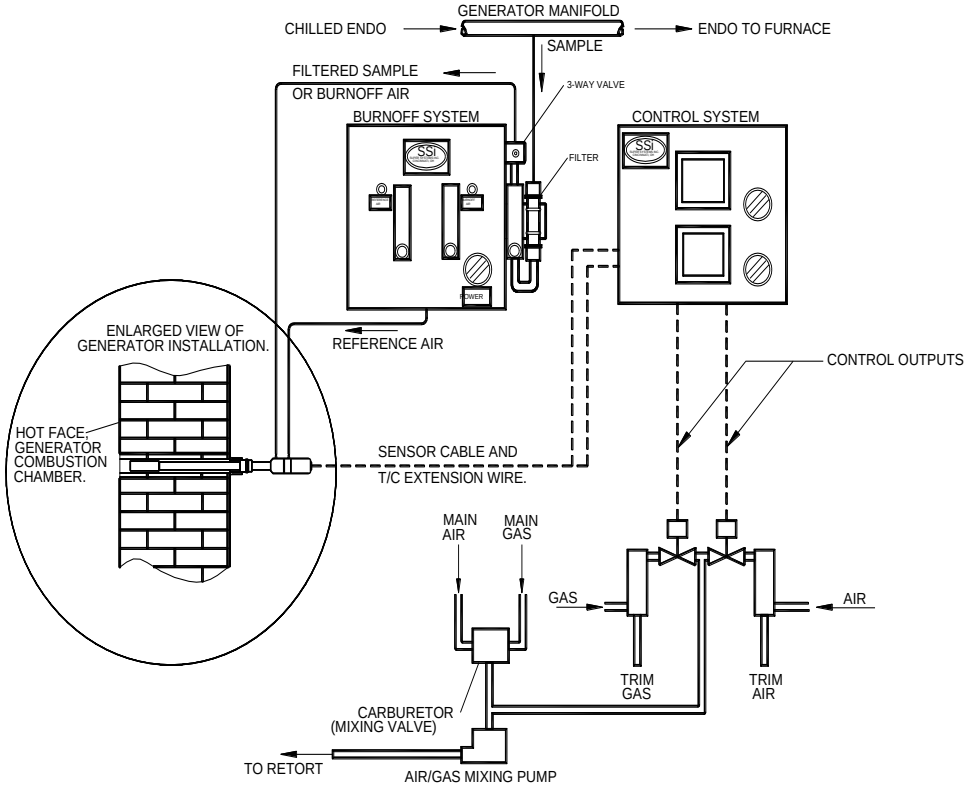

FIG. 2 ENDOTHERMIC GENERATOR BAZOOKA SAMPLING AND CONTROL SYSTEM WITH CONDITIONING.

Troubleshooting

WARNING!

When troubleshooting, follow all proper safety precautions. Use proper eye protection and hand protection at all times.

If problems are encountered in operation, it is necessary to verify the integrity of the probe and its supporting equipment, the control instrument, signal transmission lines, or the process, including the controlling elements, such as solenoid or motor driven valves. If there is disagreement between the probe's indicated value and dew point analysis, the following simple tests can be conducted to eliminate the probe as a source of problems. The probe must be at temperature and under stable control.

- Reference air flow 0.5 to 1.0 CFH
- Sample flow 2.0 to 3.0 CFH
- Check the probe resistance. It should be less than 10 kilohms. If not, burn off the probe and retest.
- Test the speed of response after switching the control instrument to manual control. First, record the mV output. Then short the probe for 5 seconds, remove the short and measure the time required to return to within 1% of the original reading. If it exceeds 30 seconds, conduct a burnoff and repeat the test after the reading has stabilized.
- Turn off the reference air supply for three minutes. Read the probe millivolts, and then turn the air back on. If the reading changes (immediately) by more than 25 mV, replace the probe. The substrate is cracked or broken.

If these fundamental tests show that the probe is functional, check the following possible reasons for disagreement:

- Contamination of the reference air supply with combustibles
- Air leak into the sample line. Check with a dew pointer at the probe entry
- Faulty insulation in the signal lines
- Instrument out of calibration. Check with a DVM or calibrator that the instrument reading matches the open loop probe or temperature reading.

If you experience problems and cannot find the solution after troubleshooting, please call SSi Technical Support at (513) 772-0060.

Warranty

Super Systems, Inc. (SSi) as manufacturer of the Bazooka Probe™, warrants it for a period of one year to be free from defects in material and workmanship under normal use and service. SSi's obligation under this warranty is limited to repairing or replacing, at its option, the sensor described herein, should failure occur within the warranty period. The warranty period shall commence on installation of the sensor as certified by receipt of the postage-free Registration Card accompanying the sensor. If premature failure occurs, the sensor along with the Warranty Claim Report must be returned in the complete, original packaging to SSi. Upon receipt, SSi will conduct an examination as to the cause of failure, at which time appropriate action will be taken.

For sensors operating at elevated temperatures, the warranty period is prorated such that full warranty is granted for operation below 1850°F (1010°C); six months warranty for temperatures between 1850°F (1010°C) and 1950°F (1065.6°C); three months warranty between 1950°F (1065.6°C) and 2050°F (1121.1°C), and no warranty above 2050°F (1121.1°C).

There are no warranties, expressed or implied, by the distributors or representatives for the Bazooka Probe™, except the expressed warranty against defects described above. There will be no applicable warranty in the event of breakage resulting from thermal or mechanical shock. Additionally, there will be no applicable warranty for a probe which has been subject to misuse, negligence or accidental damage.

This warranty cannot be honored unless the Registration Card is received at SSi prior to the Warranty Claim Report, and the use and installation is accomplished according to the techniques and procedures described in the Bazooka Probe™ Manual. SSi shall in no way be liable for special or consequential damages related to the use of this sensor.

Revision History

Rev.	Description	Date	MCO #
-	Initial Release	04-24-2001	
A	Added Revision History	07-11-2001	2008
A_01	Corrected grammatical and spelling errors	05-24-2002	2025
A_02	Address & general update	04-25-2005	2035
B	Corrected some spelling errors; Added in optimal temperature warning and general usage to the *Installation* section; Added the "MCO #" column to the Revision History	06-23-2010	2075
C	Burnoff Procedure (Maintenance section) updated	06-23-2011	2080
D	Manual format updated to current format; wording updated as necessary; Bazooka Probe™ typical measurements added	02-10-2015	2157