



Flame Tracker* Lite

SiC Flame Sensor

Reuter-Stokes

Operation and Maintenance Manual

**FS-9100OM Rev. B
October 2020**

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Certification Information

ATTENTION! The RS-FS-9100 **Flame Tracker Lite** sensor complies with the following standards:

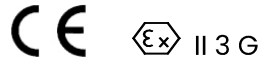
ETL



Control Number
9900287

Class I, Div. 2, Grp A,B,C,D T*
Class I, Zone 2 AEx ec IIC T* Gc
Ex ec IIC T* Gc

ATEX/IECEX



Ex ec IIC T* Gc

-40°C ≤ T_a ≤ 120°C; T3
-40°C ≤ T_a ≤ 105°C; T4
-40°C ≤ T_a ≤ 70°C; T5
-40°C ≤ T_a ≤ 55°C; T6

SPECIAL CONDITION OF USE: Transient protection shall be provided that is set at a level not exceeding 140% of the peak voltage value at the supply terminals to the equipment.

- Explosive Atmospheres - Part 0: Equipment - General Requirements [IEC 600790:2017 Ed.7]
- Explosive Atmospheres - Part 7: Equipment Protection by Increased Safety "E" [IEC 60079-7:2015 Ed.5+A1]
- Explosive Atmospheres - Part 0: Equipment - General Requirements [EN 600790:2018]
- Explosive Atmospheres - Part 7: Equipment Protection by Increased Safety "E" [EN 60079-7:2015+A1:2018]
- UL 121201:2017 Ed.9+R:31Aug2018 – Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
- Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations [CSA C22.2#213:2017 Ed.3+U1;U2]
- Explosive atmospheres - Part 0: Equipment - General requirements [UL 60079-0:2013 Ed.6+R:20Oct2017]
- Explosive Atmospheres — Part 0: Equipment — General Requirements [CSA C22.2#60079-0:2019 Ed.4]
- Standard for Safety Explosive Atmospheres - Part 7: Equipment Protection by Increased Safety "e" [UL 60079-7:2017 Ed.5+R:21Apr2017]
- Explosive Atmospheres — Part 7: Equipment Protection By Increased Safety "E" [CSA C22.2#60079-7:2016 Ed.2]
- Conforms to Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements [UL 61010-1:2012 Ed.3+R:19Jul2019]
- Certified to Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use Part 1: General Requirements [CSA C22.2#61010-1-12:2012 Ed.3]

These certifications are based on the use of approved interconnecting cables only. Currently available approved interconnecting cables are Reuter-Stokes RS-E2-0285PXXX and GE 362A1053PXXX. See Section 1.1.2 for details.

WARNING

Certifications are based on the use of approved cables only. Currently available approved cables are Reuter-Stokes RS-E2-0285PXXX and GE 362A1053PXXX.

Do not attempt to disassemble the sensor. Sensor is not repairable. Breaching the seal of the sensor will cause loss of the inert fill gas and render the sensor unusable.

Do not remove the sensor by wrenching on the body. Always use the 1 5/8 inch mounting nut. Wrenching on the body may breach the seal. Breaching the seal of the sensor will cause loss of the inert fill gas and render the sensor unusable. Once the seal has been broken it cannot be resealed by reassembly.

Do not install a sensor that has a cracked window, damaged threads, or one that has been disassembled.

CAUTION

The operating temperature range of the Flame Tracker Lite is **-40°C to 120°C**. Do not attempt to touch the Flame Tracker Lite until it has reached a safe handling temperature.

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1 **INTRODUCTION**

1.1 **SPECIFICATIONS**

1.1.1 FLAME TRACKER LITE RS-FS-9100

Mechanical

Body Mount:	AISI316 Stainless Steel
Housing:	AISI304 Stainless Steel (sealed and Argon filled)
Connection	
Process:	1" NPT female
Electrical:	MIL-C-38999 Series III size 15 (5 pin)
Sensor:	Silicon Carbide photodiode
Window:	Sapphire

Operating

Output:	4 - 20 mA dc, Max < 22 mA
Response time	< 100 milliseconds
Power Requirements:	12 - 30 vdc @ > 100 mA
Temperature Range (ambient):	-40°F to 248°F (-40°C to 120°C)
Relative Humidity	100% Non-Condensing
Process Pressure	100 psig (0.7 Mpa)

1.1.2 INTERCONNECTING CABLE RS-E2-0285PXXX OR 362A1053PXXX

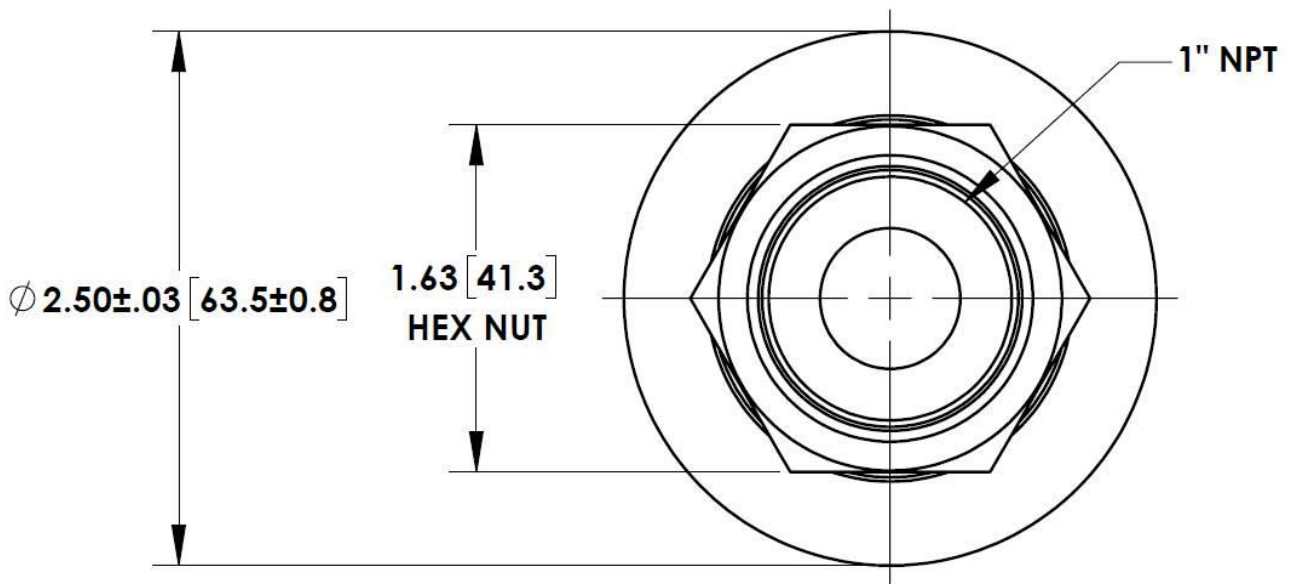
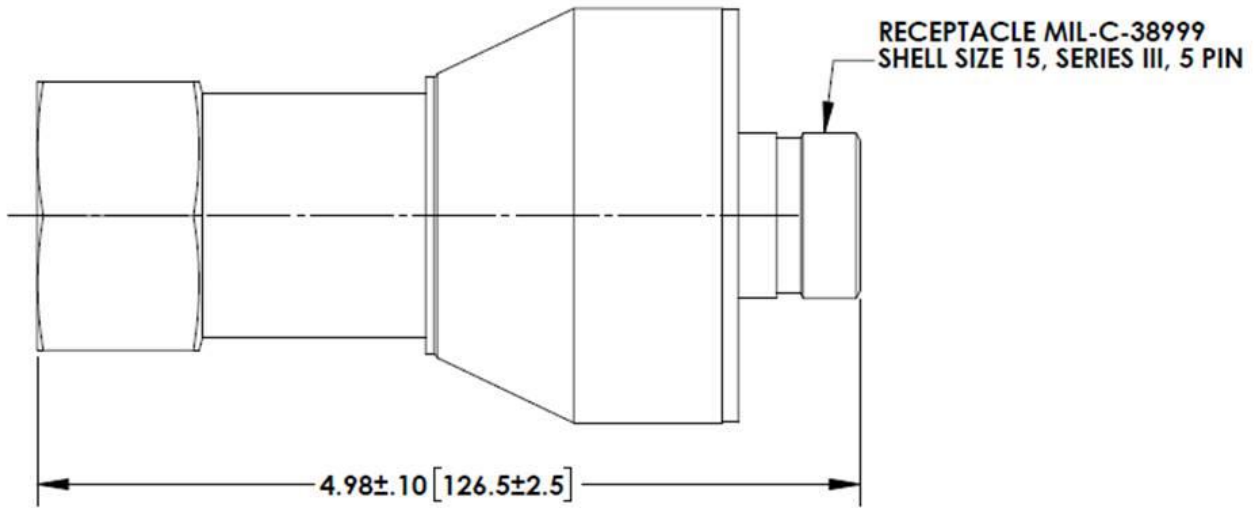
Mechanical

Wire	18 gauge (1.02 mm), 19 strand nickel plated copper
Insulation	Teflon PTFE
Shield	36 gauge (0.127 mm) nickel plated copper braid
Jacket	Extruded PFA
Armor	Stainless steel braid
Connector	MIL-C-38999 series III, shell size 15, 5 #16 pins (only 3 pins are used)

Operating

Voltage (max)	300 vrms
Temperature (max)	482°F (250°C)

1.2 REFERENCE



1.3 GENERAL DESCRIPTION

The Flame Tracker Lite is a rugged flame sensor that can operate in harsh industrial applications. The Reuter-Stokes technology has millions of operating hours and very high reliability. The sensor has high sensitivity and is tailored for use with hydrocarbon flames. It uses a silicon carbide sensing element for UV detection and has a single 4-20 mA current loop output. The Flame Tracker Lite can operate under high temperature and pressure and is constructed of corrosion resistant material. The sensor body is sealed and filled with dry argon.

The sensor circuit has a high initial gain, which automatically shifts to a lower gain in order to accommodate a wide range of input light level without saturating. The sensor regulates the supply current in proportion to the amount of UV light present. Both power and signal are transmitted on the same two wires. The sensor can be powered from a dc voltage between 12 and 30 volts.

The maximum operating temperature for the flame sensor is 120°C (248°F). Cooling systems are not applicable.

2 INSTALLATION

2.1 MECHANICAL

Mount the Flame Tracker Lite on a sight tube with 1" NPT male threads. Ensure that the sight tube has an unobstructed view of the flame. The sight tube should be adjusted to maximize the view of the flame. The line of sight for the sensor should be at a shallow angle to the burner center line and should pass through the primary combustion zone of the flame.

In order to reduce the risk of galling, use an anti seize compound on the sight tube threads. Be sure the amount is minimal and only applied below the 2nd thread. If anti-seize compound is applied to the face of the sight tube, upon heating, it can fog the window of the Flame Tracker Lite.

Inspect the sensor window and, if necessary, clean with an isopropanol soaked swab. Hand tighten then tighten with a 1 5/8" wrench approximately 2.5 turns. To connect the cable, align keys on cable connector with slots in sensor connector. Tighten the connector by turning the knurled ring of the connector until the red line is hidden.

Although purge air for cooling is not generally required, purge air to prevent contamination on the sensor window is necessary. Any contamination that deposits on the sensor window will decrease the amount of UV light that enters the sensor and decrease the output of the sensor. Use a Y or T fitting to introduce purge air into the sight tube. Ensure that the pressure and flow rate are sufficient to flow air down the sight tube and away from the flame sensor.

2.2 ELECTRICAL

The sensors can be connected directly to the control system or it can be connected to a junction box and then to the control system. An interconnect cable RS-E2-0285PXXX or equivalent is used to connect to the sensor. The RS-E2-0285PXXX consists of black, white and green wires twisted and shielded. All wiring must be in grounded conduit except the armored sections of the interconnect cables. The green wire must be connected to earth ground at the junction box, if one exists. If no junction box is used and the cable is run directly to the control system, do not connect the green wire to anything. Do not connect the shields to each other or to earth ground at any location. The shields should be individually jumped through all junction boxes and connected to the proper ground terminal at the Controller.

The polarity of the cable is as follows: white is positive and black is negative/signal return. Reverse polarity will not damage the sensor, however the sensor will not function connected this way. If a junction box is used, the signal cable from the junction box to the control system should be 18 gauge (1.02 mm) twisted shielded pair. See Figure 1.

Figure 1 shows the preferred wiring for the sensor with the R_{sense} of the control system in the return line of the sensor. This configuration can be used with control systems that have single ended inputs (one side of the input

grounded) or differential inputs (neither side of the input grounded). For pin outs and cable color code see Table 1 in section 2.3.

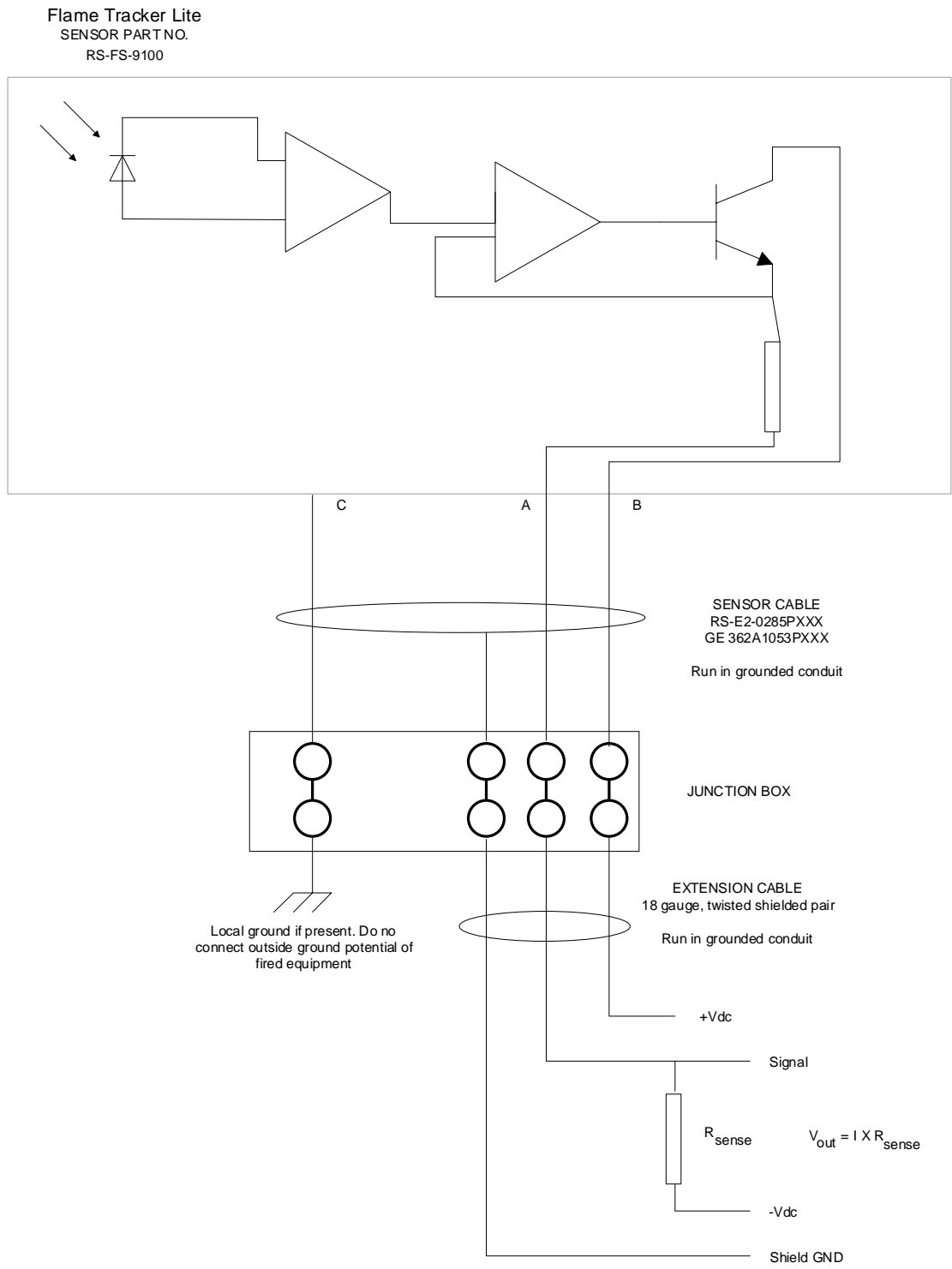


FIGURE 1 - FLAME SENSOR WIRING DIAGRAM

The Flame Tracker Lite is connected to the control system as a typical two wire current transmitter. It can be operated from any well-filtered dc supply from 12 volts to 30 volts. The supply should be capable of supplying 100 milliamps.

The power supply must be protected to prevent the supply voltage from exceeding 30 volts in normal use and more than 42 volts under transient conditions. The sensor is protected against reverse polarity. The maximum value for the sense resistor plus the wire resistance is dependent on the supply voltage. At 24 volts this value is 560 ohms. Resistance values for other voltages can be determined from the chart in Figure 2.

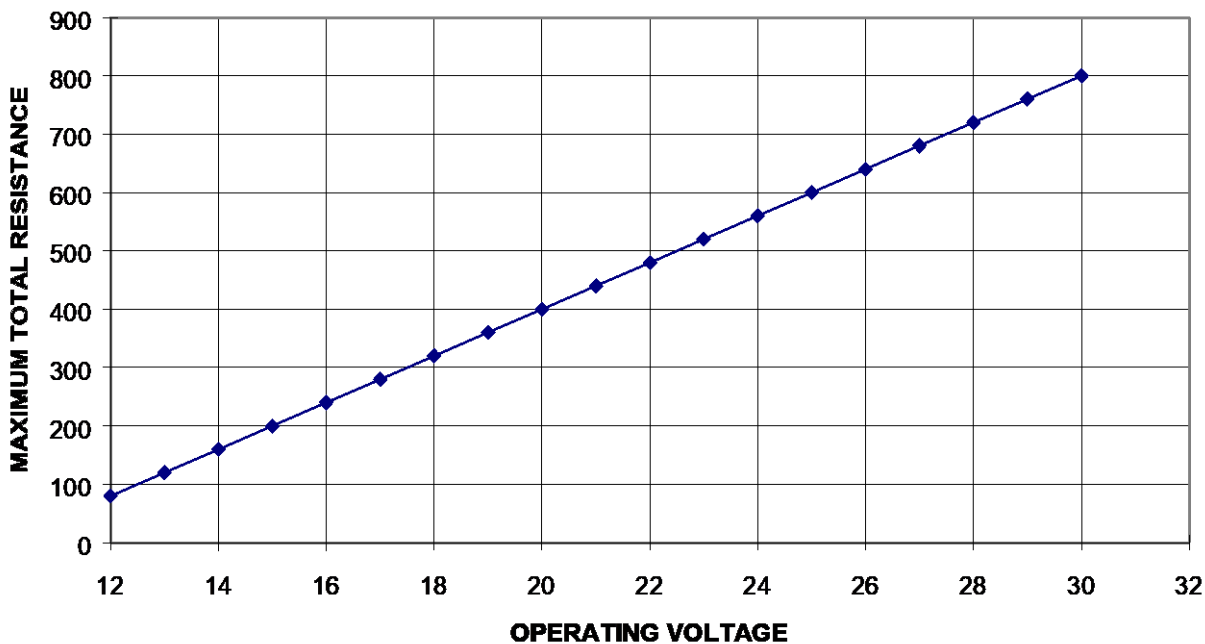


FIGURE 2 – MAXIMUM RESISTANCE VS. OPERATING VOLTAGE

2.3 CONNECTOR PINOUT

The pinout for the power connector is as follows:

Table 1

Interconnecting Cable Pinout		
PIN	CIRCUIT DESIGNATION	WIRE COLOR
A	-	Black
B	+	White
C	Ground	Green
D	Not Used	
E	Not Used	

2.4 SENSOR CHECKOUT

A UV light source in the range of 200-400 nm is required to test the Flame Tracker Lite. Many LED flashlights do not emit UV light. Incandescent flashlights will work. A good solution is a light that is specifically made to emit UV light, such as the Streamlight Stylus UV pen light, manufacturer part number 65069.

Disconnect the sensors and unscrew them from the sight tubes. Plug the sensor cables back in to each of the sensors. Apply power to the sensors. Check the current values at the control system for each of the sensors. The sensors are sensitive to light, and may have some reading, depending on the ambient light intensity and UV content. Test each sensor by covering the window to see the zero flame intensity signals, and with a UV light to see a positive reading. With no UV light the reading should be 3.7 to 4.1 milliamps and with most flashlights the reading should be above 8 milliamps. Variations in light type, strength, or battery voltage may cause variation in signal output. The test is intended as a field test for general functionality only and is not a controlled or quantitative test. If a sensor is outside these rough check limits see Section 4 Troubleshooting.

Disconnect the sensor cables, and reinstall the sensors according to the instruction in Section 2.1.

2.5 CONTROLLER SETUP

The Flame Tracker Lite is very sensitive to hydrocarbon and other types of flames. It will output 4 mA for no UV light and will output a maximum of 22 mA for high intensity UV light, although most outputs will be within the range of 4-20 mA. Milliamp threshold values for Flame On/Off determination should be stored in the control system. Some control systems will use a single threshold value and 5.0 mA is typical. Some control system use hysteresis and have two thresholds, one for Flame On and one for Flame Off. 5.0 mA and 6.0 mA are typical values for such control systems.

3 MAINTENANCE

3.1 WARNING

Do not disconnect the cable connector while circuit is energized (or live), unless area is known to be non-hazardous.

3.2 CAUTION

The operating temperature range of the Flame Sensor is **-40°C to 120°C**. **Do not** attempt to touch the Flame Tracker Lite or the cable until they have reached a safe handling temperature.

The flame sensor output will deteriorate as the lens becomes dirty. It is recommended, when initially installed, that the signal level be recorded during normal operation. During subsequent operation, the signal level should

be compared with the initial values. If a significant reduction in the signal level is noticed, then it is recommended that the lens be cleaned at the next opportunity (with the fired equipment shut down and cold). Clean the sensor window with isopropyl alcohol or other residue free solvent compatible with sapphire. Apply a small amount of anti-sieze compound to threads of sight tube prior to installation. Be sure the amount is minimal and only applied below the 2nd thread. If anti-sieze compound is applied to the face of the sight tube, upon heating, it can fog the window of the Flame Tracker Lite.

4 TROUBLESHOOTING

4.1 WARNING

Do not disconnect connector while circuit is energized (or live), unless area is known to be non-hazardous.

4.2 CAUTION

The operating temperature range of the Flame Sensor is **-40°C to 120°C**. **Do not** attempt to touch the flame sensor or the cable until they have cooled to a safe handling temperature.

PROBLEM	POSSIBLE CAUSES	SOLUTION
No current flow	Reversed polarity Open wire	Change polarity Check connections
Low sensitivity during checkout or operation	Dirty lens Grounded cable	Clean lens (Section 4) Check cable for grounds
Low flame intensity signal during operation	Misalignment of the sight tube	Check the squareness of all flanges and pipes of the sensor mount. Verify that the sensors have a clear view of the primary combustion zone of the flame.