Apter Power



CU-95
September 9, 2025

TYPE 95IR/95UV/95DS

MODEL S1, S2

Integrated Flame Scanner with Internal Flame Relay

c UL us LISTED CE FM APPROVED TUV SIL2

RoHS Compliant to EU Directive 2002/95/EC

DESCRIPTION

The FIREYE InSight Type 95IR, 95UV, and 95DS flame scanners are micro-processor-based flame scanners utilizing solid state infrared (IR) or ultraviolet (UV) or dual (IR and UV) sensors.

The FIREYE InSight Type 95 flame scanners incorporate an internal flame relay with adjustable ON/OFF thresholds, thereby eliminating the need for a remote flame amplifier.

The InSight scanners are now a replacement to the FIREYE Type 45FS1 and 45UVFS1 Signature ScannersTM as well as the Type 45RM4 to detect the presence or absence of a target flame in single or multi-burner applications.

The InSight scanners measure the amplitude of the modulations (the flame "flicker") that occur within the targeted flame. During the scanner set-up procedure, the modulation frequency that yields the best flame ON/OFF discrimination is selected. The appropriate modulation frequency and sensor gain is either manually selected (S1 models), or automatically selected with manual override capability (S2 models).

The InSight 95IR, 95UV, and 95DS scanners are each available in two models differentiated by feature levels.

The Standard Model S1 has three choices of modulation frequency, adjustable sensor gain, adjustable flame relay ON/OFF thresholds, 4-20 mA analog signal strength output, fault relay, and two selectable programmable files to store setpoints (for two different fuels or firing rates).

The Expanded Model S2 adds automatic programming (AutoTune) with manual override capability, 21 choices of flame flicker frequency, a total of four selectable programmable files to store setpoints, plus adds remote communication capability via Fireye Windows 95/98/NT user software.

All FIREYE InSight scanner models are powered by 24 Vdc and contain electronic self-checking (no mechanical shutter required). The scanners contain an eight-character alpha-numeric LED display and a four (4) push-button keypad to enable the user to view operating parameters and select setpoints.

"CG" models include a 10 ft. (3m) captive cable and gland. Non-"CG" models have a twelve-pin electrical quick-disconnect. Fiber optic-mount versions of the InSight scanners are also available. Refer to bulletin CU-101 for installation instructions.

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OPERATION

The InSight scanners measure the amplitude of the modulations that occur within the targeted flame. During the scanner set-up procedure, the modulation frequency that yields the best flame ON: OFF discrimination is selected. The appropriate modulation frequency and sensor gain is either manually selected (S1models), or automatically selected with manual override capability (S2 models).

With the appropriate modulation frequency selected, the flame relay's ON and OFF thresholds are then entered. (This selection is set automatically with S2 models). The scanner's 4-20 mA signal strength output is at minimum (4 mA) with a signal strength of "0", and at maximum (20 mA) at a signal strength of 100.

The **FLAME RELAY** is energized (and its normally open contacts close) when the signal strength is at or above the programmed flame ON threshold. The flame relay is de-energized when the signal strength is at or below the programmed flame OFF threshold. The flame relay contact circuit will also open upon a power interruption or the detection of an internal fault (see below).

The **FAULT RELAY** is energized when the scanner is powered (24 vdc) *and* when the scanner had successfully passed all internal self-checking routines. The Fault relay is de-energized if there is a power interruption to the scanner *or* if the scanner has detected an internal fault. A normally open (fault relay) contact is wired in series with the flame relay contact (internally), and a normally closed contact is available for alarm indication.

APPLICATION

Type 95IR contains an infrared flame sensor, responding to infrared radiation from 700 to 1700 nanometers wavelength. This sensor is best suited to coal and oil applications.

Type 95UV contains an ultraviolet flame sensor, responding to ultraviolet radiation from 295 to 320 nanometers wavelength. This sensor is best suited to gas applications.

Type 95DS (Dual sensor) contains both the infrared and ultraviolet flame sensors described above. This sensor is best suited to multi-fuel applications.

The Standard Model S1 is best suited to the many applications that do not require the level of sophistication, or the remote communications capability of the Expanded Model S2 (e.g. single burner boilers and furnaces, duct burners, etc.)

The Expanded Model S2 is best suited to the applications that require the highest level of sophistication and flexibility (addition choices of modulation frequencies, and the time-saving AutoTune function), and remote communications capability (e.g. larger multi-burner boilers and furnaces).

InSight SCANNER FEATURES

Features	Basic Models (S1)			Expanded Models (S2)		
	95IRS1	95UVS1	95DSS1	95IRS2	95UVS2	95DSS2
Infrared Sensor	X		X	X		X
Ultraviolet Sensor		X	X		X	X
Flame Relay	X	X	X	X	X	X
Fault Relay	X	X	X	X	X	X
4-20 mA Output	X	X	X	X	X	X
Modulation Frequency Selections	3	3	3	21	21	21
Memory Files	2	2	2	4	4	4
Communications				X	X	X
AutoTune				X	X	X
Pre-Edit	X	X	X			

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MODEL LISTING

PART NUMBER (see note 4)	SENSOR	FEATURES	FIBER OPTIC MOUNT	12-PIN CONNECTOR	10 FT (3M) CABLE & GLAND	MAXIMUM CONTACT RATING	HOUSING RATING (see note)UL	AGENCY APPROVALS		
								UL C/US	FM	CE
95IRS1-1	IR	BASIC	NO	YES	NO	240 vac	NEMA 4X, IP66 CLASS I DIV. 2 GROUPS A, B, C & D CLASS II DIV. 2 GROUPS F & G	YES	YES	NO
95UVS1-1	UV									
95DSS1-1	IR & UV									
95IRS2-1	IR	EXPANDED								
95UVS2-1	UV									
95DSS2-1	IR & UV									
95IRS1-1CG	IR	BASIC	NO	NO	YES	240 vac	NEMA 4X, IP66 CLASS I DIV. 2 GROUPS A, B, C & D CLASS II DIV. 2 GROUPS F & G	YES	YES	NO
95UVS1-1CG	UV									
95DSS1-1CG	IR & UV									
95IRS2-1CG	IR	EXPANDED								
95UVS2-1CG	UV									
95DSS2-1CG	IR & UV									
95IRS1E-1	IR	BASIC	NO	YES	NO	50 vac	NEMA 4X, IP66 Ex II 3 G/D Ex nA IIC T6	NO	YES	YES
95UVS1E-1	UV									
95DSS1E-1	IR & UV									
95IRS2E-1	IR	EXPANDED								
95UVS2E-1	UV									
95DSS2E-1	IR & UV									
95IRS1E-1CG	IR	BASIC	NO	NO	YES	240 vac	NEMA 4X, IP66 Ex II 3 G/D Ex nA IIC T6	NO	YES	YES
95UVS1E-1CG	UV									
95DSS1E-1CG	IR & UV									
95IRS2E-1CG	IR	EXPANDED								
95UVS2E-1CG	UV									
95DSS2E-1CG	IR & UV									
95UVS2-3	UV	EXPANDED	NO	YES	NO	240 vac	NEMA 4X, IP66 CLASS I DIV. 2 GROUPS A, B, C & D CLASS II DIV. 2 GROUPS F & G	YES	YES	NO
95UVS2-3CG	UV			NO	YES					

Note: Class I Division 2 Hazardous Area requirements for InSight scanners with electrical connectors (non-CG models):

1. The connector coupling nut setscrew must be tightened after mating the cable to the scanner.
2. The red warning label must be adhered to the connector housing.
3. Evaluated by TUV that the flame detector device is suitable to be used as single device for safety instrumented functions (SIF) according to DIN EN 61511-1 up to SIL2. The flame detector device also fulfills the applicable requirements of DIN EN 61508:2002 parts 2-3 for safety integrity level SIL2

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SPECIFICATIONS

MECHANICAL:

Housing Material: Cast aluminum with gray polyester powder coat finish

Housing Weight: 4.3 1bs (1.96kg), non-"CG" models
5.9 lbs. (2.69kg) "CG" models
6.3 lbs. (2.89kg) "CEX" models

Environmental: NEMA 4X, IP66, Class I Division 2, Groups A, B, C & D, Class II Division 2, Groups F& G (refer to agency approvals table)

Mounting: Requires one of two threaded mounting flanges, ordered separately (see below). For fiber optic mount, refer to bulletin CU-101

Mounting Flange Kit: P/N 60-2692 1" NPT female pipe mount with 3/8" NPT female cooling air connection, includes 1" NPT x 3" long heat insulating nipple (P/N 35-127-1)

P/N 60-2693 1" BSP female pipe mount with 3/8" BSP female cooling air connection, includes 1" BSP x 3"long heat insulating nipple (P/N 35-127-3)

Mounting Flange Shipping Weight: 0.62lbs. (0.28kg)

Cooling / Purge Air Requirements:

Source: Clean, dry, cool

Volume: 4 SCFM (113 l/min) at 3/8" threaded mounting flange, or 1 inch "Y" fitting, mounted on scanner sight pipe. Temperature near the upper limit of the scanner operating range and/or use with dirty/dusty fuels may require up to 15 SCFM (425 l/min).

Pressure: Adequate to overcome furnace or windbox pressure

Temperature Rating: -40°F to + 150°F (-40°C to +65°C), ambient; -40°F to 178°F (-40°C to 81°C), scanner internal temperature

Humidity: 0% to 95% relative humidity, non-condensing

ELECTRICAL:

Input Power: 24 Vdc, +10%, -15% supply current: 0.35 A, 8.5 VA

Electrical Connection: 12-pin quarter-turn quick-disconnect.
"CG" models have cable gland and 10 ft (3m) of captive cable
"CEX" models have 3/4" threaded opening and internal terminal blocks

Relay Output FLAME RELAY, SPST (N.O.)
FAULT RELAY, SPST (N.C.)

Contact Rating: Minimum: 10 mA @ 5 Vdc
Maximum: 2 A @ 30 Vdc
2 A @ 50 Vac (CE approved models)
2 A @ 240 Vac (FM & UL models and all "CG" models)

Analog Output: 4-20 mA dc current, referenced to 24Vdc common, maximum connected 1oad: 750 ohms

Status Indication: Eight (8) character alpha-numeric LED display (scrolling capability)

Operator Interface: Four (4) pushbutton style keys

Cable Specification: P/N 59-497:

Multi-core, 12 conductor (color coded), with foil wrap and overall braided shield
Six #18 AWG and four #22 AWG conductors, plus one #22 AWG twisted pair
Cable Jacket: Irradiated Modified Polyolefin (flame-retardant, low smoke, zero halogen)
Maximum Temperature: 257°F (125°C)
Nominal O.D. 0.41" (10.4 mm), Maximum O.D. 0.43" (10.9 mm)
Maximum cable length 1000 feet (305 meters)

INSTALLATION NOTES

The InSight flame scanners determine the presence or absence of flame by monitoring the frequency spectrum of the flame. The scanner should initially be mounted so that the primary combustion zone is within the scanner's line of sight.

The location and sighting instructions listed in the following sections are rough guidelines for the location of the scanner. The scanner provides feedback via its LED display to assist in the adjustment and proper alignment of the flame scanner. Refer to the setpoint procedures described in this bulletin.

Note: *An acceptable scanner location must ensure the following:*

Reliable main flame and/or ignitor flame detection at all air flow and furnace loads (ranges of fuel firing).

Rejection of the ignitor flame if too short or in the wrong position to ignite the main flame reliably, thus prohibiting the delivery of fuel to the burner.

Note: *Due to the microprocessor based design of the InSight scanner, the heat insulating nipple (P/N 35-127-1 or 35-127-3) must be used to isolate the scanner from ground and to reduce conducted energy and noise. See Figure 7. The nipple is included in mounting flange kit P/N 60-2692, 60-2693.*

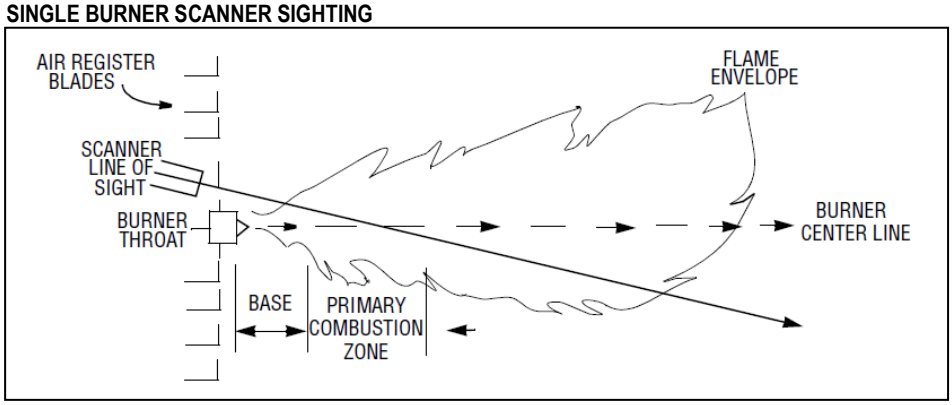
INSTALLATION PROCEDURE

WARNING: Protective filtered lenses should be worn when viewing flame. Infrared and ultraviolet energy from the flame can be damaging to the eyes.

1. The best results are obtained when the scanner is aimed so that the scanner's line of sight intersects the burner center at a slight angle (e.g. 5 degrees) and sees a maximum of the primary combustion zone, as shown in Figure 4. If only one scanner is used per burner, the line of sight should also intersect the igniting flame.
2. For installations where separate scanners are used to monitor main and ignitor flames, the main flame scanner should be sighted so it does not detect the ignitor flame.
3. The scanner should have an unrestricted view of flame as far as possible. Physical obstructions such as air register blades, interfering vanes, or other hardware should be cut away or notched so they do not fall within the scanner's line of sight as shown in Figure 6.

Note: *Always check with the burner manufacturer* ***before*** *you trim the register blades.*

FIGURE 4. SINGLE BURNER SCANNER SIGHTING



4. Consideration must be given to burner secondary air rotation, some burners have clockwise (CW) air rotation and others have counterclockwise (CCW) air rotation. If combustion air enters the furnace with a rotational movement of sufficient velocity to deflect the ignitor flame in the direction of rotation, position the scanner 10 to 30 degrees downstream of the ignitor as shown in Figure 5 and close to the periphery of the burner throat (See Figure 4).

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13. Depress the SELECT key to return to the Status menu. “AutoTune” will be displayed.
14. Depress the UP key and “FQ=0” will be displayed.
15. Turn the burner OFF then ON to verify proper detection and discrimination. If necessary, you may enter the Edit menu and adjust the gain, or band, or enable or disable a sensor. For future reference, list the final setpoints on the following Configuration Record.

InSight Configuration Record

Parameter	FILE A	FILE B	FILE C	FILE D
Temperature Scale				
Comm Address				
Remote File Select				
Language				
Sensors				
IR Band				
IR Gain				
IR Range				
UV Band				
UV Gain				
UV Range				
ON Threshold				
OFF Threshold				
FFRT				
OTD				
Operating Conditions and Firing rate at time of “LEARN ON” or “Set FEG”				

InSight Replacement Procedure

This procedure may be followed when replacing a damaged InSight scanner. It assumes that the InSight Configuration Record (above) was completed and kept as a reference when the original scanner was installed and calibrated. If not, the replacement scanner must be completely reprogrammed as describes earlier in this document.

1. Install the new scanner and apply power.
2. Enter the programming password and enter the EDIT menu.
3. Manually enter the values from the InSight Configuration Record into the new scanner. ***Important Note:*** *After Step 3, the scanner should detect flame ON, but may not properly indicate flame OFF until Step 4 is performed.*
4. Create the burner firing conditions that existed when the scanner was originally installed and calibrated, typically the low-fire condition.

S1 models only:

a. Enter the PRE-EDIT menu.
b. Depress the Up button until “Set FEG” is displayed.
c. Depress the Select button then the Program button
d. The scanner will set its internal Front End Gain Reference, then display “FEG is Set”.

S2 models only:

a. Enter the AUTOTUNE menu.
b. Depress the Up button until “LEARN ON” is displayed.

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c. Depress the Select button then the Program button.
d. The scanner will set its internal Front End Gain Reference, count down from 128 to 0, then display “Learn On Complete”. Note: If the proper data was manually entered into the EDIT menu, it should not be necessary to learn the flame OFF condition.

5. Turn the burner OFF and ON to verify proper flame detection and discrimination.
6. Repeat Steps 2 through 5 for each scanner memory file used (A, B, C, D).

Error Messages

In the event that an internal scanner fault is detected, the scanner will turn off its output and a four digit error code will appear on the display. If the scanner’s internal temperature exceeds 80°C (176°F), the scanner will turn off its output and “Too HOT!” will appear on the display.

To clear the error code and re-start the scanner, the 24 vdc power must be cycled off then on.

Each time power is applied to a scanner that had experienced a fault, the display will read “Errors” followed by several digits indicating the scanner’s error history. Pressing any key will clear this message.

ERROR CODE	DESCRIPTION
1001 through 1027	RAM Error
2001 through 2003	ROM Error
3001 through 3003	EEPROM Error
4001 through 5201	CPU Error
6001	Relay Error
6002	Pulsed Output Error
6101	Voltage Error
6102	Fault Relay Error
6201	Overtemp
7001 through 7008	Program Sequence Error

ORDERING INFORMATION

PART NUMBER STRUCTURE

TYPE	SENSOR	MODEL	HOUSING
95 = Integrated (internal flame relay)	IR = Solid state infrared	S1 = Basic features, FM & UL, 220 Vac contact rating.	-1 = NEMA 4X/IP66 housing, 12 pin electrical connector, pipe mount.
	UV = Solid state ultraviolet	S1E = Basic features, CE, 50 Vac contact rating.	-1CG = NEMA 4X/IP66 housing, cable gland and ten (10) feet (3m) of captive cable, pipe mount.
			-1CEX = CENELEC Exd IIC T6 housing, pipe mount, internal terminal blocks.
	DS = Dual sensor, IR + UV	S2 = Expanded features, FM & UL, 220 Vac contact rating, “Remote Command” user software.	-2 = NEMA 4X/IP66 housing, 12 pin electrical connector, fiber optic mount (not avail-able for DS models).
		S2E = Expanded features, CE, 50 Vac contact rating, “Read Only” user Software.	-2CG = NEMA 4X/IP66 housing, cable gland and ten (10) feet (3m) of captive cable, fiber optic mount (not available for DS models).

Example 1

To select the Fireye equipment meeting the following specification:

InSight scanner, dual sensor, basic features, UL & FM approved, surface mounted NEMA 4X/IP66 enclosure with male electrical connector. Accessories to include 1" NPT mounting flange, 100 ft of 12-conductor cable and female electrical connector kit, right angle.

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