



**Appendix 1**  
**FM Approval Examination and Test Report**

**Flame response, false stimuli, field of view,  
hazardous location ratings and environmental ratings.**

- **Operating temperature rating: -40°C to +85°C (-40°F to +185°F).**
- **Explosion Electrical equipment verified per FM 3615**
- **Automatic Fire Alarm Signaling Performance verified per FM 3260 (2000)**
- **Radian Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling verified per ANSI/NFPA 72 (2002)**
- **Explosion-Proof for Class I, Div.1, Groups B, C and D, T4 Ta= -40°C to +85°C, IP 66 Hazardous Locations per FM 3615**
- **Explosion-Proof Enclosures for Use in Class I Hazardous Locations verified per CSA C22.2 No.30 1986 (Reaffirmed 2003)**

**RESPONSE CHARACTERISTICS.**

**Very high sensitivity**

Fuel	Pan size	Distance, feet (m)	Average response time (seconds)
n-Heptane	1×1 foot	211 (64,3)	9
JP4	1×1 foot	201 (60)	12
JP4	2×2 foot	206 (62,8)	8
Gasoline	1×1 foot	200 (60)	14
Gasoline	2×2 foot	196 (60)	4
Kerosene	1×1 foot	164 (50)	11
Kerosene	2×2 foot	196 (60)	6
Diesel	1×1 foot	151 (46)	15
Diesel	2×2 foot	151 (46)	10
Methanol	1×1 foot	151 (46)	9
Ethanol	1×1 foot	151 (46)	11
Methane	Plume Diameter 3/8 inch, height 3 foot	151 (46)	10
Methane	Methane sand burner 1×2 foot	151 (46)	10

**High sensitivity**

Fuel	Pan size	Distance, feet (m)	Average response time (seconds)
n-Heptane	1×1 foot	143 (43,5)	5
Isopropyl Alcohol	1×1 foot	99 (30)	6
JP4	2×2 foot	115 (35)	12

**Medium sensitivity**

Fuel	Pan size	Distance, feet (m)	Average response time (seconds)
n-Heptane	1×1 foot	108 (32,9)	5
Isopropyl Alcohol	1×1 foot	87 (26,5)	5
JP4	1×1 foot	60 (18,2)	6
JP4	2×2 foot	95 (29)	7

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### *Response characteristics in the presence of false alarm sources.*

#### **Very high sensitivity**

False alarm source	Distance Feet (m)	Fire source	Distance, feet (m)	Average response time (seconds)	
				unmodulated	modulated
1,5 kW heater	16 (5)	n-Heptane (1×1 foot)	82 (25)	2.0	2.0
100W incandescent light	16 (5)	n-Heptane (1×1 foot)	82 (25)	2.1	2.2
500W halogen light	16 (5)	n-Heptane (1×1 foot)	82 (25)	2.3	2.3
Arc welding (100 A, #7118, 3/16')	16 (5)	n-Heptane (1×1 foot)	82 (25)	2.0	2.1
Two 20W flourescent light	16 (5)	n-Heptane (1×1 foot)	82 (25)	2.0	2.1
Sunlight exposure (direct, reflect)	-	n-Heptane (1×1 foot)	82 (25)	2.0	2.2

#### **Medium sensitivity**

False alarm source	Distance Feet (m)	Fire source	Distance, feet (m)	Average response time (seconds)	
				unmodulated	modulated
1,5 kW heater	10 (3)	n-Heptane (1×1 foot)	108 (32,9)	10.4	5.2
100W incandescent light	10 (3)	n-Heptane (1×1 foot)	108 (32,9)	3.1	3.4
500W halogen light	10 (3)	n-Heptane (1×1 foot)	108 (32,9)	3.7	5.2
40W flourescent light	10 (3)	n-Heptane (1×1 foot)	108 (32,9)	6.2	5.5
Arc welding (115 A, #7018, 1/8')	10 (3)	n-Heptane (1×1 foot)	108 (32,9)	6.0	5.9
Sunlight exposure (direct, reflect)	-	n-Heptane (1×1 foot)	82 (25)	2.0	2.2

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**FALSE ALARM IMMUNITY.**

**Very high sensitivity**

False alarm source	Distance Feet (m)	Modulated response	Unmodulated response
1,5 kW heater	3 (0,9)	No alarm	No alarm
Arc welding (100A, #7118, 3/16')	9 (2,7)	No alarm	No alarm
100W incandescent lamp	1 (0,3)	No alarm	No alarm
500W halogen lamp	3 (0,9)	No alarm	No alarm
Two 20W fluorescent lamp	0 (0)	No alarm	No alarm
Sunlight (direct, reflect)	-	No alarm	No alarm

**High sensitivity**

False alarm source	Distance Feet (m)	Modulated response	Unmodulated response
1,5 kW heater	3,2 (1)	No alarm	No alarm
Arc welding (115A, #7018, 1/8')	10 (3)	No alarm	No alarm
100W incandescent light	3,2 (1)	No alarm	No alarm
500W halogen light	6,5 (2)	No alarm	No alarm
10W fluorescent light	0,25 (0,08)	No alarm	No alarm
Sunlight exposure (direct, reflect)	-	No alarm	No alarm

**Medium sensitivity**

False alarm source	Distance Feet (m)	Modulated response	Unmodulated response
1,5 kW heater	7,3 (2,2)	No alarm	No alarm
Arc welding (115A, #7018, 1/8')	10 (3)	No alarm	No alarm
100W incandescent light	3,2 (1)	No alarm	No alarm
500W halogen light	6,5 (2)	No alarm	No alarm
10W fluorescent light	0,25 (0,08)	No alarm	No alarm
Sunlight exposure (direct, reflect)	-	No alarm	No alarm

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**FIELD OF VIEW.**

**Very high sensitivity**

Fuel	Size	Distance, feet (m)	Horizontal (degrees)	Avg. horiz. response time (seconds)	Vertical (degrees)	Avg. vert. response time (seconds)
n-Heptane	1×1 foot	105 (32)	+45	4.4	+45	5.9
			-45	6.4	-45	8.5
JP4	1×1 foot	98 (30)	+45	4.2	+45	4.3
			-45	13.5	-45	7.5
Gasoline	1×1 foot	98 (30)	+45	5.7	+45	4.9
			-45	10.4	-45	5.5
Kerosene	1×1 foot	98 (30)	+45	6.3	+45	7.0
			-45	18.9	-45	14.0
Diesel	1×1 foot	75 (23)	+45	6.5	+45	5.2
			-45	18.6	-45	8.9
Methanol	1×1 foot	75 (23)	+45	2.7	+45	3.0
			-45	4.2	-45	3.1
Ethanol	1×1 foot	75 (23)	+45	3.0	+45	2.4
			-45	3.7	-45	2.6
Methane	Plume Diameter 3/8 inch, height 3 foot	75 (23)	+45	2.5	+45	2.6
			-45	2.8	-45	2.8

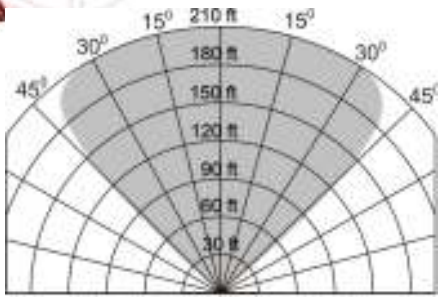
**High sensitivity**

Fuel	Size	Distance, feet (m)	Horizontal (degrees)	Avg. horiz. response time (seconds)	Vertical (degrees)	Avg. vert. response time (seconds)
n-Heptane	1×1 foot	71,5 (22)	+45	6.8	+45	6.4
			-45	13.6	-45	8.5
Isopropyl Alcohol	1×1 foot	50 (15)	+45	5.7	+45	4.2
			-45	8.2	-45	4.2

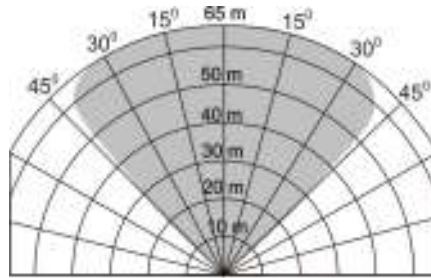
**Medium sensitivity**

Fuel	Size	Distance, feet (m)	Horizontal (degrees)	Avg. horiz. response time (seconds)	Vertical (degrees)	Avg. vert. response time (seconds)
n-Heptane	1×1 foot	60 (18)	+45	4.8	+45	17.4
			-45	4.5	-45	3.8
Isopropyl Alcohol	1×1 foot	44 (14)	+45	19.5	+45	7.3
			-45	7.3	-45	6.9
JP4	1×1 foot	30 (9)	+45	20.9	+45	20.8
			-45	11.9	-45	12.8

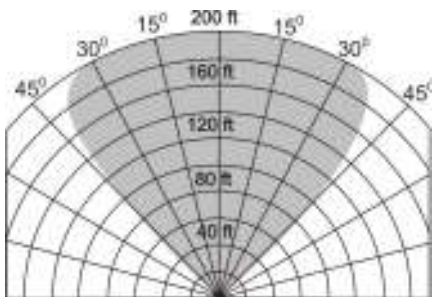
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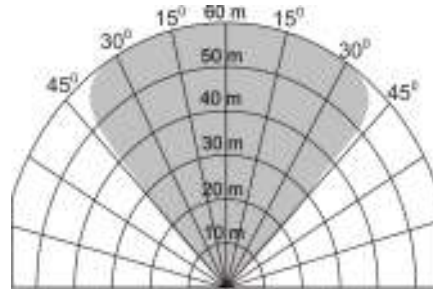
Field of View at Indicated Distance in Feet for **n-Heptane** at **Very High** Sensitivity (1 x 1 foot)



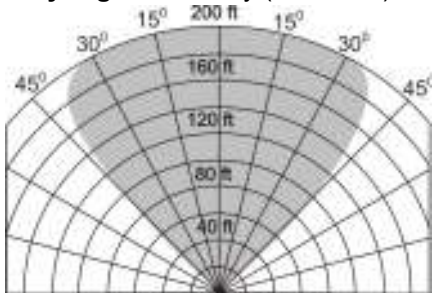
Field of View at Indicated Distance in Meters for **n-Heptane** at **Very High** Sensitivity (1 x 1 foot)



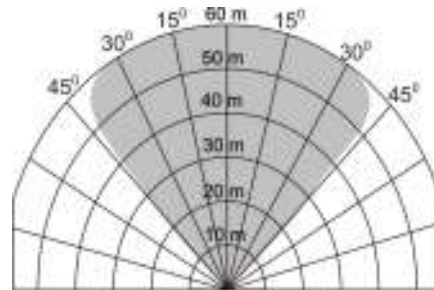
Field of View at Indicated Distance in Feet for **JP4** at **Very High** Sensitivity (1 x 1 foot)



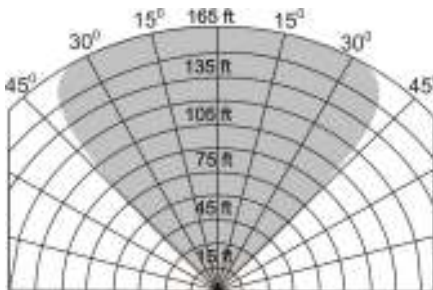
Field of View at Indicated Distance in Meters for **JP4** at **Very High** Sensitivity (1 x 1 foot)



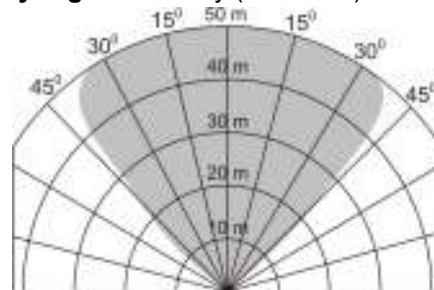
Field of View at Indicated Distance in Feet for **gasoline** at **Very High** Sensitivity (1 x 1 foot)



Field of View at Indicated Distance in Meters for **gasoline** at **Very High** Sensitivity (1 x 1 foot)

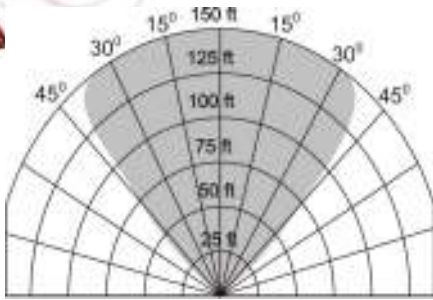


Field of View at Indicated Distance in Feet for **kerosene** at **Very High** Sensitivity (1 x 1 foot)

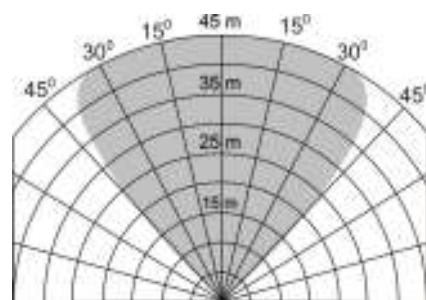


Field of View at Indicated Distance in Meters for **kerosene** at **Very High** Sensitivity (1 x 1 foot)

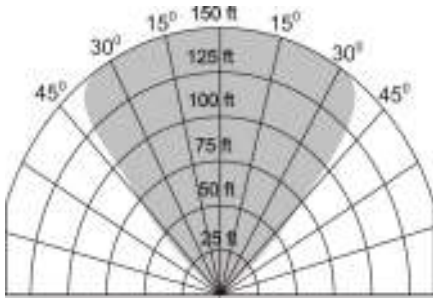
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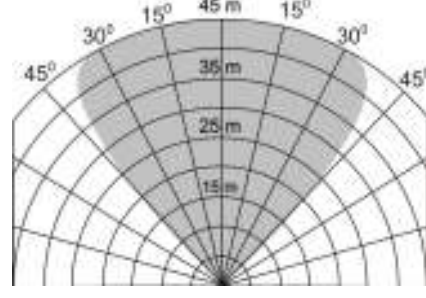
Field of View at Indicated Distance in Feet for **diesel** at **Very High Sensitivity** (1 x 1 foot)



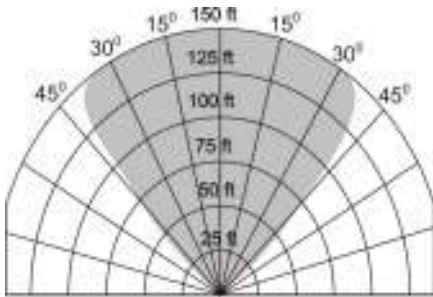
Field of View at Indicated Distance in Meters for **diesel** at **Very High Sensitivity** (1 x 1 foot)



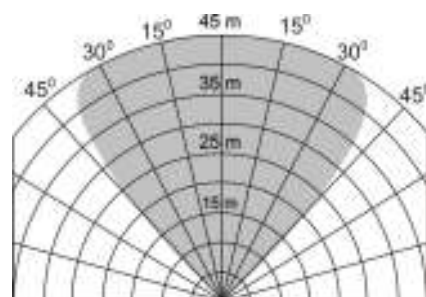
Field of View at Indicated Distance in Feet for **methanol** at **Very High Sensitivity** (1 x 1 foot)



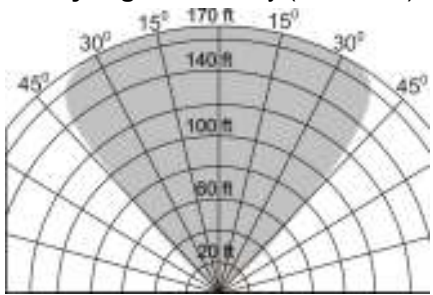
Field of View at Indicated Distance in Meters for **methanol** at **Very High Sensitivity** (1 x 1 foot)



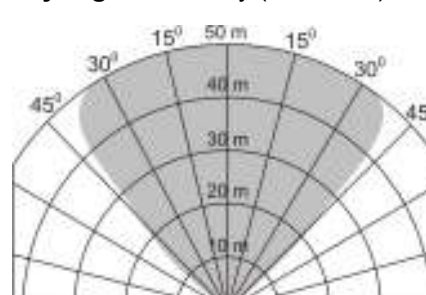
Field of View at Indicated Distance in Feet for **ethanol** at **Very High Sensitivity** (1 x 1 foot)



Field of View at Indicated Distance in Meters for **ethanol** at **Very High Sensitivity** (1 x 1 foot)

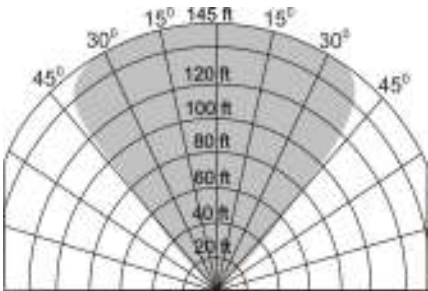


Field of View at Indicated Distance in Feet for **Methane plume** at **Very High Sensitivity** (3/8 inch, 3 feet)

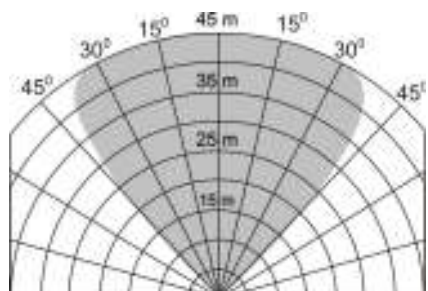


Field of View at Indicated Distance in Meters for **Methane plume** at **Very High Sensitivity** (3/8 inch, 3 feet)

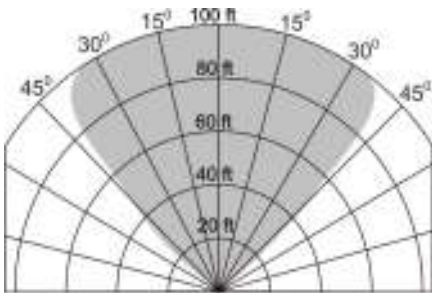
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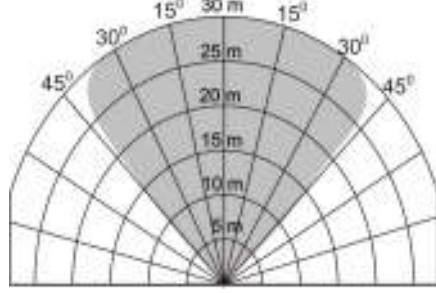
Field of View at Indicated Distance in Feet for **n-Heptane** at **High** Sensitivity (1 x 1 foot)



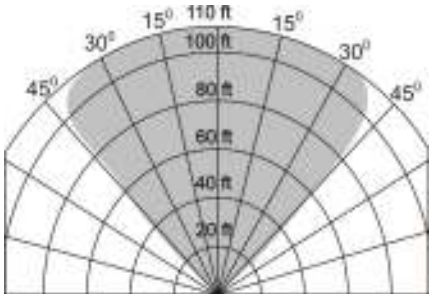
Field of View at Indicated Distance in Meters for **n-Heptane** at **High** Sensitivity (1 x 1 foot)



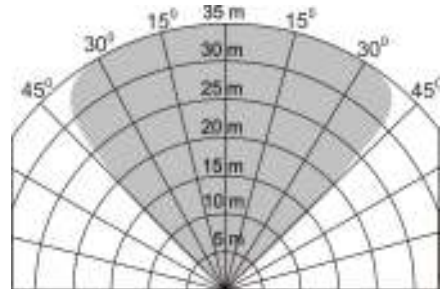
Field of View at Indicated Distance in Feet for **Isopropyl** at **High** Sensitivity (1 x 1 foot)



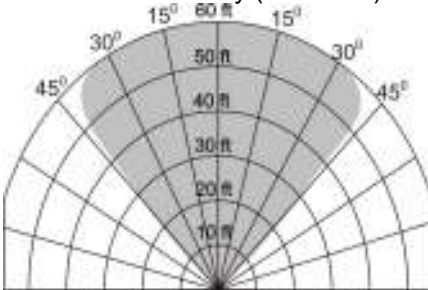
Field of View at Indicated Distance in Meters for **n-Heptane** at **High** Sensitivity (1 x 1 foot)



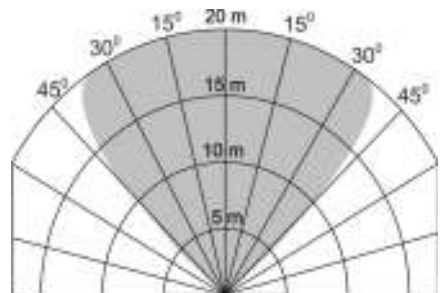
Field of View at Indicated Distance in Feet for **n-Heptane** at **Medium** Sensitivity (1 x 1 foot)



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

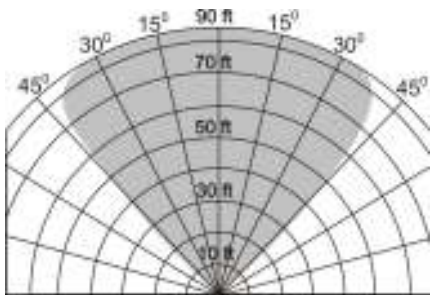


Field of View at Indicated Distance in Feet for **JP4** at **Medium** Sensitivity (1 x 1 foot)

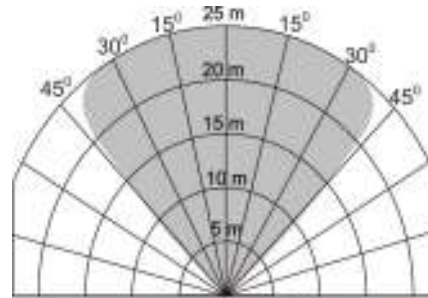


Field of View at Indicated Distance in Meters for **JP4** at **Medium** Sensitivity (1 x 1 foot)

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



Field of View at Indicated Distance in Meters for **Isopropyl** at **Medium** Sensitivity (1 x 1 foot)