AMETEK®
POWER INSTRUMENTS

SPECTRA™ GT30 FLAME SENSOR

INSTALLATION AND OPERATIONS MANUAL

POWER INSTRUMENTS

1084-429 Rev. A

Disclosure Notice

Purpose and Scope

This manual describes the AMETEK Power Instruments Spectra™ GT30 Flame Sensor and its accessories. If more data is necessary or special problems occur that are not covered in this manual, refer inquiries to:

AMETEK Power Instruments
255 North Union Street
Rochester, NY 14605

Phone: 585-263-7700
Fax: 585-238-4945
Website: http://www.ametekpower.com

Reference Documents

ANSI/ISA-1995 (S50.1)
Compatibility of Analog Signals for Electronic Industrial Process Instruments

ANSI/ISA-1995 (S71.01)
Environmental Conditions for Process Measurement and Control Systems: Temperature and Humidity

ANSI/ISA-1995 (S71.03)
Environmental Conditions for Process Measurement and Control Systems: Mechanical Influences

ANSI/ASME CSD-1-195
Controls and Safety Devices for Automatically Fired Boilers by ASME

FACTORY MUTUAL
Approval Standards for Combustion Safeguards

NFPA 70
National Electrical Code by NFPA

Notes, Cautions, and Warnings

Note, Caution, and Warning icons denote information of special interest. The icons appear in the column to the left of the text and are reproduced below, along with explanations of their meanings. Failure to observe a Warning could cause a dangerous condition.

NOTE

The **NOTE** icon signifies a cautionary statement, an operating tip or maintenance suggestion.

CAUTION

The **CAUTION** icon signifies information that, if ignored, could lead to instrument damage.

WARNING

The **WARNING** icon signifies information that denotes a potentially hazardous situation, which, if not avoided, may result in death or serious injury.

Contents

1. Introduction and Installation

The Spectra™ GT30 Flame Sensor is a two-wire loop-powered optical flame sensor that receives UV energy from the combustion process and transmits a 4-20 mA analog signal proportional to flame intensity. The Spectra™ GT30 operates continuously at 125 °C (257 °F) without cooling and at process pressures up to 30 bar (435 psi). For operating temperatures between 125 °C (257 °F) and 371 °C (700 °F), a cooling coil must be used to maintain a safe sensor operating temperature. The Spectra™ GT30 is mounted directly to the turbine case or on a short standoff pipe via an internal 3/4" NPT thread. Various cabling options are available to connect the sensor directly to a control system or through a relay module (see "Optional Accessories" on page A-4).

Installation

Installation of a the Spectra™ GT30 flame sensor includes installation of the sensor to the turbine, making connections to the sensor, sighting the sensor for best response, and installing the cooling coil, if required.

There are two installation types:

- Standard applications where the maximum temperature is 125 °C (257 °F). See "Standard Installation" on page 1-2.
- Elevated Temperature applications, between 125 °C (257 °F) and 200 ° C (392 °F) or for a mounting surface temperature up to 371 °C (700 °F). See "Elevated Temperature Installation" on page 1-3.

Table 1.1 lists the tools required for either installation type.

Table 1.1 Installation Material and Equipment

Item	Description
Wrench	Adjustable to 1-1/2"
Anti-seize compound	High temperature grade
Screw driver	Standard tip

Standard Installation

To perform a standard installation:

1. Attach the sensor to the installation pipe or mounting flange using the internal 3/4" NPT thread connection at the sensor window, and tighten using an adjustable wrench (Figure 1.1).

CAUTION

The use of high temperature anti-seize compound is recommended. When using any anti-seize or thread sealant take care not to get any on the sensor window as it degrades sensor operation.

2. Attach the mating cable by aligning the keyways of the connectors and tightening the coupling ring clockwise until the cable is fully mated. The cable is fully mated when the red indicator band on the receptacle connector is not visible.
3. Wire per National Electrical Code standards (Figure 1.2).

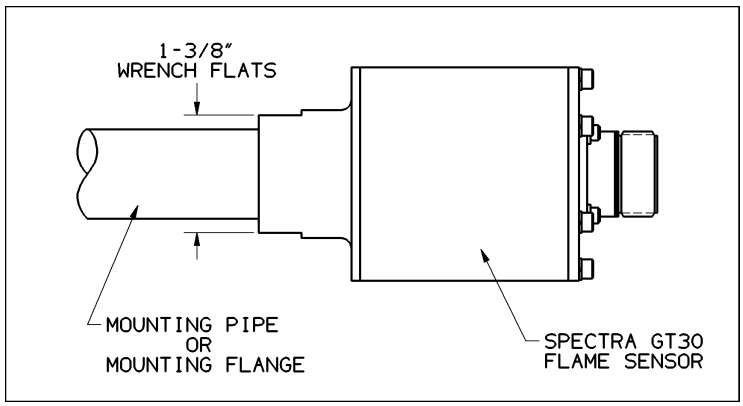

Figure 1.1 Standard Installation Diagram

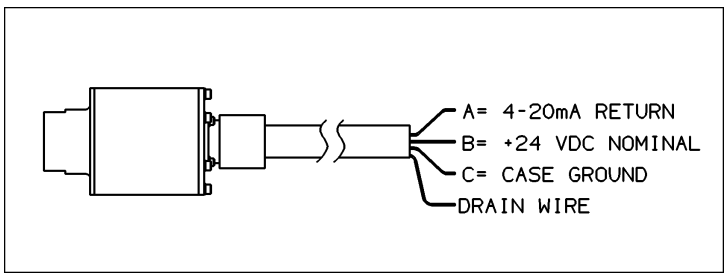

Figure 1.2 Standard Installation Wiring

See Table A.3 on page A-4 for wire identification.

Elevated Temperature Installation

To perform an elevated temperature installation:

1. Attach the sensor to the installation pipe or mounting flange using the internal 3/4" NPT thread connection at the sensor window, and tighten using an adjustable wrench (Figure 1.3).

CAUTION

The use of high temperature anti-seize compound is recommended. When using any anti-seize or thread sealant, take care not to get any on the sensor window as it degrades sensor operation.

2. Attach the cooling coil assembly by sliding it over the outside of the flame sensor, and tighten the clamps until the coil assembly is snug.
3. Attach supply and return lines to the Ø .250 diameter stainless steel tubing, ensuring that the flow direction is correct.

CAUTION

Adequate supply and return lines must be used to ensure that water flow through the cooling coil is not restricted.

4. Attach the mating cable, if supplied.
5. Wire per national electrical code standards (Figure 1.4).

CAUTION

Cooling water must be applied at all times when operating temperatures are above 125 °C (257 °F). Operational specifications for the cooling water are:

- **Minimum Water flow rate = 1 to 1.5 GPM**
- **Maximum water temperature = 57 °C (135 °F)**
- **Minimum water pressure = 60 psig**

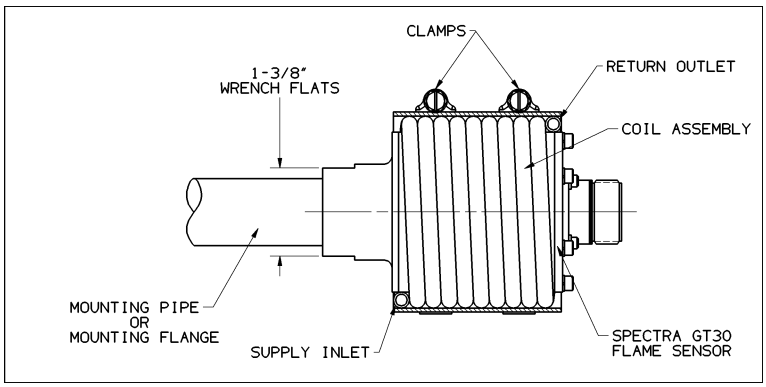

Figure 1.3 Elevated Temperature Installation Diagram

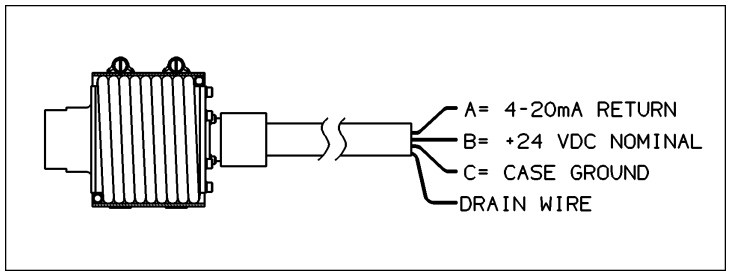

Figure 1.4 Elevated Temperature Installation Wiring

See Table A.3 on page A-4 for wire identification.

2. Operation

Inspection

You must have a 3X magnifying glass to perform an inspection. Inspect the sensor for conditions given in Table 2.1. If conditions are found during inspection that cannot be repaired locally, return the unit to:

AMETEK Power Instruments
255 North Union Street
Rochester, NY 14605

Phone: 585-263-7700
Fax: 585-238-4945
Website: http://www.ametekpower.com

NOTE

Before returning any item you must call for a Return Material Authorization (RMA).

CAUTION

Ametek takes no responsibility for field repairs.

Table 2.1 Inspection Criteria

Condition	Corrective Action
Sensor window: Surface scratches on the sensor window	Return to AMETEK.
Sensor window: Unwanted material/contamination on window	Refer to "Cleaning and Storage" on page 3-1.
Sensor window: Damaged threads	Repair damaged threads with thread chaser or return to AMETEK for repair.
Connector: Unwanted material/contamination	Remove unwanted material; refer to "Cleaning and Storage" on page 3-1.
Connector: Bent pins	Carefully straighten the pins so that they fit into the mating receptacle.

Table 2.1 Inspection Criteria (Continued)

Condition	Corrective Action
Connector: Broken pins	Return to Ametek if pins A,B or C are broken.
Cooling Coil: Unwanted material/contamination	Remove unwanted material; refer to "Cleaning and Storage" on page 3-1.

Testing and Fault Isolation

The sensor and interconnection cable can be tested as a system. If the result is not satisfactory, isolate the fault by testing the sensor and by performing a continuity test of the system interconnections.

To aid in fault isolation, refer to "Current Measurement" on page 2-3 or "Voltage Measurement" on page 2-4. Table 2.2 lists the equipment needed for Testing and Fault isolation.

Table 2.2 Test Equipment

Item	Description
AC/DC Light Source	Quartz halogen lamp (100 W minimum) or equivalent
DC Power Supply	0-30 VDC adjustable
Multimeter	0-5 VDC, 0.1% accuracy, 20 mA,1% accuracy
Resistor	250 Ω, 1%, 1/4 W minimum

Current Measurement

To perform this test:

CAUTION

Ametek takes no responsibility for field repairs.

1. Connect the sensor as shown in Figure 2.1.
2. Block the sensor window to prevent any light from entering.
3. Vary the output of the DC power supply from 20 VDC minimum to 30 VDC maximum.

   Ensure that the multimeter steadily reads 4.00±0.50 mA.
4. Shine direct light from the AC/DC light source into the sensor window until the multimeter reads greater than 6.00 mA.
5. Vary the output of the DC power supply from 20 VDC minimum to 30 VDC maximum.

   Ensure that the multimeter steadily reads greater than 6.00 mA.

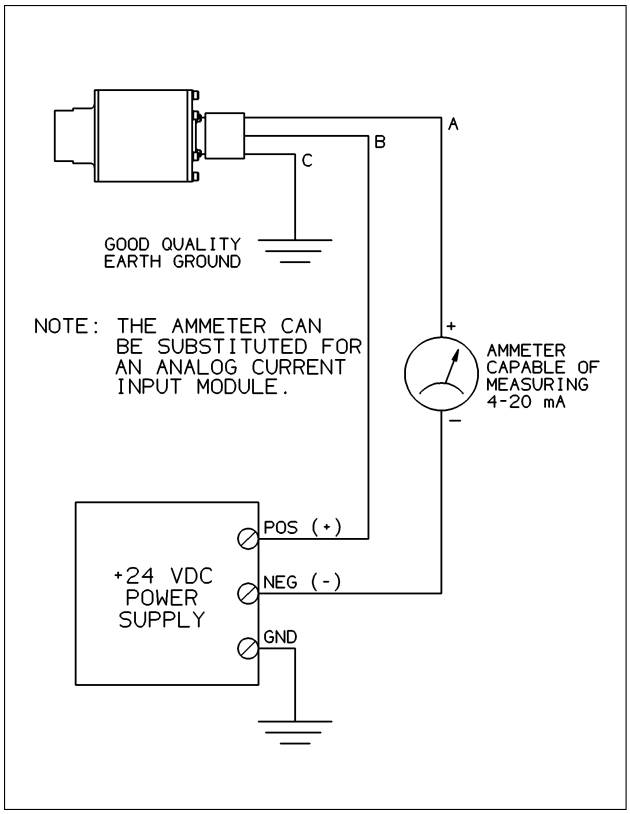

Figure 2.1 Current Measurement

Voltage Measurement

To perform this test:

CAUTION

Ametek takes no responsibility for field repairs.

1. Connect the sensor as shown in Figure 2.2.
2. Block the sensor window to prevent any light from entering.
3. Vary the output of the DC power supply from 20 VDC minimum to 30 VDC maximum.

   Ensure that the multimeter steadily reads 1.00±0.13 VDC.
4. Shine direct light from the AC/DC light source into the sensor window until the multimeter reads greater than 1.5 VDC.
5. Vary the output of the DC power supply from 20 VDC minimum to 30 VDC maximum.

   Ensure that the multimeter steadily reads greater than 1.5 VDC.

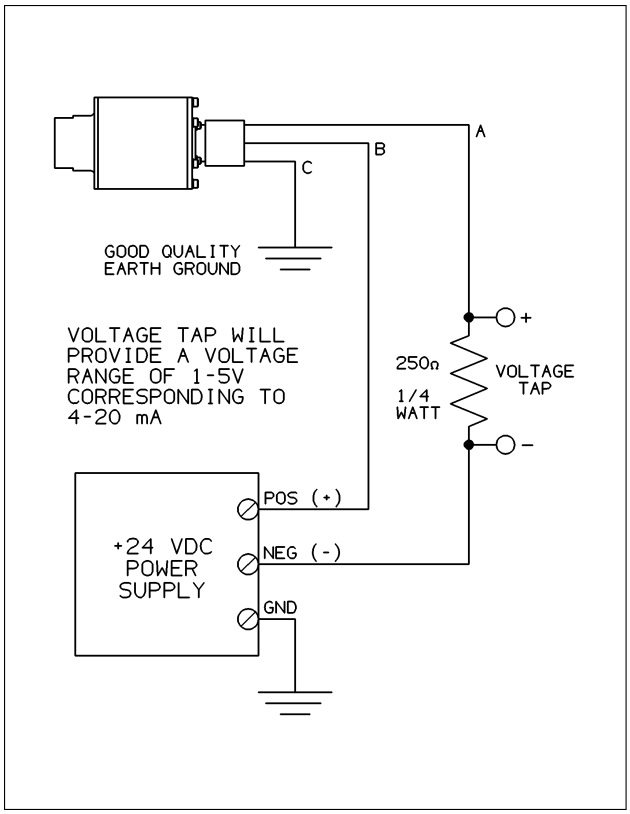

Figure 2.2 Voltage Measurement

3. Cleaning and Storage

Cleaning and Preparation for Storage or Shipment

The sensor should always be cleaned:

- Before a test
- Before shipping or storing

Refer to Table 3.1 on page 3-2 for material and equipment used in cleaning and preparing for shipment.

Sensor Cleaning

WARNING

Contact with liquid or particles propelled by compressed air can permanently damage eyes.

Inhalation of air-blown particles or solvent vapor can damage lungs.

WARNING

Cleaning fluids may be toxic and/or flammable. For safety, use only with adequate ventilation; wear protective clothing; avoid contact with skin and eyes; avoid breathing fumes. Do not expose to flame or sparks.

CAUTION

Do not direct compressed air flow at the lens; damage may result.

CAUTION

Do not let solvent come in contact with the window.

To clean the sensor:

1. Remove unwanted material from the external surface and threads using filtered compressed air.
2. If residue remains, remove it from the external surface and threads with a brush and a lint-free cloth moistened with cleaning solvent.
3. Dry the external surfaces and threads with filtered compressed air.
4. Clean the sensor window using a lint-free cloth or cotton swab and glass cleaner.
5. Install protective covers on the sensor window, connector, and cooling coil tube ends.

Preparation for Shipment or Storage

Table 3.1 lists items required to prepare for storage or shipment.

To perform this procedure:

1. Seal the unit in a clean plastic bag with a label indicating its part number and serial number.
2. Pack the unit in a shipping box, protecting it with packing material.
3. Attach a label to the shipping box that indicates the part number and serial number of the unit.

NOTE

Before returning any item you must call for a Return Material Authorization (RMA).

NOTE

Store the unit in a location with low humidity.

Table 3.1 Material and Equipment

Item	Description
Plastic bag	12" by 8"
Cardboard box	12" by 6" by 6"
Brush	Non-metallic
Cloth	Soft, lint free
Compressed air	25-35 psig, filtered
Glass cleaner	#1 denatured alcohol
Safety goggles	GG-G-531 or equivalent
Safety gloves	ZZ-G-381 or equivalent
Dry cleaning solvent	P-D-680 Type II or equivalent

Appendix A. Specifications and Accessories

Specifications

The Spectra™ GT30 physical and operational specifications are listed in Table A.1.

See Table A.2 on page A-3 for a listing of Spectra™ GT30 compliance tests and Table A.3 on page A-4 for a listing of optional accessories.

Table A.1 Specifications

Specification	Range
Physical	
Wire connections	• Pin A: 4–20 mA current return • Pin B: +24 VDC nominal • Pin C: Case ground • Pin D: No connection • Pin E: No connection
Mounting flange connection	3/4–14" stainless steel NPT internal thread
Body	100% stainless steel
Weight	0.95 kg (~2.1 lbs)
Operational	
Operating temperatures	–40 to 125 °C (–40 °F to +257 °F), without cooling coil –40 °C to 200 °C (–40 °F to 392 °F), with cooling coil –40 °C to 371°C (–40 °F to 700 °F), mounting surface temperature with cooling coil
Cooling water	1 to 1.5 GPM minimum 57 °C (135 °F) maximum 60 psig minimum
Humidity	95% relative per MIL-STD-202F

Table A.1 Specifications (Continued)

Specification	Range
Vibration	0.0125" DA from 10 to 88 Hz 6 Gs peak from 88 to 1200 Hz
Maximum pressure at optical interface	30 bar (435 psi)
Input	• UV energy from flame • 2 ° field of view
UV sensitive range	200 nm to 400 nm
Response time	< 30 mS
Power requirement	+24 VDC nominal power input (20–30 VDC range)
Input current	25 mA maximum
Output	
Signal output	Industry standard 4 to 20 mA current loop, no light input (total darkness) = 4.0 mA, ± 0.5 mA over entire temperature range
Maximum signal output	19.75 mA at full optical saturation
Dual gain stage circuitry	High amplification at low UV levels and saturation limiting for high UV levels

Compliance Tests

Table A.2 lists the compliance tests for the Spectra™ GT30.

Table A.2 Compliance Tests

Standard	Tests Conducted
CE	EN55011: Radiated emissions EN61000-4-2: ESD EN61000-4-3: Radiated immunity EN61000–4–4: EFT EN61000-4-6: Conducted immunity EN61326: TBD EN61010-1: TBD
UL	To standard UL 3111–1 harmonized with IEC 1010
CSA	To standard C22.2 No. 1010-92
ATEX Directive	To standard 94/9/EC
Factory Mutual (FM)	To standards FM7610 FM3611

Optional Accessories

Table A.3 lists the accessories available to perform unit installation.

NOTE

Consult factory for other cable options.

Table A.3 Optional Accessories

Part Number	Description
1084-417 Cooling Coil Assembly	Cooling coil assembly • 1084-495 Cooling coil • 1084-406 Cover • 1084-423 Hose clamps (2)

8EH8DHK1 Cable Assembly	Typical for Aeroderivative turbine applications
	• 43' long·14' stainless steel overbraid, remaining
	• 26' Teflon overbraid covering Teflon jacket
	• Color code:
	  • Black = Pin A: 4-20mA current Return·
	  • Red = Pin B: +24 VDC Nominal
	  • Orange = Pin C: Case Ground
	• Right angle connector

8EH8EAB1 Cable Assembly	Typical for Frame turbine applications
	• 60′ long
	• 3′ stainless steel overbraid covering
	• Teflon jacket
	• Color code:
	  • Black = Pin A: 4-20mA current Return
	  • White = Pin B: +24 VDC Nominal
	  • Green = Pin C: Case Ground
	• Right angle connector

Table A.3 Optional Accessories (Continued)

Part Number	Description

8EH8CAT1
Cable Assembly
	• Typical for Frame turbine applications
	• 120′ long
	• 3′ stainless steel overbraid covering
	• Teflon jacket
	• Color code:
	  • Black = Pin A: 4-20mA current Return
	  • White = Pin B: +24 VDC Nominal
	  • Green = Pin C: Case Ground
	• Right angle connector

ET-1215 Relay Module	• Single or double 4–20 mA inputs - specify • Two SPDT inputs • Trip mode to be specified • Power 115 VAC
SC-7403-N Relay Module	• Single Input • Single Output (SPDT) • Software Adjustable Trip only (PC-7400-3 Required) • Power 24 VDC, 48VDC, 110 VDC, 120 VAC 50/60 Hz
SC-7404-N Relay Module	• Single Input • Dual Output (SPDT) • Software Adjustable Trip only (PC-7400-3 Required) • Power 24 VDC, 48VDC, 110 VDC, 120 VAC 50/60 Hz
SC-7405-N Relay Module	• Single Input • Single Output (SPDT)·Single 4-20mA Retransmit Output • Software Adjustable Trip only (PC-7400-3 Required) • Power 24 VDC, 48VDC, 110 VDC, 120 VAC 50/60 Hz
PC-7400-3 Configuration Kit	• Configuration software and cable • Used on 7403-N, 7404-N, 7405-N

Table A.3 Optional Accessories (Continued)

Part Number	Description
8998A31P002 Power Supply	• 24 VDC, 0.6A Output • Din mount • Power Input 115 VAC
8998A31P003 Power Supply	• 24 VDC, 2.0A Output • Din mount • Power Input 115 VAC
8998A31P004 Power Supply	• 24 VDC, 5.0A Output • Din mount • Power Input 115 VAC

Appendix B. Schematics

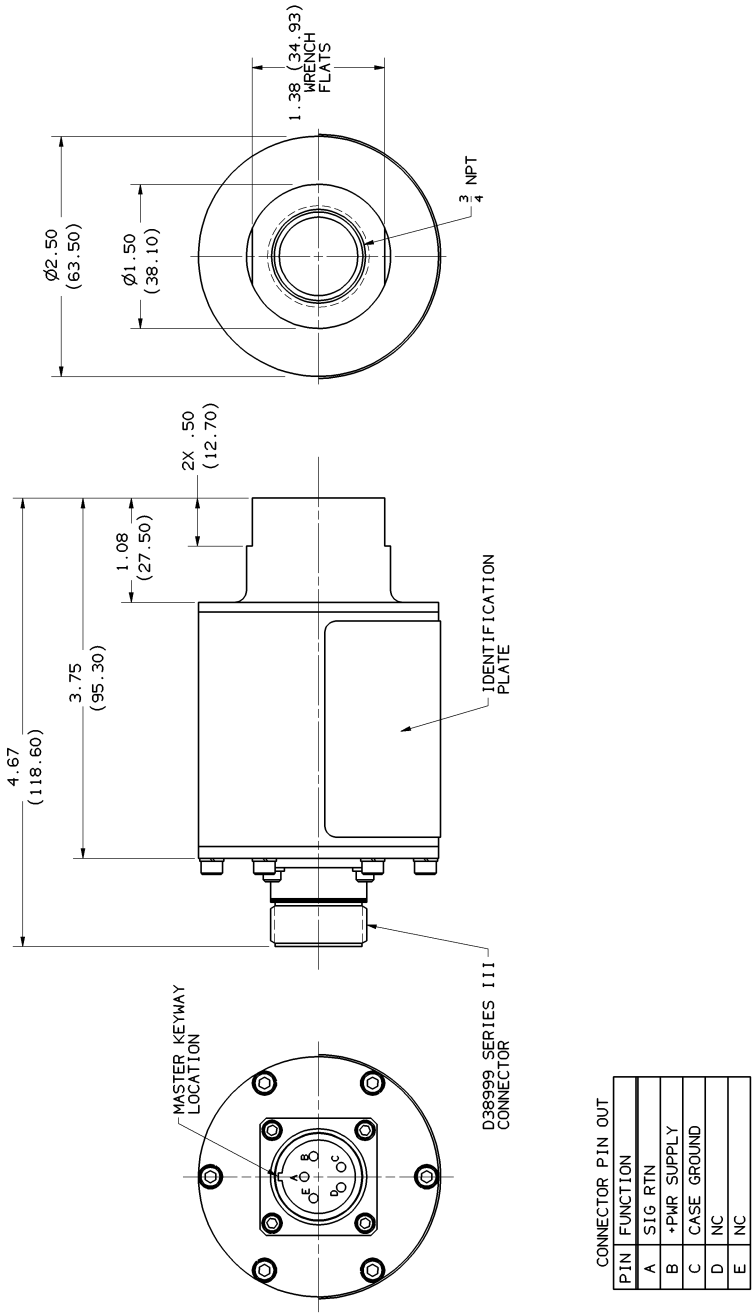

Figure B.1 Spectra™ GT30 Flame Sensor

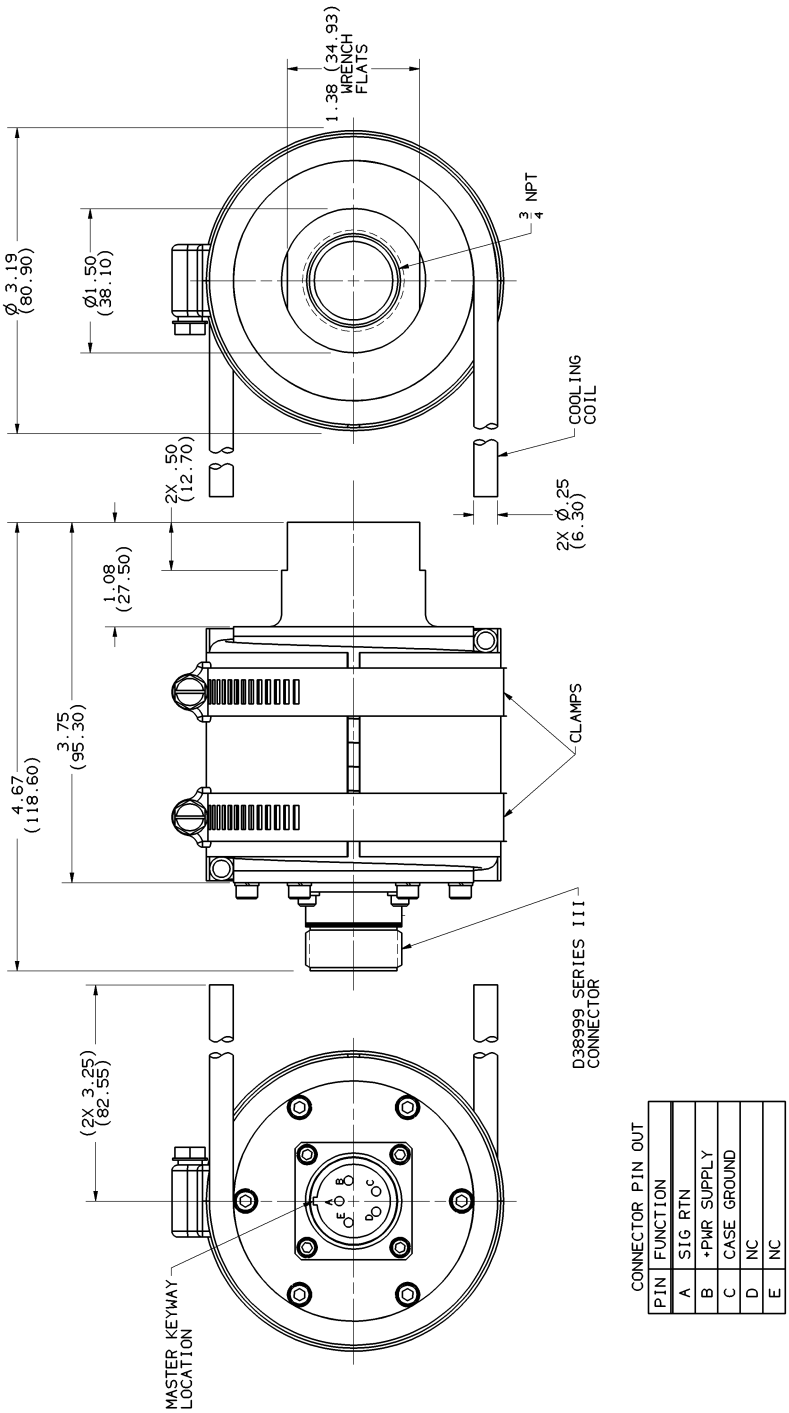

Figure B.2 Spectra™ GT30 Flame Sensor with Cooling Coil

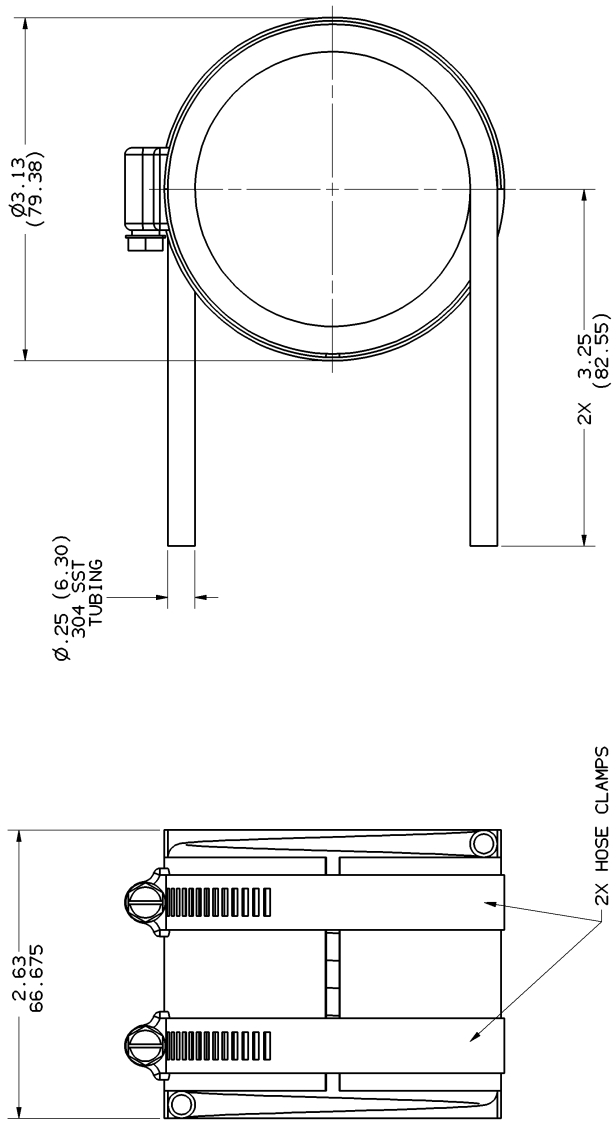

Figure B.3 Cooling Coil Assembly

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