



# Instructions

AutoFlame X33AF PL  
Multispectrum IR Flame Detector



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# INSTRUCTIONS

## Multispectrum IR Flame Detector

### AutoFlame X33AF PL

#### IMPORTANT

*Be sure to read and understand the entire instruction manual before installing or operating the flame detection system. Any deviation from the recommendations in this manual may impair system performance and compromise safety.*

#### ATTENTION

*The X33AF PL includes the Automatic Optical Integrity (oi<sup>®</sup>) feature — a calibrated performance test that is automatically performed once per minute to verify complete detector operation capabilities. No testing with an external test lamp is approved or required.*

#### DESCRIPTION

The X33AF PL is a multispectrum infrared (IR) flame detector. It provides unsurpassed detection of fires from light to heavy hydrocarbon fuels combined with the highest degree of false alarm rejection. The detector has Division and Zone explosion-proof ratings and is suitable for use in indoor and outdoor applications.

The detector utilises advanced signal processing algorithms, supported by an embedded 32-bit microprocessor, to provide continuous protection in the presence of false alarm sources and environments with infrared radiation present.

The detector has built-in PowerLoop technology which makes the detector capable of being powered and communicate with AutoSafe Integrated Fire and Gas panels (IFG) on the same pair of wire, saving cable cost and weight. Each detector has a built-in short circuit isolator; hence no detectors will be lost because of a single break or short circuit in the PowerLoop lines.

All alarms and faults will be signalled via PowerLoop.



The PowerLoop is a two-wire power and signalling bus connected in ring topology that is galvanically isolated from the rest of the system. The detector does not require any local power supply.

The detector has a detection range to gasoline of over 60m, and a solid cone of vision for methane.

The X33AF PL includes the Automatic Optical Integrity (oi) feature - a calibrated performance test that is automatically performed once per minute to verify complete detector operation capabilities. No testing with an external test lamp is required.

The X33AF PL contains three IR sensors with their associated signal processing circuitry. The standard output configuration includes fire, fault and auxiliary relays. A tricolor LED on the detector faceplate indicates normal condition and notifies personnel of fire alarm or fault conditions. Microprocessor controlled heated optics increase resistance to moisture and ice.

The X33AF PL housing is available in copper-free aluminum or stainless steel, with NEMA/Type 4X and IP66/IP67 rating.

## LED

A tricolor LED on the detector faceplate indicates normal, fire alarm and fault conditions. Table 1 indicates the condition of the LED for each status.

Detector Status	LED Indicator
Power On/Normal Operation (no fault or fire alarm)	Green
Fault	Yellow
Fire (Alarm)	Red
Low Sensitivity	One Yellow Flash During Power-up
T- Low Sensitivity	Three Yellow Flashes During Power-up
Medium Sensitivity	Two Yellow Flashes During Power-up
Very High Sensitivity	Four Yellow Flashes During Power-up

**NOTE:** See "Detector Sensitivity Levels" for additional information.

Table 1—Detector Status Indicator

## OPICAL INTEGRITY ( $oi$ )

### Automatic $oi$

The X33AF PL includes the Automatic Optical Integrity ( $oi$ ) feature — a calibrated performance test that is automatically performed once per minute to verify complete detector operation capabilities. No testing with an external test lamp is required. The detector automatically performs the same test that a maintenance person with a test lamp would perform — once every minute; 60 times per hour. However, a successful Automatic  $oi$  test does not produce an alarm condition.

The Protect•IR signals a fault condition when less than half of the detection range remains. This is indicated by the Fault output relay and is evident by the yellow color of the LED on the face of the detector. The  $oi$  fault condition is self-clearing if the optical contamination is temporary. If the contamination is not automatically cleared and the  $oi$  fault remains, the detector may require cleaning or service. See the "Troubleshooting" section for further information.

### Magnetic $oi$ / Manual $oi$

The detector also incorporates both Magnetic  $oi$  (Mag  $oi$ ) and Manual  $oi$  (Man  $oi$ ) features that provide the same calibrated test as the Automatic  $oi$ , and in addition actuates the Alarm output to verify operation for preventive maintenance requirements. These features can be performed at any time and eliminate the need for testing with a non-calibrated external test lamp.

## CAUTION

*These tests require disabling of all extinguishing devices to avoid release resulting from a successful test.*

The Mag  $oi$  test is performed by placing a magnet at the location marked "MAG OI" on the outside of the detector (see Figure 2). The Man  $oi$  test is accomplished by connecting the  $oi$  lead (terminal 22) to power supply minus via an external switch. The magnet or switch must be held in place for a minimum of six seconds to complete the test. Either of these test methods activates the calibrated IR emitters. If the resulting signal meets the test criteria, indicating that greater than half of the detection range remains, the fire alarm output of the detector is activated. On all models other than the EQP, this condition remains until the magnet is removed or the switch is released, regardless of whether the detector has been configured for latching or non-latching operation. On model EQP, the condition remains for four seconds.

If less than half of the detection range remains, no alarm is produced and a fault is generated. The fault indication can be reset by momentarily applying the Mag  $oi$  or Man  $oi$  switch. In this case, the detector's optics should be cleaned and the  $oi$  tests should be repeated. See the "Cleaning Procedure" section of this manual for details.

### NOTE

*Refer to Appendix A for FM verification of the Optical Integrity  $oi$  function.*

## AUTOMATIC ALARM TEST

The X33AF PL performs an automatic alarm-path test every 24 hours. This test includes the functionalities of the magnetic  $oi$  test, and is also making sure that the alarm is transmitted to the panel. If this test is successful, no indication will be given on the panel. However, if the test fails, a fault message is generated on the AutoSafe IFG panel.

## COMMUNICATION

The X33AF PL has built-in PowerLoop technology which makes the detector capable of being powered by and communicating with AutoSafe Integrated Fire and Gas panels (IFG) on the same pair of wire, saving cable cost and weight.

## DATA LOGGING

Data logging capability is also provided. Status conditions such as normal, power down, general and *oi* faults, pre-alarm, fire alarm, time and temperature are recorded. Each event is time and date stamped, along with the temperature and input voltage. Event data is stored in non-volatile memory when the event becomes active, and again when the status changes. Data from the log can only be extracted at the factory.

## INTEGRAL WIRING COMPARTMENT

All external wiring to the device is connected within the integral junction box. The detector is furnished with four conduit entries, with M25 threads.

## DETECTOR SENSITIVITY LEVELS

There are four factory configured sensitivity levels available for the X33AF PL Flame Detector:

Very High, Medium, Low and T-Low.

The following criteria should be considered when choosing a sensitivity level for the intended application:

- Detector placement
- Speed of response based on fuel type and fire size (see Appendix A for response times)
- Distance between the hazard and the flame detector

Additional information on X33AF PL Flame Detector performance results and sensitivities can be found in Appendix A, the FM Approval and Performance Report.

Consult the factory with any questions on how to choose the optimum sensitivity level for the intended application.

## GENERAL APPLICATION INFORMATION

### RESPONSE CHARACTERISTICS

Response is dependent on the detector's sensitivity setting, distance, type of fuel, temperature of the fuel, and time required for the fire to come to equilibrium. As with all fire tests, results must be interpreted according to an individual application.

See Appendix A for third-party approved fire test results. Additional fire test results are available from Autronica.

### IMPORTANT APPLICATION CONSIDERATIONS

In applying any type of sensing device as a fire detector, it is important to know of any conditions that can prevent the device from responding to fire, and also to know what other sources besides fire can cause the device to respond.

#### Welding

It is recommended that the system be bypassed during welding operations in situations where the possibility of a false alarm cannot be tolerated. Gas welding mandates system bypass, since the gas torch is an actual fire. Arc welding rods can contain organic binder materials in the flux that burn during the welding operation and are detectable by the X33AF PL. Welding rods with clay binders do not burn and will not be detected by the X33AF PL. However, system bypass is always recommended, since the material being welded may be contaminated with organic substances (paint, oil, etc.) that will burn and possibly cause the X33AF PL to alarm.

Due to the possibility of an alarm condition, arc welding should not be performed within 40 feet (12.2 m) of the detector configured to very high sensitivity, within 10 feet (3.0 m) at medium sensitivity, within 5 feet (1.5 m) at T-Low sensitivity, or at Low sensitivity.

#### Artificial Lighting

The X33AF PL should not be located within 3 feet (0.9 m) of artificial lights. Excess heating of the detector could occur due to heat radiating from the lights.

#### EMI/RFI Interference

The X33AF PL is resistant to interference by EMI and RFI, and is EMC Directive compliant. It will not respond to a 5 watt walkie-talkie at distances greater than 1 foot. Do not operate a walkie-talkie within 1 foot of the X33AF PL.

#### Non-Carbon Fires

The X33AF PL is a multiple spectrum IR device with detection limited to carbonaceous fuels. It should not be used to detect fires from fuels that do not contain carbon,

such as hydrogen, sulfur, and burning metals.

## IMPORTANT SAFETY NOTES

### WARNING

Do not open the detector assembly in a hazardous area when power is applied. The detector contains limited serviceable components and should never be opened. Doing so could disturb critical optical alignment and calibration parameters, possibly causing serious damage.

### CAUTION

The wiring procedures in this manual are intended to ensure proper functioning of the device under normal conditions. However, because of the many variations in wiring codes and regulations, total compliance to these ordinances cannot be guaranteed. Be certain that all wiring complies with the NEC as well as all local ordinances. If in doubt, consult the authority having jurisdiction before wiring the system. The PowerLoop calculator must verify all wiring calculations. Installation must be done by a properly trained person.

### CAUTION

To prevent unwanted actuation or alarm, extinguishing devices must be disabled prior to performing system tests or maintenance.

### CAUTION

The multispectrum IR flame detectors are to be installed in places where the risk of mechanical damages is low.

### ATTENTION

Remove the protective cap from the front of the detector before activating the system.

### ATTENTION

Observe precautions for handling electrostatic sensitive devices.

## INSTALLATION

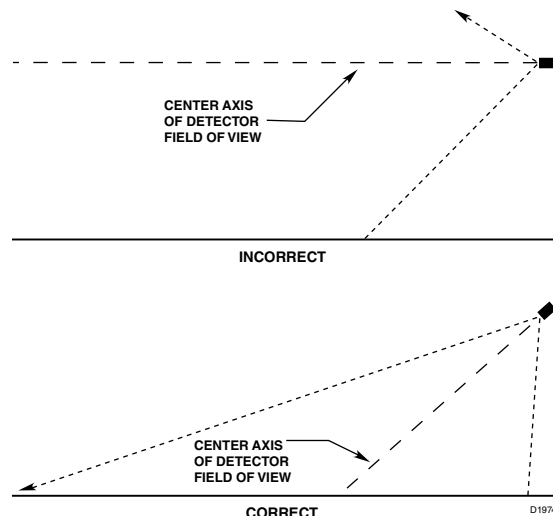
### NOTE

The recommended lubricant for threads and O-rings is a silicone free grease (part number 116-005003-001) available from Autronica. Under no circumstances should a lubricant containing silicone be used.

## DETECTOR POSITIONING

Detectors should be positioned to provide the best unobstructed view of the area to be protected. The following factors should also be taken into consideration:

- Identify all high risk fire ignition sources.
- Be sure that enough detectors are used to adequately cover the hazardous area.
- Be sure that the unit is easily accessible for cleaning and other periodic servicing.
- Verify that all detectors in the system are properly located and positioned so that any fire hazards are within both the Field of View (FOV) and detection range of the detector. The Q1201C Laser Aimer is recommended for establishing the detector's FOV. Refer to the "High Resolution Field of View Diagrams" section for specific information regarding detector range and FOV.
- The detector should be aimed downward at least 10 to 20 degrees to allow lens openings to drain. See Figure 1. **The detector should be positioned so that its FOV does not cover areas outside the area that requires flame detection monitoring.** This will minimize the possibility of false alarms caused by activities outside the area requiring protection.



NOTE: DETECTOR MUST ALWAYS BE AIMED DOWNWARD AT LEAST 10 TO 20 DEGREES.

Figure 1—Detector Orientation Relative to Horizon



- The detector must be mounted on a rigid surface in a low vibration area.
- Dense fog, rain or ice can absorb IR radiation and reduce the sensitivity of the detector. To ensure optimum performance, be certain that the internal optical heater is enabled on detectors that are used in applications where snow, ice, and condensation are likely to occur.
- Although IR detectors are less affected by smoke than other detectors, the X33AF PL should not be placed where rising combustion products can obscure its vision. If smoke is expected before fire, smoke or other alternative detectors should be used in conjunction with the X33AF PL. For indoor applications, if dense smoke is expected to accumulate at the onset of a fire, mount the detector on a side wall at least a few feet (approximately 1 meter) down from the ceiling.
- If possible, fire tests should be conducted to verify correct detector positioning and coverage.
- For ATEX/IECEX installations, the X33AF PL detector housing must be electrically connected to earth ground.

## DETECTOR ORIENTATION

Refer to Figure 2 and ensure that the  $\sigma_i$  plate will be oriented as shown when the X33AF PL is mounted and sighted. This will ensure proper operation of the  $\sigma_i$  system and will also minimize the accumulation of moisture and contaminants between the  $\sigma_i$  plate and the viewing windows.

### IMPORTANT

If removed, the  $\sigma_i$  plate **must** be securely tightened to ensure proper operation of the  $\sigma_i$  system (40 oz./inches [28.2 N/cm] recommended).

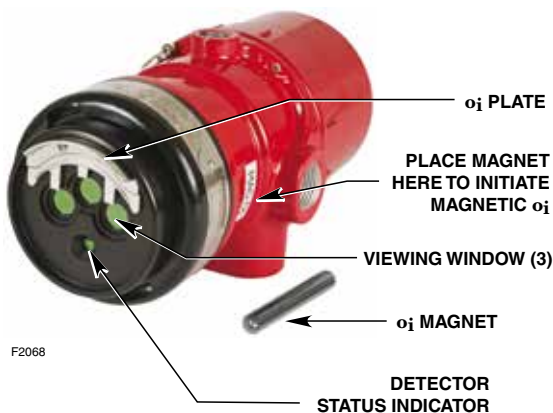


Figure 2—Front View of the X33AF PL

## PROTECTION AGAINST MOISTURE DAMAGE

It is important to take proper precautions during installation to ensure that moisture will not come in contact with the electrical connections or components of the system. The integrity of the system regarding moisture protection must be maintained for proper operation and is the responsibility of the installer.

If conduit is used, we recommend installing drains, according to local codes, at water collection points to automatically drain accumulated moisture.

It is also recommended to install at least one breather, according to local codes, at upper locations to provide ventilation and allow water vapor to escape.

Conduit raceways should be inclined so that water will flow to low points for drainage and will not collect inside enclosures or on conduit seals. If this is not possible, install conduit drains above the seals to prevent the collection of water or install a drain loop below the detector with a conduit drain at the lowest point of the loop.

Conduit seals are not required for compliance with explosion-proof installation requirements, but are highly recommended to prevent water ingress in outdoor applications. Units with M25 threads must use an IP66 washer to prevent water ingress.

## WIRING PROCEDURE

### Wire Size and Type

The X33AF PL can only be used with the AutoSafe IFG system, and must be connected to the BSD-340 PowerLoop driver.

The system should be wired according to local codes. The wire size selected should be based on the number of detectors connected, the supply voltage and the cable length. Typically 16 AWG or 2.5 mm<sup>2</sup> shielded cable is recommended. Wires should be stripped 3/8 inch (9 mm). A minimum input voltage of 18 Vdc must be present at the X33AF PL.

### NOTE

Refer to “Power Consumption” in the “Specifications” section of this manual.

The use of shielded cable is required to protect against interference caused by EMI and RFI. When using cables with shields, terminate the shields as shown in Figures 7 through 12, and Figure 15. Consult the factory if not using shielded cable.

In applications where the wiring cable is installed in conduit, the conduit must not be used for wiring to other electrical equipment.

If disconnection of power is required, separate disconnect capability must be provided.

**⚠ WARNING**

All entries must contain appropriately rated plugs or fittings. It is required that each plug or fitting be wrench-tightened to an appropriate installation torque and meet the minimum thread engagement requirements per the applicable local standards, codes, and practices in order to retain the defined ratings, PTFE sealant or equivalent should be used on NPT threads.

**IMPORTANT**

Devices certified for hazardous locations shall be installed in accordance with EN/IEC 60079-14 and NEC 505.

**⚠ CAUTION**

Installation of the detector and wiring should be performed only by qualified personnel.

**Connections**

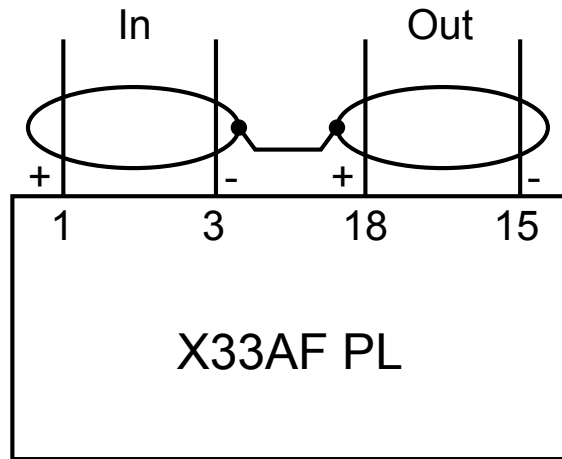


Figure 4 - If shielded cable is used for the PowerLoop, the shielding should be continued.

**Detector Mounting**

Install the mounting arm assembly on a rigid surface. The ideal installation surface should be free of vibration and suitable to receive 3/8 inch (M10) bolts with a length of at least 1 inch (25 mm). The surface must also have sufficient capacity to hold the detector and mounting arm weights (See "Specifications" section). Refer to the Q9033 Mounting Arm and Collar Attachment Manual (95-8686) for additional mounting information. See Figure 3 for dimensions.

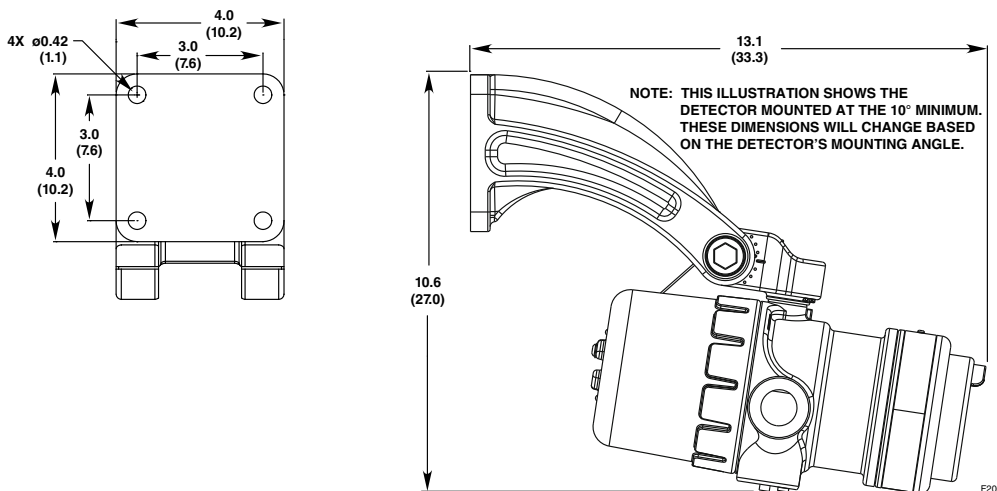


Figure 3—Q9033 Mounting Bracket Dimensions in Inches (cm)  
(See Figure 1 for Correct Detector Orientation.)

## STARTUP PROCEDURE

When installation of the equipment is complete, perform the “Fire Alarm Test” below.

### FIRE ALARM TEST

1. Disable any extinguishing equipment that is connected to the system.
2. Apply input power to the system.
3. Initiate an  $o_j$  test. (See “Magnetic  $o_j$  / Manual  $o_j$ ” under Optical Integrity in the Description section of this manual.)
4. Repeat this test for all detectors in the system. If a unit fails the test, refer to the “Troubleshooting” section.
5. Verify that all detectors in the system are properly aimed at the area to be protected. (The Autronica Q1201C Laser Aimer is recommended for this purpose.)
6. Enable extinguishing equipment when the test is complete.

## TROUBLESHOOTING

### WARNING

*The sensor module (“front” half of the detector) contains no user serviceable components and should never be tampered with.*

1. Disable any extinguishing equipment that is connected to the unit.
2. Inspect the viewing windows for contamination and clean as necessary. The detector is relatively insensitive to airborne contaminants, however, thick deposits of ice, dirt, or oil will reduce sensitivity. (Refer to the “Maintenance” section for complete information regarding cleaning of the detector viewing windows.)
3. Check input power to the unit (18 – 30V DC on terminals 1, 3 and 15, 18. ref. fig. 4).
4. Check the fire panel display for fault status.
5. Turn off the input power to the detector and check all wiring for continuity. **Important: Disconnect wiring at the detector before checking system wiring for continuity.**
6. If all wiring checks out and cleaning of the  $o_j$  plate/window did not correct the fault condition, check for high levels of background IR radiation by covering the detector with the factory supplied cover or aluminum foil. If the fault condition clears within six minutes or less, extreme background IR is present. Re-adjust the view of the detector away from the IR source or relocate the detector.

If none of these actions corrects the problem, return the detector to the factory for repair.

### NOTE

*It is highly recommended that a complete spare be kept on hand for field replacement to ensure continuous protection.*

Table 3—Current Level Output Troubleshooting Guide

Current Level ( $\pm 0.3$ mA)	Status	Action
0 mA	Power Fault	Check system wiring.
1 mA	General Fault	Cycle power <sup>1</sup>
2 mA	$o_j$ Fault	Clean windows <sup>2</sup>
3 mA	High Background IR Fault	Remove IR source or aim detector away from IR source.
4 mA	Normal Operation	
20 mA	Fire Alarm	

<sup>1</sup>If fault continues, return device to factory for repair.

<sup>2</sup>See “Maintenance” section for cleaning procedure.

## MAINTENANCE

### IMPORTANT

*Periodic flamepath inspections are not recommended, since the product is not intended to be serviced and provides proper ingress protection to eliminate potential deterioration of the flamepaths.*

### ⚠ WARNING

*To avoid a potential electrostatic discharge (ESD), the painted surface of the detector should only be cleaned with a damp cloth.*

### ⚠ WARNING

*The sensor module ("front" half of the detector) contains no user serviceable components and should never be tampered with.*

To maintain maximum sensitivity and false alarm resistance, the viewing windows of the X33AF PL must be kept relatively clean. Refer to the procedure below for cleaning instructions.

## CLEANING PROCEDURE

### ⚠ CAUTION

*Disable any extinguishing equipment that is connected to the unit to prevent unwanted actuation.*

To clean the windows and *oj* plate, use Autronics window cleaner (part number 116-001680-001) and a soft cloth, cotton swab or tissue and refer to the following procedure.

1. **Disable any extinguishing equipment that is connected to the unit.**
2. Since the X33AF PL is less affected by contamination than other detectors, removal of the *oj* plate is needed only under extreme conditions. In addition, it is not necessary to achieve perfect cleanliness, because IR is not significantly absorbed by slight films of oil and/or salt. If a fault condition is still indicated after cleaning, remove and clean the *oj* Plate Removal and Replacement procedure.
3. In all environments, clean all three viewing windows and reflector surfaces thoroughly. Use a cotton swab and Autronics window cleaning solution. Use Isopropyl alcohol for contaminations that Autronics window cleaning solution can not remove.

### IMPORTANT

*When used in extreme environments, the reflective surface of the detector *oj* plate may eventually deteriorate, resulting in reoccurring *oj* faults and the need for *oj* plate replacement.*

## *oj* PLATE REMOVAL AND REPLACEMENT

1. Disable any extinguishing equipment that is connected to the unit.
2. Loosen the two captive screws, then grasp the *oj* plate by the visor and remove it from the detector. See Figure 5.
3. Install the new (or cleaned) *oj* plate.

### NOTE

*When installing the stainless steel plate, ensure that the gasket is present and correctly seated to prevent moisture or contaminants from penetrating behind the plate. To ensure even seating, tighten both screws equally.*

4. Re-calibrate the detector's *oj* system. Refer to the Inspector Monitor manual, number 95-8581, for instructions regarding *oj* plate replacement and *oj* system recalibration.

### ⚠ CAUTION

*Do not replace the *oj* reflector plate without also recalibrating the *oj* system.*

Recalibration of the *oj* system requires the use of the Inspector Connector Cable and Inspector Monitor Software. These two items are included in the *oj* replacement kit, or they can be purchased separately. See Ordering Information for details.

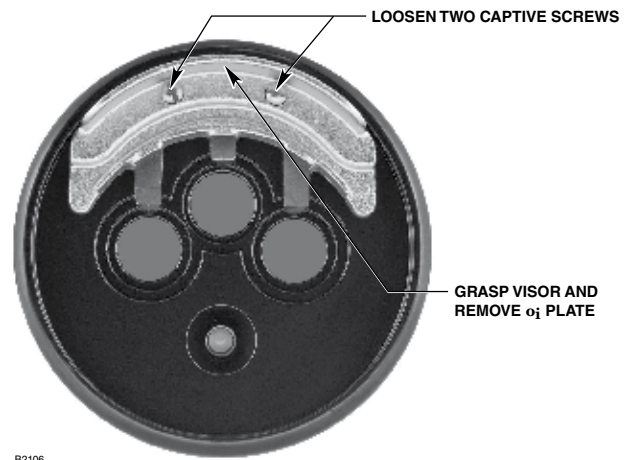


Figure 5 – *oj* plate removal

## X33AF PL REFLECTOR PLATES

X33AF PL models are supplied with either a black or a stainless steel reflector plate. These plates are not interchangeable. Order the replacement that matches the reflector plate on your X33AF PL flame detector.

## CLOCK BATTERY

The real time clock has a backup battery that will operate the clock with no external power for nominally 10 years. It is recommended that the battery be replaced every 7 years. Return the device to the factory for battery replacement if needed.

### NOTE

*If the backup battery is depleted, there is no effect on the operation of the flame detector, but the time stamping of the data log may be affected.*

## FEATURES

- Long detection range to carbonaceous fires.
- Unequaled false alarm rejection.
- Responds to a fire in the presence of modulated blackbody radiation (i.e. heaters, ovens, turbines) without false alarm.
- Microprocessor controlled heated optics for increased resistance to moisture and ice
- Automatic, manual or magnetic optical integrity ( $\sigma_i$ ) testing
- Automatic alarm-path test is performed once every 24 hours
- Easily replaceable  $\sigma_i$  plate.
- FDT/DMT capable
- Multiple sensitivity levels
- A tricolor LED on the detector faceplate indicates normal condition and notifies personnel of fire alarm or fault conditions
- Operates under adverse weather conditions and in dirty environments
- Mounting arm allows easy sighting
- Integral wiring compartment for ease of installation.
- Redundant PowerLoop communications and power supply
- Explosion-proof/flame-proof detector housing. Meets FM, CSA, ATEX Directive and IECEx certification requirements
- Class A wiring per NFPA-72
- Meets NFPA-33 response requirement for under 0.5 second (available when model selected)
- 5 year warranty
- RFI and EMC Directive compliant

## SPECIFICATIONS

### OPERATING VOLTAGE—

The BSD-340 PowerLoop driver provides the power. The operating voltage is 20 to 30Vdc.

### POWER CONSUMPTION—

Without heater: 4 watts at 24 Vdc nominal;  
5.2 watts at 24 Vdc in alarm.  
4.5 watts at 30 Vdc nominal;  
6.5 watts at 30 Vdc in alarm.

Heater only: 8 watts maximum.  
Total power: 14.5 watts maximum

### POWER UP TIME—

Fault indication clears after 0.5 second; device is ready to indicate an alarm condition after 30 seconds.

### TEMPERATURE RANGE—

Operating:  $-40^{\circ}\text{F}$  to  $+167^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$  to  $+75^{\circ}\text{C}$ ).  
Storage:  $-67^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$  ( $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ).  
Hazardous location ratings from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

### HUMIDITY RANGE—

0 to 95% relative humidity, can withstand 100% condensing humidity for short periods of time.

### CONE OF VISION—

The detector has a  $90^{\circ}$  cone of vision (horizontal) with the highest sensitivity lying along the central axis. Unlike conventional detectors, the X33AF PL provides full coverage at a minimum of 70% of the maximum detection distance.

Perfect cone of vision for methane fire detection — 100 feet (30.5 m) on and off axis on “very high” setting.

Refer to Appendix A for FM Approved cone of vision data.

### RESPONSE TIME—

Typical response times are under 10 seconds. Models are available that can respond to automotive paint gun fires in under 0.5 seconds. See Appendix A for actual response times.

### DIMENSIONS—

See Figure 6.

### ENCLOSURE MATERIAL—

Copper-free aluminum (painted) or stainless steel (316/CF8M Cast).

### VIBRATION—

Conformance per FM 3260: 2000, MIL-STD 810C (Curve AW), DNV Note 2.4 (Class B).

### WIRING—

Field wiring screw terminals are UL/CSA rated for up to 14 AWG wire, and are DIN/VDE rated for 2.5 mm<sup>2</sup> wire. Screw terminal required torque range is 3.5–4.4 in.-lbs. (0.4-0.5 N·m).

**Important:** 18 Vdc minimum must be available at the detector. For ambient temperatures below  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ) and above  $+60^{\circ}\text{C}$  ( $140^{\circ}\text{F}$ ) use field wiring suitable for both minimum and maximum ambient temperature.

### THREAD SIZE—

Conduit connection: Four entries, M25.  
Conduit seal not required.

### SHIPPING WEIGHT (Approximate)—

Aluminum: 7 pounds (3.2 kilograms).  
Stainless Steel: 13.8 pounds (6.3 kilograms).  
Mounting Arm (AL): 6 pounds (2.75 kilograms).  
Mounting Arm (SS): 14 pounds (6.4 kilograms).

### WARRANTY PERIOD—

**5 years.**

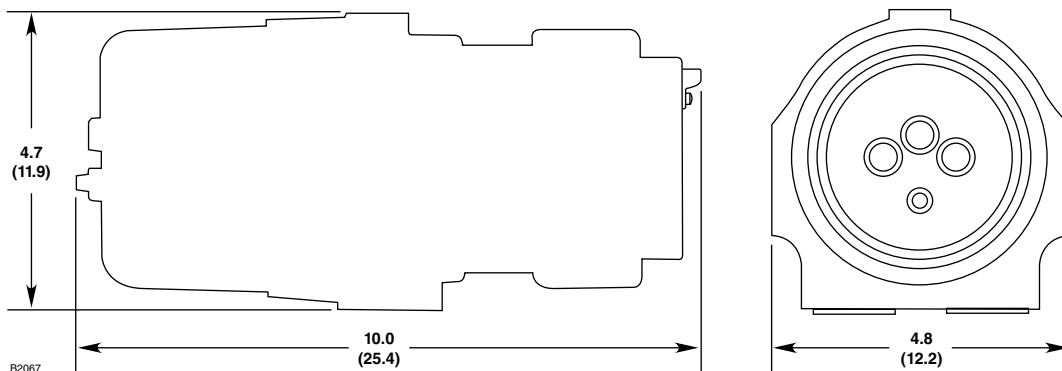


Figure 18—X33AF PL Dimensions in Inches (cm)

## CERTIFICATION—



For complete approval details, refer to the appropriate Appendix:

Appendix A - FM

Appendix B - CSA

Appendix C - ATEX

Appendix D - IECEx

Appendix E- Offshore

Appendix F - Additional approvals

Appendix G - Declaration of Conformity

## REPLACEMENT PARTS

The detector is not designed to be repaired in the field. If a problem should develop, refer to the Troubleshooting section. If it is determined that the problem is caused by an electronic defect, the device must be returned to the factory for repair.

## REPLACEMENT PARTS

Part Number	Description
116-009208-001	o; Replacement kit for X33AF PL (5 Black Reflector Plates) with Inspector Connector and Monitor
116-010831-001	o; Replacement kit for X33AF PL (5 Stainless Steel Reflector Plates) with Inspector Connector and Monitor
116-007307-001	Replacement o; Reflector Plates for X33AF PL with Black plate (requires Inspector Connector to calibrate)
116-010830-001	Replacement o; Reflector Plates for X33AF PL with Stainless Steel plate (requires Inspector Connector to calibrate)

**NOTE:** Refer to instruction manual 95-8530 to determine the correct o; replacement plate.

## DEVICE REPAIR AND RETURN

Prior to returning devices, contact the nearest local Autronica office so that a Return Material Identification (RMI) number can be assigned. A written statement describing the malfunction must accompany the returned device or component to assist and expedite finding the root cause of the failure.

Pack the unit properly. Always use sufficient packing material. Where applicable, use an antistatic bag as protection from electrostatic discharge.

### NOTE

*Autronica reserves the right to apply a service charge for repairing returned product damaged as a result of improper packaging.*

Return all equipment transportation prepaid to the factory in Trondheim.

### NOTE

*It is highly recommended that a complete spare be kept on hand for field replacement to ensure continuous protection.*

## ORDERING INFORMATION

When ordering, please specify:

X33AF PL IR Flame Detector

Refer to the X33AF PL Model Matrix for details

Q9033; Mounting Arm is required:

- Q9033A for aluminum detectors only.
- Q9033B for aluminum and stainless steel detectors.

## ACCESSORIES

Part Number	Description
116-000511-029	Converter RS485 to RS232
116-103881-001	Converter RS485 to USB
116-007819-001	W6300B1002 Serial Inspector Connector (Inspector Monitor software included)
116-007819-002	W6300B1003 USB Inspector Connector (Inspector Monitor software included)
116-009207-001	Flame Inspector Monitor CD
116-103922-001	Model 475 HART Communicator
116-102740-002	Magnet
116-008082-001	Magnet and Adapter for Extension Pole
116-007739-001	Magnet and Extension Pole
116-007240-001	Q1116A1001, Air Shield (AL)
116-007818-001	Q1118A1001 Aluminum Air Shield/Flange Mount (AL)
116-007818-002	Q1118S1001 Stainless Steel Air Shield/Flange Mount (SS)
116-009177-001	Q1120A1001 Paint Shield mounting ring (AL)
116-010857-001	Q1130A1001 Flange Mount Assembly
116-006097-001	Q1201 Laser
116-102871-001	Laser Battery, 3V Lithium (laser)
116-007255-001	Q1201C1001 X-Series Laser Holder (AL/Plastic)
116-007338-001	Q2000A1001 X-Series Weather Shield (AL)
116-007338-010	Q2033A10R X33AF/X3302 FOV Limiter 10° (AL)
116-007338-020	Q2033A20R X33AF/X3302 FOV Limiter 20° (AL)
116-007338-030	Q2033A30R X33AF/X3302 FOV Limiter 30° (AL)
116-007912-010	Spare Restrictor Plate 10° (AL)
116-007912-020	Spare Restrictor Plate 20° (AL)
116-007912-030	Spare Restrictor Plate 30° (AL)
116-007290-001	Q9033B Stainless Steel Mounting Arm Assembly is for aluminum and stainless steel detectors
116-007290-002	Q9033A Aluminum Mounting Arm Assembly is for aluminum detectors only
116-011385-001	Q9033 Collar Attachment
116-101197-001	Stop Plug, 3/4" NPT, AL
116-101197-004	Stop Plug, 3/4" NPT, SS
116-101197-005	Stop Plug, M25, AL, IP66
116-101197-003	Stop Plug, M25, SS, IP66
116-010816-001	Stop Plug, 20 Pack, 3/4" NPT, AL
116-010817-001	Stop Plug, 20 Pack, 3/4" NPT, SS
116-010818-001	Stop Plug, 20 Pack, M25, AL, IP66
116-010819-001	Stop Plug, 20 Pack, M25, SS, IP66
116-103363-001	14 mm Hex Wrench (Steel)
116-103406-001	Screwdriver
116-001680-001	Window cleaner (6 pack)
116-107427-040	O-ring - Rear Cover (Viton) - black or brown
116-005003-001	1 oz grease for detectors (silicone-free)
116-104346-154	O-ring - Rear Cover (Fluorosilicone) - blue
116-012549-001	1 oz PTFE silicone-free lubricant

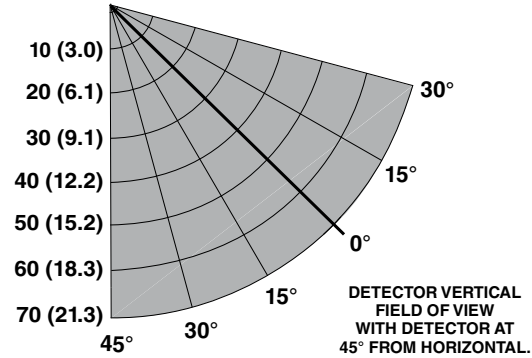
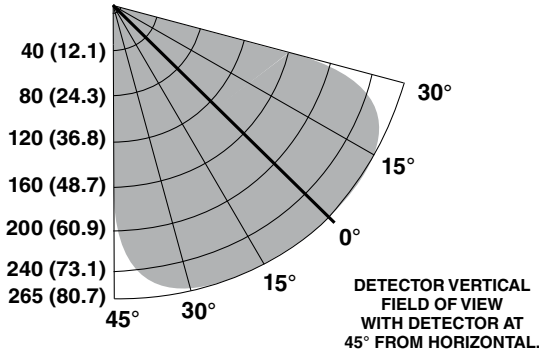
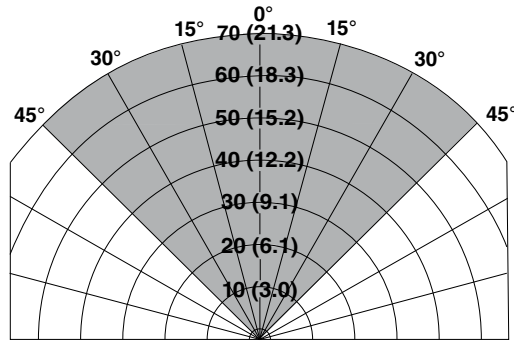
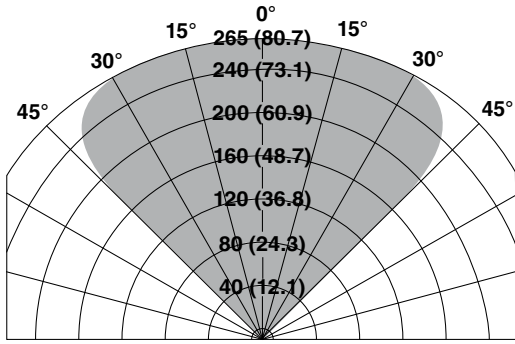


**X33AF PL MODEL MATRIX**

<b>MODEL</b>	<b>DESCRIPTION</b>	
<b>X33AF</b>	Multispectrum IR Flame Detector	
	<b>TYPE</b>	<b>MATERIAL</b>
	<b>A</b>	Aluminum
	<b>S</b>	Stainless Steel (316)
	<b>TYPE</b>	<b>THREAD TYPE</b>
	<b>4M</b>	4 PORT, METRIC M25
	<b>TYPE</b>	<b>OUTPUTS</b>
	<b>19</b>	PowerLoop Protocol
	<b>TYPE</b>	<b>APPROVALS*</b>
	<b>B</b>	INMETRO (Brazil)
	<b>W</b>	FM/CSA/ATEX/IECEX
	<b>TYPE</b>	<b>CLASSIFICATION</b>
	<b>1</b>	Division/Zone Ex d e
	<b>2</b>	Division/Zone Ex d

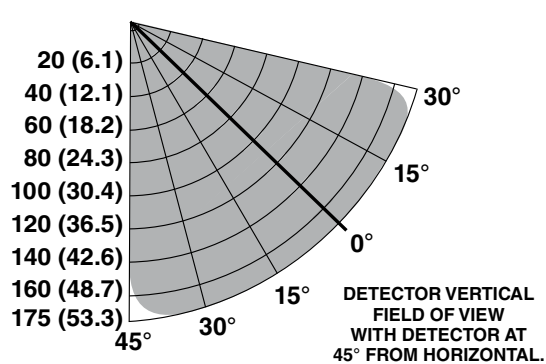
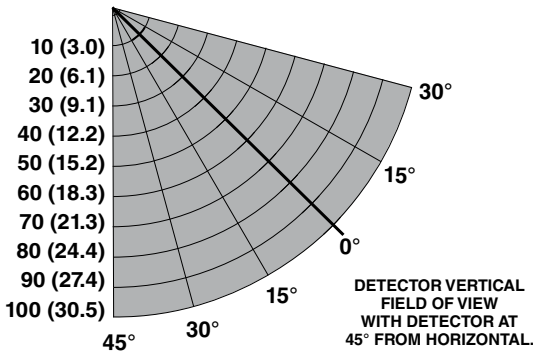
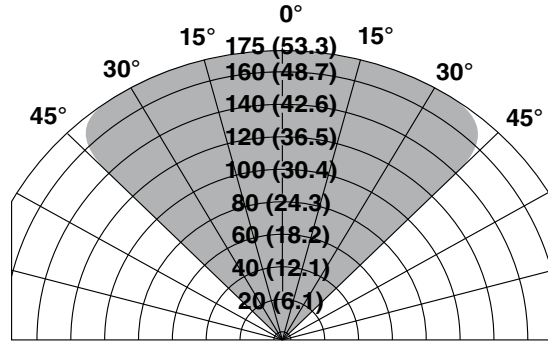
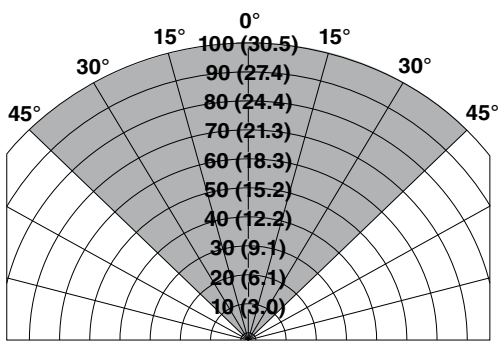
\*Type Approvals can use one or more letters to designate the approvals of the product.

## High Resolution Field of View Diagrams



Field of View at Indicated Distance in Feet (m) for  
**n-Heptane at Very High Sensitivity (1 x 1 foot)**

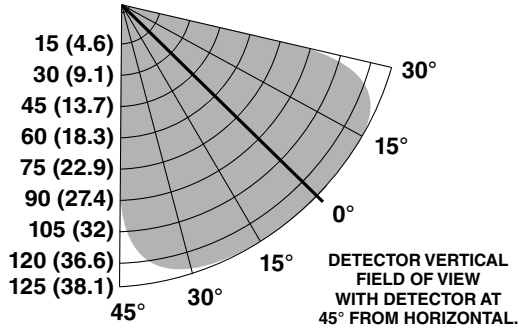
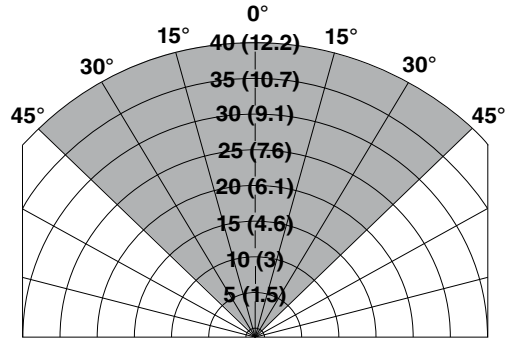
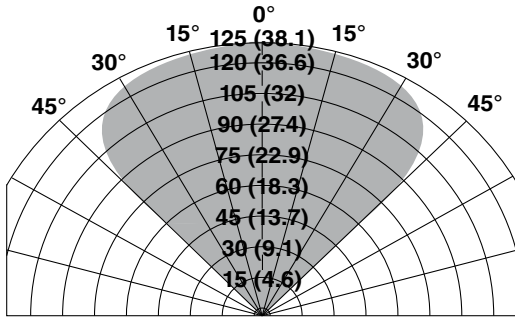
Field of View at Indicated Distance in Feet (m) for  
**Isopropanol at Very High Sensitivity (6 in. x 6 in.)**



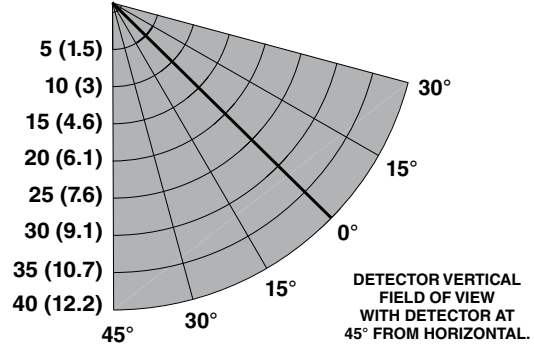
Field of View at Indicated Distance in Feet (m) for  
**n-Heptane at Very High Sensitivity (6 in. x 6 in.)**

Field of View at Indicated Distance in Feet (m) for  
**Diesel at Very High Sensitivity (1 x 1 foot)**

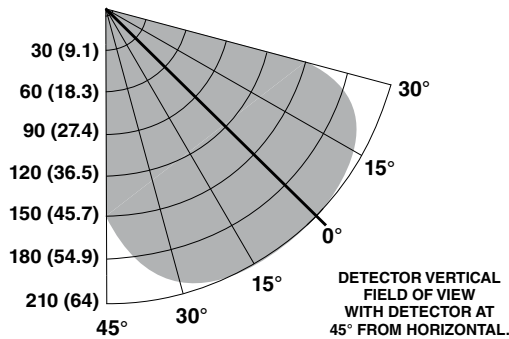
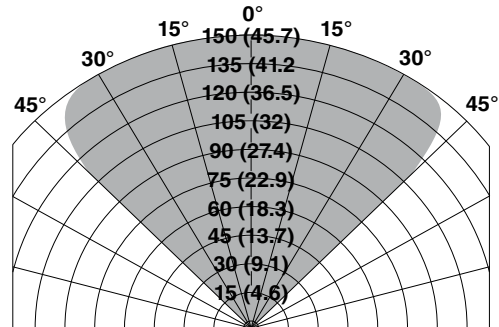
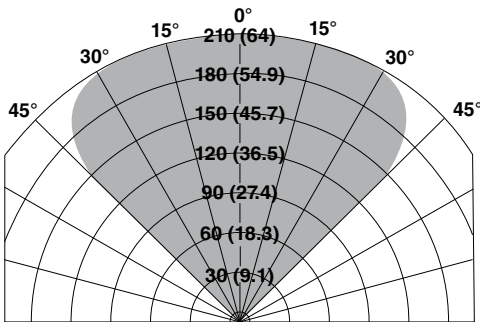
## High Resolution Field of View Diagrams – Continued



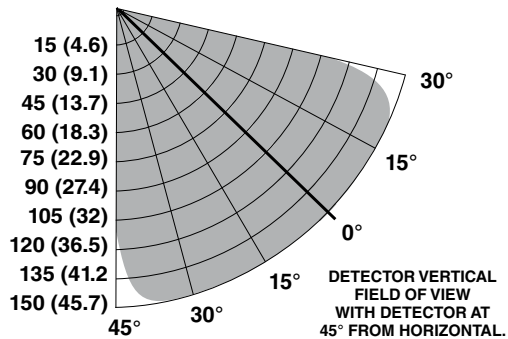
Field of View at Indicated Distance in Feet (m) for  
**Propane** at **Very High** Sensitivity (32 inch plume)



Field of View at Indicated Distance in Feet (m) for  
**Methanol** at **Very High** Sensitivity (6 in. x 6 in.)

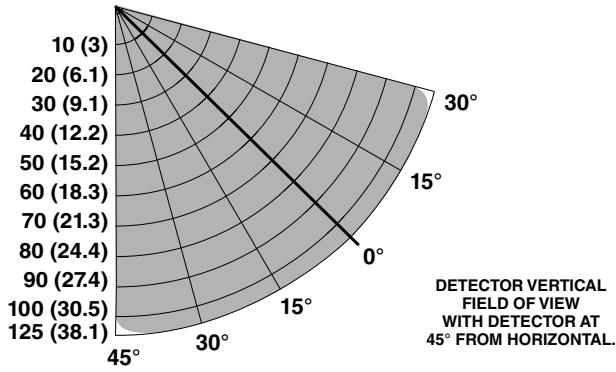
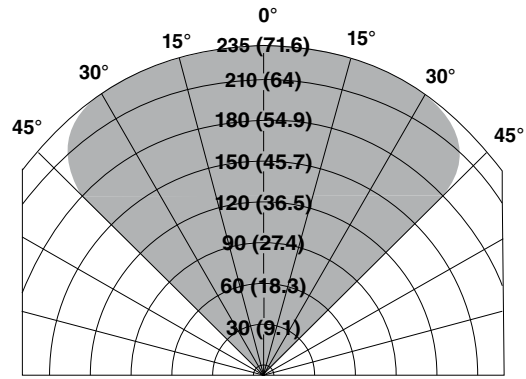
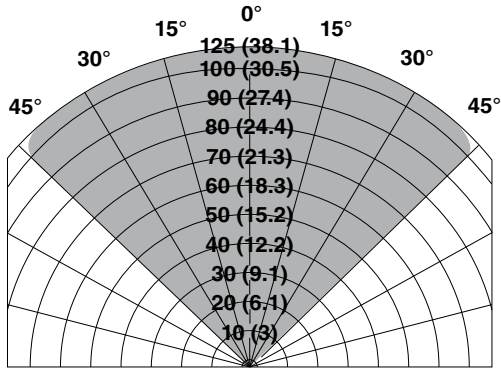


Field of View at Indicated Distance in Feet (m) for  
**Ethanol** at **Very High** Sensitivity (1 x 1 foot)

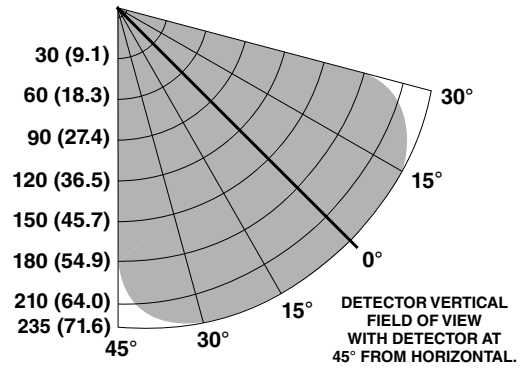


Field of View at Indicated Distance in Feet (m) for  
**Methanol** at **Very High** Sensitivity (1 x 1 foot)

## High Resolution Field of View Diagrams – Continued

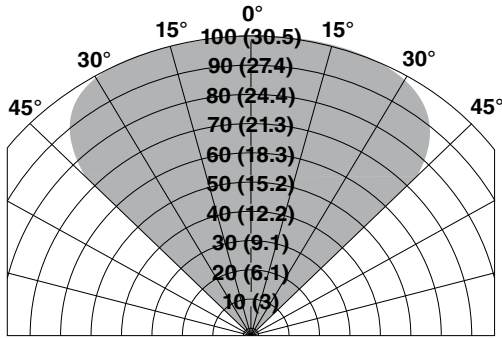


Field of View at Indicated Distance in Feet (m) for  
**Methane at Very High Sensitivity (32 inch plume)**

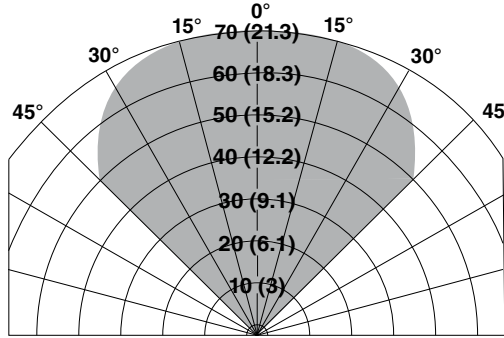


Field of View at Indicated Distance in Feet (m) for  
**JP-5 at Very High Sensitivity (2 x 2 feet)**

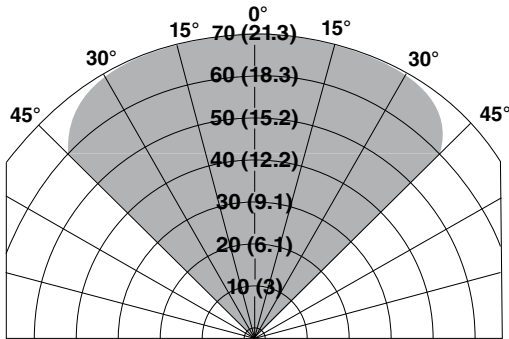
## High Resolution Field of View Diagrams – Continued



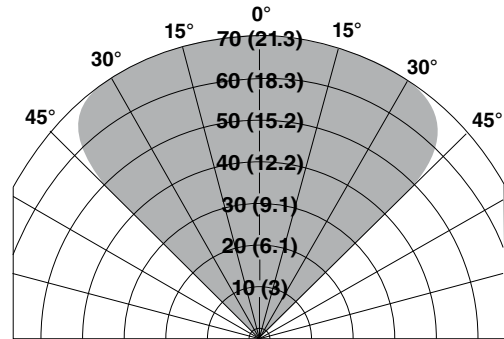
Field of View at Indicated Distance in Feet (m) for  
**n-Heptane at Medium Sensitivity (1 x 1 foot)**



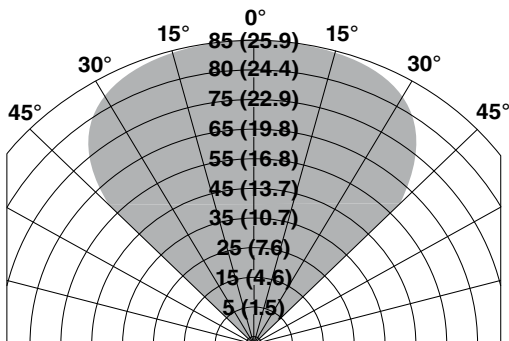
Field of View at Indicated Distance in Feet (m) for  
**Methanol at Medium Sensitivity (1 x 1 foot)**



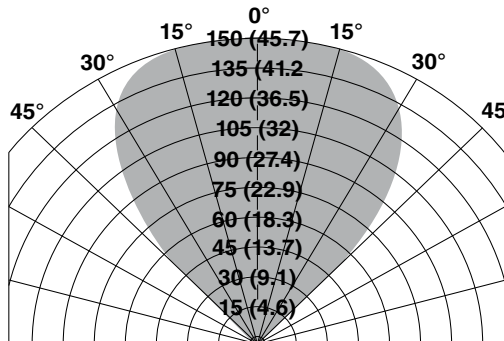
Field of View at Indicated Distance in Feet (m) for  
**Diesel at Medium Sensitivity (1 x 1 foot)**



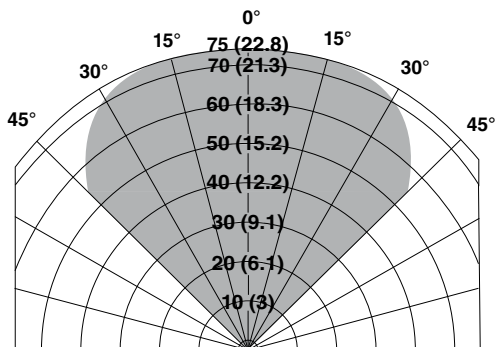
Field of View at Indicated Distance in Feet (m) for  
**Methane at Medium Sensitivity (32 inch plume)**



Field of View at Indicated Distance in Feet (m) for  
**Ethanol at Medium Sensitivity (1 x 1 foot)**



Field of View at Indicated Distance in Feet (m) for  
**JP-5 at Medium Sensitivity (2 x 2 feet)**



Field of View at Indicated Distance in Feet (m) for  
**Propane at Medium Sensitivity (32 inch plume)**

# APPENDIX A – FM APPROVAL AND PERFORMANCE REPORT

THE FOLLOWING ITEMS, FUNCTIONS AND OPTIONS DESCRIBE THE FM APPROVAL:

- Explosion-proof for Class I, Div. 1, Groups B, C and D (T4A) Hazardous (Classified) Locations per FM 3615.
- Dust-ignition proof for Class II/III, Div. 1, Groups E, F and G (T4A) Hazardous (Classified) Locations per FM 3615.
- Nonincendive for Class I, Div. 2, Groups A, B, C and D (T3C) Hazardous (Classified) Locations per FM 3611.
- Nonincendive for Class II, Div. 2, Groups F and G (T3C) Hazardous (Classified) Locations per FM 3611.
- Enclosure rating NEMA/Type 4X per NEMA 250.
- Ambient Temperature Limits: –40°F to +167°F (–40°C to +75°C).
- Automatic Fire Alarm Signaling Performance verified per FM 3260 (2000).

Flameproof per ANSI/ISA 60079-0, -1, -7, -31

CL I, ZONE 1, AEx db eb IIC T6...T5

T6 (Tamb –40°C to +60°C)

T5 (Tamb –40°C to +75°C)

ZONE 21, AEx tb IIIC T130°C

Tamb –40°C to +75°C

IP66

CL I, ZONE 1, AEx db IIC T6...T5

T6 (Tamb –40°C to +60°C)

T5 (Tamb –40°C to +75°C)

IP66/IP67

The following accessories are FM approved for use with the X33AF PL Flame Detector:

Part Number	Description
116-102740-002	Magnet
116-007739-001	Magnet and Extension Pole
116-010857-001	Q1130A1001 Flange Mount Assembly
116-007290-001	Q9033B Stainless Steel Mounting Arm Assembly is for aluminum and stainless steel detectors
116-007290-002	Q9033A Aluminum Mounting Arm Assembly is for aluminum detectors only
116-011385-001	Q9033 Collar Attachment

The following performance criteria were verified:

## AUTOMATIC OPTICAL INTEGRITY TEST:

The detector generated an optical fault in the presence of contamination on any single or combination of lens surfaces resulting in a loss of approximately 50% of its detection range, verifying that the detector performs a calibrated Automatic Optical Integrity ( $o_j$ ) test for each sensor. Upon removal of the contamination, the detector fault was cleared and the detector was verified to detect a fire.

## MANUAL OPTICAL INTEGRITY TEST:

The Manual / Magnetic  $o_j$  performs the same calibrated test as the Automatic  $o_j$ , and additionally actuates the alarm relay to verify output operation. If there is a 50% loss of its detection range, an alarm signal is not generated.

The Optical Integrity test procedure, as described in the "Magnetic  $o_j$  / Manual  $o_j$ " section of this instruction manual, is the approved external optical test method for this detector to verify end-to-end detector function. This test replaces the function and need of a traditional external test lamp.

## FM Approval and Performance Report – Continued

### RESPONSE CHARACTERISTICS

A maximum delay of 1 second must be added to the average response time to account for the delay in communication of alarm from the detector to the control panel.

#### Very High Sensitivity

Fuel	Size	Distance feet (m)	Average Response Time (seconds)
n-Heptane	1 x 1 foot	210 (64)*	11
n-Heptane**	1 x 1 foot	210 (64)*	6
n-Heptane	1 x 1 foot	100 (30.5)	3
n-Heptane	6 in. x 6 in.	80 (24.4)	3
Isopropanol	6 in. x 6 in.	70 (21.3)	4
Diesel**	1 x 1 foot	150 (45.7)*	14
Ethanol	1 x 1 foot	210 (64)	11
Methanol	6 in. x 6 in.	40 (12.2)	3
Methanol	1 x 1 foot	150 (45.7)*	18
Methanol**	1 x 1 foot	150 (45.7)*	7
Methane	30 inch plume	100 (30.5)	3
JP-5**	1 x 1 foot	150 (45.7)*	2
JP-5**	2 x 2 feet	210 (64)*	4
JP-5**	2 x 2 feet	100 (30.5)	2
Office Paper 0.5 lb.	19" x 19" x 8"	100 (30.5)	4
Corrugated Panel	18" x 36"	100 (30.5)	8

\* Outdoor test condition.

\*\* Pre-burn from ignition.

#### Medium Sensitivity

Fuel	Size	Distance feet (m)	Average Response Time (seconds)
n-Heptane	1 x 1 foot	100 (30.5)	12
n-Heptane	1 x 1 foot	50 (15.2)	2
Diesel**	1 x 1 foot	70 (21.3)	4
Ethanol	1 x 1 foot	85 (25.9)	13
Methanol	1 x 1 foot	70 (21.3)	10
Methane	30 inch plume	65 (19.8)	3
Methane	30 inch plume	55 (16.8)	2
JP-5**	2 x 2 feet	100 (30.5)	3
Office Paper 0.5 lb.	19" x 19" x 8"	50 (15.2)	6
Corrugated Panel	18" x 36"	50 (15.2)	2

\*\* Pre-burn from ignition.

#### T-Low Sensitivity

Fuel	Size	Distance feet (m)	Average Response Time (seconds)
n-Heptane	1 x 1 foot	50 (15.2)	7
Methanol	1 x 1 foot	20 (6.1)	5
Methane	32 inch plume	15 (4.6)	4

#### Low Sensitivity

Fuel	Size	Distance feet (m)	Average Response Time (seconds)
n-Heptane	1 x 1 foot	50 (15.2)	10
Methanol	1 x 1 foot	20 (6.1)	10
Methane	32 inch plume	15 (4.6)	9

## FM Approval and Performance Report – Continued

### RESPONSE CHARACTERISTICS IN THE PRESENCE OF FALSE ALARM SOURCES

A maximum delay of 1 second must be added to the average response time to account for the delay in communication of alarm from the detector to the control panel.

#### Very High Sensitivity

False Alarm Source	Distance feet (m)	Fire Source	Distance feet (m)	Average Response Time (seconds)
Sunlight, direct, modulated, reflected	—	6-inch propane	6 (1.8)	< 10
Vibration	N/A	3-inch propane	10.5 (3.2)	< 10
Radio frequency interference	1 (0.3)	3-inch propane	12 (3.7)	< 10
Arc welding, #7014	40 (12.2)	1 x 1 foot n-Heptane	40 (12.2)	4
6 kw heater, modulated	80 (24.4)	1 x 1 foot n-Heptane	80 (24.4)	2
6 kw heater, unmodulated	10 (3)	1 x 1 foot n-Heptane	80 (24.4)	3
250 w vapor lamp, modulated	3 (0.9)	1 x 1 foot n-Heptane	80 (24.4)	2
300 w incandescent lamp, modulated	3 (0.9)	1 x 1 foot n-Heptane	80 (24.4)	7
500 w shielded quartz halogen lamp, modulated	8 (2.4)	1 x 1 foot n-Heptane	80 (24.4)	2
500 w unshielded quartz halogen lamp, modulated	8 (2.4)	1 x 1 foot n-Heptane	80 (24.4)	3
1500 w electric radiant heater, modulated	10 (3)	1 x 1 foot n-Heptane	80 (24.4)	5
Two 34 w fluorescent lamps, modulated	3 (0.9)	1 x 1 foot n-Heptane	80 (24.4)	3

#### Medium Sensitivity

False Alarm Source	Distance feet (m)	Fire Source	Distance feet (m)	Average Response Time (seconds)
Sunlight, direct, modulated, reflected	—	6-inch propane	6 (1.8)	< 4
Vibration*	N/A	N/A	N/A	N/A
Radio frequency interference	1 (0.3)	6-inch propane	6 (1.8)	< 1
Arc welding, #7014	10 (3)	1 x 1 foot n-Heptane	40 (12.2)	4
6 kw heater, modulated	60 (18.3)	1 x 1 foot n-Heptane	60 (18.3)	2
6 kw heater, unmodulated	10 (3)	1 x 1 foot n-Heptane	60 (18.3)	2
250 w vapor lamp, modulated	3 (0.9)	1 x 1 foot n-Heptane	60 (18.3)	1
300 w incandescent lamp, modulated	3 (0.9)	1 x 1 foot n-Heptane	60 (18.3)	1
500 w shielded quartz halogen lamp, modulated	8 (2.4)	1 x 1 foot n-Heptane	60 (18.3)	1
500 w unshielded quartz halogen lamp, modulated	8 (2.4)	1 x 1 foot n-Heptane	60 (18.3)	1
1500 w electric radiant heater, modulated	10 (3)	1 x 1 foot n-Heptane	60 (18.3)	6
Two 34 w fluorescent lamps, modulated	3 (0.9)	1 x 1 foot n-Heptane	60 (18.3)	2

\* Fire was verified with very high sensitivity only.



## FM Approval and Performance Report – Continued

### T-Low Sensitivity

False Alarm Source	Distance feet (m)	Fire Source	Distance feet (m)	Average Response Time (seconds)
Sunlight, direct, unmodulated, reflected*	—	1 x 1 foot n-Heptane	35 (10.7)	< 6
Sunlight, direct, modulated, reflected*	—	1 x 1 foot n-Heptane	15 (4.6)	< 4
Arc welding, steady, #7014	5 (1.5)	1 x 1 foot n-Heptane	50 (15.2)	10
Arc welding, modulated, #7014	5 (1.5)	1 x 1 foot n-Heptane	30 (9.1)	3
70 w sodium vapor, unmodulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	6
70 w sodium vapor, modulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	7
250 w vapor lamp, unmodulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	8
250 w vapor lamp, modulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	6
300 w incandescent lamp, unmodulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	7
300 w incandescent lamp, modulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	8
500 w shielded quartz halogen lamp, unmodulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	4
500 w shielded quartz halogen lamp, modulated	10 (3)	1 x 1 foot n-Heptane	50 (15.2)	5
1500 w electric radiant heater, unmodulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	5
1500 w electric radiant heater, modulated	10 (3)	1 x 1 foot n-Heptane	30 (9.1)	7
Two 34 w fluorescent lamps, unmodulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	5
Two 34 w fluorescent lamps, modulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	4

\* Outdoor test conditions.

### Low Sensitivity

False Alarm Source	Distance feet (m)	Fire Source	Distance feet (m)	Average Response Time (seconds)
Sunlight, direct, unmodulated, reflected*	—	1 x 1 foot n-Heptane	35 (10.7)	< 13
Sunlight, direct, modulated, reflected*	—	1 x 1 foot n-Heptane	15 (4.6)	< 14
Arc welding, steady, #7014	5 (1.5)	1 x 1 foot n-Heptane	50 (15.2)	11
Arc welding, modulated, #7014	5 (1.5)	1 x 1 foot n-Heptane	30 (9.1)	10
70 w sodium vapor, modulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	16
250 w vapor lamp, modulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	18
300 w incandescent lamp, modulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	18
500 w shielded quartz halogen lamp, unmodulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	12
500 w shielded quartz halogen lamp, modulated	10 (3)	1 x 1 foot n-Heptane	50 (15.2)	11
1500 w electric radiant heater, unmodulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	12
1500 w electric radiant heater, modulated	10 (3)	1 x 1 foot n-Heptane	30 (9.1)	11
Two 34 w fluorescent lamps, modulated	3 (0.9)	1 x 1 foot n-Heptane	50 (15.2)	14

\* Outdoor test conditions.

## FM Approval and Performance Report – Continued

### FALSE ALARM IMMUNITY

#### Very High Sensitivity

False Alarm Source	Distance feet (m)	Modulated Response	Unmodulated Response
Sunlight, direct, reflected	—	No alarm	No alarm
Vibration	N/A	No alarm	N/A
Radio frequency interference	1 (0.3)	No alarm (keyed)	No alarm (steady)
Arc welding	40 (12.2)	No alarm	No alarm
6 kw heater	3 (0.9)	No alarm	No alarm
250 w vapor lamp	3 (0.9)	No alarm	No alarm
300 w incandescent lamp	3 (0.9)	No alarm	No alarm
500 w unshielded quartz halogen lamp	8 (2.4)	No alarm	No alarm
500 w shielded quartz halogen lamp	8 (2.4)	No alarm	No alarm
1500 w electric radiant heater	3 (0.9)	No alarm	No alarm
Two 34 w fluorescent lamps	3 (0.9)	No alarm	No alarm

#### Medium Sensitivity

False Alarm Source	Distance feet (m)	Modulated Response	Unmodulated Response
Sunlight, direct, reflected	—	No alarm	No alarm
Vibration	N/A	No alarm	N/A
Radio frequency interference	1 (0.3)	No alarm (keyed)	No alarm (steady)
Arc welding	10 (3)	No alarm	No alarm
6 kw heater	3 (0.9)	No alarm	No alarm
250 w vapor lamp	3 (0.9)	No alarm	No alarm
300 w incandescent lamp	3 (0.9)	No alarm	No alarm
500 w unshielded quartz halogen lamp	8 (2.4)	No alarm	No alarm
500 w shielded quartz halogen lamp	3 (0.9)	No alarm	No alarm
1500 w electric radiant heater	3 (0.9)	No alarm	No alarm
Two 34 w fluorescent lamps	3 (0.9)	No alarm	No alarm

#### T-Low Sensitivity

False Alarm Source	Distance feet (m)	Modulated Response	Unmodulated Response
Sunlight, direct, reflected	—	No alarm	No alarm
Vibration	—	No alarm	No alarm
Arc welding	5 (1.5)	No alarm	No alarm
6 kw heater	3 (0.9)	No alarm	No alarm
70 w sodium vapor	3 (0.9)	No alarm	No alarm
250 w vapor lamp	3 (0.9)	No alarm	No alarm
300 w incandescent lamp	3 (0.9)	No alarm	No alarm
500 w shielded quartz halogen lamp	3 (0.9)	No alarm	No alarm
1500 w electric radiant heater	3 (0.9)	No alarm	No alarm
Two 34 w fluorescent lamps	3 (0.9)	No alarm	No alarm

#### Low Sensitivity

False Alarm Source	Distance feet (m)	Modulated Response	Unmodulated Response
Sunlight, direct, reflected	—	No alarm	No alarm
Vibration	—	No alarm	No alarm
Radio frequency interference	N/A	No alarm	N/A
Arc welding	5 (1.5)	No alarm	No alarm
6 kw heater	3 (0.9)	No alarm	No alarm
250 w vapor lamp	3 (0.9)	No alarm	No alarm
300 w incandescent lamp	3 (0.9)	No alarm	No alarm
500 w shielded quartz halogen lamp	3 (0.9)	No alarm	No alarm
1500 w electric radiant heater	3 (0.9)	No alarm	No alarm
Two 34 w fluorescent lamps	3 (0.9)	No alarm	No alarm

**FM Approval and Performance Report – Continued**

**FIELD OF VIEW**

**Very High Sensitivity**

<b>Fuel</b>	<b>Size</b>	<b>Distance feet (m)</b>	<b>Horizontal (degrees)</b>	<b>Avg. Horiz. Response Time (seconds)</b>	<b>Vertical (degrees)</b>	<b>Avg. Vert. Response Time (seconds)</b>
n-Heptane	1 x 1 foot	150* (45.7)	+45 -45	12 14	+45 -30	13 5
n-Heptane	1 x 1 foot	100 (30.5)	+45 -45	6 3	+45 -30	3 2
n-Heptane	6 in. x 6 in.	80 (24.4)	+45 -45	5 6	+45 -30	4 4
Isopropanol	6 in. x 6 in.	70 (21.3)	+45 -45	5 5	+45 -30	4 6
Diesel**	1 x 1 foot	100 (30.5)	+45 -45	2 3	+45 -30	4 3
Ethanol	1 x 1 foot	150 (45.7)	+45 -45	13 10	+45 -30	10 8
Methanol	6 in. x 6 in.	40 (12.2)	+45 -45	4 6	+45 -30	3 3
Methanol	1 x 1 foot	110 (33.5)	+45 -45	9 7	+45 -30	9 3
Methane	30 inch plume	100 (30.5)	+45 -45	7 3	+45 -30	2 2
JP-5**	1 x 1 foot	<b>100</b> <b>(30.5)</b>	+45 -45	2 4	+45 -30	3 2
JP-5**	2 x 2 feet	<b>180*</b> <b>(54.9)</b>	+45 -45	2 5	+45 -30	3 2
JP-5**	2 x 2 feet	<b>90</b> <b>(27.4)</b>	+45 -45	2 3	+45 -30	1 2
Office Paper 0.5 lb.	19" x 19" x 8"	<b>80</b> <b>(24.4)</b>	+45 -45	4 2	+45 -30	2 1
Corrugated Panel	18" x 36"	<b>80</b> <b>(24.4)</b>	+45 -45	1 1	+45 -30	3 2

\* Outdoor test condition.

\*\* Pre-burn from ignition.

**FM Approval and Performance Report – Continued**

**Medium Sensitivity**

<b>Fuel</b>	<b>Size</b>	<b>Distance feet (m)</b>	<b>Horizontal (degrees)</b>	<b>Avg. Horiz. Response Time (seconds)</b>	<b>Vertical (degrees)</b>	<b>Avg. Vert. Response Time (seconds)</b>
n-Heptane	1 x 1 foot	75 (22.9)	+45 -45	9 6	+45 -30	10 7
n-Heptane	1 x 1 foot	50 (15.2)	+45 -45	4 3	+45 -30	3 3
Diesel**	1 x 1 foot	60 (18.3)	+45 -45	4 4	+45 -30	4 2
Ethanol	1 x 1 foot	60 (18.2)	+45 -45	12 9	+45 -30	12 9
Methanol	1 x 1 foot	50 (15.2)	+45 -45	9 3	+45 -30	9 1
Methane	32 inch plume	45 (13.7)	+45 -45	3 3	+45 -30	7 1
JP-5**	2 x 2 feet	90 (27.4)	+45 -45	4 2	+45 -30	2 2
Office Paper 0.5 lb.	19" x 19" x 8"	40 (12.2)	+45 -45	2 1	+45 -30	1 1
Corrugated Panel	18" x 36"	40 (12.2)	+45 -45	2 1	+45 -30	1 1

\*\* Pre-burn from ignition.

**T-Low Sensitivity**

<b>Fuel</b>	<b>Size</b>	<b>Distance feet (m)</b>	<b>Horizontal (degrees)</b>	<b>Avg. Horiz. Response Time (seconds)</b>	<b>Vertical (degrees)</b>	<b>Avg. Vert. Response Time (seconds)</b>
n-Heptane	1 x 1 foot	35 (10.7)	+45 -45	7 7	+45 -30	7 7
Methanol	1 x 1 foot	15 (4.6)	+45 -45	5 5	+45 -30	5 5
Methane	32 inch plume	15 (4.6)	+45 -45	4 4	+45 -30	4 4

**Low Sensitivity**

<b>Fuel</b>	<b>Size</b>	<b>Distance feet (m)</b>	<b>Horizontal (degrees)</b>	<b>Avg. Horiz. Response Time (seconds)</b>	<b>Vertical (degrees)</b>	<b>Avg. Vert. Response Time (seconds)</b>
n-Heptane	1 x 1 foot	35 (10.7)	+45 -45	13 13	+45 -30	9 18
Methanol	1 x 1 foot	15 (4.6)	+45 -45	14 12	+45 -30	10 8
Methane	32 inch plume	15 (4.6)	+45 -45	10 11	+45 -30	8 10

## APPENDIX – B CSA APPROVAL

### DIVISION CLASSIFICATION:

Multispectrum IR Flame Detector/Controller X33AF Series, rated 18-30 Vdc, 4.6 Watts to 17 Watts.  
Relay contacts rated 30 Vdc, 5 Amps.

### CLASS 4818 04 - SIGNAL APPLIANCES - Systems - For Hazardous Locations

Class I, Division 1, Groups B, C, and D (T4A); Class II, Division 1, Groups E, F, and G (T4A);  
Class I, Division 2, Groups A, B, C, and D (T3C); Class II, Division 2, Groups F and G (T3C);  
Class III; Enclosure NEMA/Type 4X;  
Conduit seal not required.

### APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 0-M91	- General Requirements — Canadian Electrical Code, Part II
CAN/CSA-C22.2 No. 25-1966	- Enclosures for use in Class II Groups E, F & G Hazardous Locations
CAN/CSA-C22.2 No. 30-M1986	- Explosion-Proof Enclosures for use in Class I Hazardous Locations
CAN/CSA-C22.2 No. 94-M91	- Special Purpose Enclosures
CAN/CSA-C22.2 No. 142-M1987	- Process Control Equipment
CAN/CSA-C22.2 No. 213-M1987	- Nonincendive Electrical Equipment for use in Class I, Division 2 Hazardous Locations

### ZONE CLASSIFICATION:

### CLASS 4818 04 - SIGNAL APPLIANCES - Systems - For Hazardous Locations

Ex db eb IIC T6...T5  
T6 (Ta -50°C to +60°C)  
T5 (Ta -50°C to +75°C)  
Ex tb IIIC T130°C  
(Tamb = -50°C to +75°C)  
Seal required adjacent to enclosure  
IP66

Ex db IIC T6...T5  
T6 (Ta -55°C to +60°C)  
T5 (Ta -55°C to +75°C)  
Seal required adjacent to enclosure  
IP66/IP67

### APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 60079-0:2015	Electrical apparatus for explosive gas atmospheres. Part 0: General requirements
CAN/CSA-C22.2 No. 60079-1:2016	Explosive atmospheres. Part 1: Equipment protection by flameproof enclosures "d"
CAN/CSA-C22.2 No. 60079-7:2012	Explosive atmospheres. Part 7: Equipment protection by increased safety "e"
CAN/CSA-C22.2 No. 60079-31:2015	Explosive atmospheres. Part 31: Equipment dust ignition protection by enclosure "t"

The following accessories are CSA approved for use with the X33AF PL Flame Detector:

Part Number	Description
116-102740-002	Magnet
116-007739-001	Magnet and Extension Pole
116-010857-001	Q1130A1001 Flange Mount Assembly
116-007290-001	Q9033B Stainless Steel Mounting Arm Assembly is for aluminum and stainless steel detectors
116-007290-002	Q9033A Aluminum Mounting Arm Assembly is for aluminum detectors only
116-011385-001	Q9033 Collar Attachment

# APPENDIX C – ATEX APPROVAL

## EC-TYPE EXAMINATION CERTIFICATE

### DEMKO 01 ATEX 130204X

#### Increased Safety Model

CE 0539  $\text{Ex}$  II 2 G  
II 2 D

Ex db eb IIC T6...T5  
Ex tb IIIC T130°C  
T6 (Tamb = -50°C to +60°C)  
T5 (Tamb = -50°C to +75°C)  
IP66

#### Flameproof Model

CE 0539  $\text{Ex}$  II 2 G

Ex db IIC T6...T4  
T6 (Tamb = -55°C to +60°C)  
T5 (Tamb = -55°C to +75°C)  
T4 (Tamb = -55°C to +125°C)  
IP66/IP67

### Compliance with:

EN 60079-0: 2012+A11:2013  
EN 60079-1: 2014  
EN 60079-7: 2015  
EN 60079-31: 2014  
EN 60529: 1991+A1:2000+A2:2013

## INSTALLATION INSTRUCTIONS

The field wiring connections in the terminal compartment are ATEX certified and accepts wiring specifications from 14-24 AWG or 2.5-0.2 mm<sup>2</sup>.

The Multispectrum infrared (IR) flame detector type X33AF PL shall be installed according to the instructions given by the manufacturer.

The cable entry devices shall be certified in type of explosion protection flameproof enclosure "d" for use with the terminal compartment in type of explosion protection flameproof enclosure "d", or in type of explosion protection increased safety "e" for use with the terminal compartment in type of explosion protection increased safety "e". They shall be IP66/IP67 rated, suitable for the conditions of use and correctly installed.

Unused entries shall be closed with suitable certified blanking elements.

The metal housing for the Multispectrum infrared (IR) flame detector type X33AF PL must be electrically connected to earth ground.

For ambient temperatures below -10°C and above +60°C use field wiring suitable for both minimum and maximum ambient temperature.

### Special conditions for safe use:

The front window assembly contains a special cemented joint construction. In accordance with EN60079-1 clause 5.1.c, all inspections, repair and/or adjustments to this front window assembly shall be done by the manufacturer only.

The EOL resistor can only be used within the flameproof terminal compartment.

EOL resistors must be ceramic, wirewound type, rated 5 watts minimum, with actual power dissipation not to exceed 2.5 watts.

The Multispectrum infrared (IR) flame detector type X33AF PL is to be installed in places where there is a low risk of mechanical damage.

- See the "Maintenance" section of this manual for guidance on minimizing the risk from electrostatic discharge.
- Flameproof joints are not intended to be repaired. See the "Device Repair and Return" section of this manual for more information on conducting repairs.

**NOTE**

*Operational performance verified from -40°C to +75°C.*

**NOTE**

*For ATEX installations, the X33AF PL Flame Detector must be electrically connected to earth ground.*

The following accessories are ATEX approved for use with the X33AF PL Flame Detector:

<b>Part Number</b>	<b>Description</b>
116-007290-001	Q9033B Stainless Steel Mounting Arm Assembly is for aluminum and stainless steel detectors
116-007290-002	Q9033A Aluminum Mounting Arm Assembly is for aluminum detectors only
116-011385-001	Q9033 Collar Attachment

## APPENDIX D – IECEX APPROVAL

### IECEX CERTIFICATE OF CONFORMITY

#### DEMKO

IECEX ULD 06.0017X

Ex db eb IIC T6...T5

Ex tb IIIC T130°C

T6 (Tamb = -50°C to +60°C)

T5 (Tamb = -50°C to +75°C)

IP66

Ex db IIC T6...T4

T6 (Tamb = -55°C to +60°C)

T5 (Tamb = -55°C to +75°C)

T4 (Tamb = -55°C to +125°C)

IP66/IP67

#### Compliance with:

IEC 60079-0: 2011, Ed. 6

IEC 60079-1: 2014, Ed. 7

IEC 60079-7: 2015, Ed. 5

IEC 60079-31: 2013, Ed. 2

IEC 60529: 2013, Ed. 2.2

#### INSTALLATION INSTRUCTIONS

The field wiring connections in the terminal compartment are suitable certified and accepts wiring specifications from 14-24 AWG or 2.5-0.2 mm<sup>2</sup>.

The Multispectrum infrared (IR) flame detector type X33AF PL shall be installed according to the instructions given by the manufacturer.

The cable entry devices shall be certified in type of explosion protection flameproof enclosure "d" for use with the terminal compartment in type of explosion protection flameproof enclosure "d" or in type of explosion protection increased safety "e" for use with the terminal compartment in type of explosion protection increased safety "e". They shall be IP66 rated, suitable for the conditions of use and correctly installed.

Unused entries shall be closed with suitable certified blanking elements.

The metal housing for the Multispectrum infrared (IR) flame detector type X33AF PL must be electrically connected to earth ground.

For ambient temperatures below -10°C and above +60°C use field wiring suitable for both minimum and maximum ambient temperature.

#### Special conditions for safe use:

The front window assembly contains a special cemented joint construction. In accordance with EN60079-1 clause 5.1.c, all inspections, repair and/or adjustments to this front window assembly shall be done by the manufacturer only.

The EOL resistor can only be used within the flameproof terminal compartment. EOL resistors must be ceramic, wirewound type, rated 5 watts minimum, with actual power dissipation not to exceed 2.5 watts.

The Multispectrum infrared (IR) flame detector type X33AF PL is to be installed in places where there is a low risk of mechanical damage.

- See the "Maintenance" section of this manual for guidance on minimizing the risk from electrostatic discharge.
- Flameproof joints are not intended to be repaired. See the "Device Repair and Return" section of this manual for more information on conducting repairs.

The following accessories are IECEX approved for use with the X33AF PL Flame Detector:

Part Number	Description
116-007290-001	Q9033B Stainless Steel Mounting Arm Assembly is for aluminum and stainless steel detectors
116-007290-002	Q9033A Aluminum Mounting Arm Assembly is for aluminum detectors only
116-011385-001	Q9033 Collar Attachment



## APPENDIX E – OFFSHORE APPROVALS

### MARINE EQUIPMENT DIRECTIVE

DNV Certificate No. MED-B-9427

Is found to comply with the requirements in the following Regulations / Standards:

Annex A.1, item No. A.1/3.51 and Annex B, Module B in the Directive. SOLAS 74 as amended, Regulation II-2/7 & X/3, 2000 HSC Code 7, FSS Code 9 and IMO MSC.1/Circ. 1242.

The equipment are found to comply with following location / application dependent requirements (for definition of each of the location classes, see below the table):

MODEL	TEMPERATURE	VIBRATION	EMC	ENCLOSURE
X33AF PL	TEM-D	VIB-B	EMC-B	ENC-C

Definition of the location classes with reference to relevant standards:

Temperature

TEM-D Location (-25°C-70°C) (ref. IEC 60092-504 (2001) table 1 item 6-7)

Vibration

VIB-D For eq. on reciprocating machines etc. (ref IEC 60092-504 (2001) table 1 item 10)

EMC

EMC-B Bridge and open deck zone (ref. IEC 60092-504 (2001) table 1 item 19-20)

Enclosure

ENC-C Open deck (IP56) (ref. IEC 60092-201 table 5)

Conformity to Module D, E and F.

### TYPE APPROVAL

DNV Certificate No. A-13995.

#### Subject Matter of the Approval

IR Flame Detector Type X33AF PL for use in Ships, High Speed & Light Craft, and Offshore Applications.

#### Application Location Classes:

Location classes for X33AF PL IR Flame Detector with Mounting Arm Q9033B / Q9033A (Shaded areas show Autronica approved location classes)

COLUMN 1		COLUMN 2				
TYPE	LOCATION WITHIN MAIN AREA	MAIN AREAS ON BOARD				
		Machinery spaces	Control room, Accommodation	Bridge	Pump room, Holds, Rooms with no heating	Open Deck
Temperature	Inside cubicles, desks, etc. with temperature rise of 5°C or more	B	B	B	D	D
	All other locations	A	A	A	C	D
Humidity	Locations where special precautions are taken to avoid condensation	A	A	A	A	A
	All other locations	B	B	B	B	B
Vibration	On machinery such as internal combustion engines, compressors, pumps, including piping on such machinery	B	—	—	B	B
	Masts	—	—	—	—	—
	All other locations	A	A	A	A	A
EMC (Electro-magnetic compatibility)	All locations within specified main areas	A	A	B	A	B
Enclosure	Submerged application	D	—	—	D	D
	Below floor plates in engine room	C	—	—	—	—
	All other locations	B	A	A	B	C

The following accessories are offshore approved to the listed approvals, for use with the X33AF PL Flame Detector:

Part Number	Description
116-102740-002	Magnet
116-007739-001	Magnet and Extension Pole
116-007290-001	Q9033B Stainless Steel Mounting Arm Assembly is for aluminum and stainless steel detectors
116-007290-002	Q9033A Aluminum Mounting Arm Assembly is for aluminum detectors only
116-011385-001	Q9033 Collar Attachment

## APPENDIX F – ADDITIONAL APPROVALS

### BRAZIL



UL-BR 12.0093X

Ex db eb IIC T6...T5

Ex tb IIIC T130°C

T6 (Tamb = -50°C to +60°C)

T5 (Tamb = -50°C to +75°C)

IP66

– OR –

Ex db IIC T6...T4

T6 (Tamb = -55°C to +60°C)

T5 (Tamb = -55°C to +75°C)

T4 (Tamb = -55°C to +125°C)

IP66/IP67

APPENDIX G  
DECLARATION OF CONFORMITY

[1]  **European Union**   
**Declaration of Conformity**

This declaration of conformity is issued under the sole responsibility of the manufacturer.

[2] It is declared that the following equipment:

**Model X33AF Series (AutoFlame Multispectrum Infrared Flame Detector)**

Document reference number **DEC-1207-X33AF**

[3] Manufactured by:

Detector Electronics Corporation (Det-Tronics)  
6901 West 110<sup>th</sup> Street  
Minneapolis, MN 55348 USA

[4] Is in conformity with the Essential Health and Safety Requirement and the relevant Union harmonisation legislation by complying with:

ATEX Directive: 2009/94/9/EC (until April 19 <sup>th</sup> , 2016)	EN 60079-0:2012+A11:2013
2014/34/EU (from April 20 <sup>th</sup> , 2016)	EN 60079-1:2014
Certificate No.: DEMKO 01 ATEX 130204X	EN 60079-7:2015
	EN 60079-31:2014
	EN 60529:1991+A1:2000+A2:2013

EMC Directive: 2004/108/EC (until April 19 <sup>th</sup> , 2016)	EN 50130-4:2011
2014/30/EU (from April 20 <sup>th</sup> , 2016)	EN 61000-6-2:2005
	EN 61000-6-4:2007

Low Voltage Directive: 2006/95/EC (until April 19 <sup>th</sup> , 2016)	EN 61010-1:2010
2014/35/EU (from April 20 <sup>th</sup> , 2016)	

WEEE Directive: 2002/96/EC


Marine Equipment Directive: 96/98/EC  
Certificate No.: MED-B-9427  
Certificate No.: MED-D-1515

Annex A.1, item No. A.1/3.51 and Annex B, Module B in the directive. SOLAS 74, Regulation II-2/7 & X/3, 2000 HSC Code 7, FSS Code 9 & IMO MSC.1/Circ.1242.

[5] Production QAN Issued by:

UL International DEMKO A/S, NB. No. 0539  
Borupvang 5A, 2750 Ballerup, Denmark

[6] The Marking of the equipment or protective system shall include the following:

 **II 2 G Ex db eb IIC T6...T5 IP66**

 **II 2 G Ex db IIC T6...T4 IP66/IP67**

 **II 2 D Ex tb IIIC T130°C IP66**

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