Flame Detector Sensitivity/Detection Distance to different types of fire

Not all materials (fuels) produce & emit the same levels of IR and/or UV radiation when they burn. Therefore, the effective maximum distance at which a flame detector will detect a standard flame size (1ft^2) of each type of fuel will vary accordingly.

In addition, the different detection techniques have their limitations to provide a reliable answer – thus our IR3 detector provides a reliable answer at up to 65m for a heptane fire, whilst a UV/IR type detector can only reliably detect the same size fire at max. 20m.

Fire Size - We need a reference size fire to allow comparison of different detector's capabilities. Therefore, for liquid fuels, the 'de facto' standard is a 1ft^2 (0.1m^2) pan fire. For gases, it seems to vary from one company to another as to what fire size they choose to specify. Spectrex continues to use the same total (0.1m^2) as for liquids but as it is a gas, it is a 20" (0.5m) plume x 8" (0.2m) wide.

Detection Distance - The UV and UV/IR detectors' sensitivity for different materials is fixed and as shown on table.2

Spectrex **IR3 and Multi IR** (40/40I & 40/40M) flame detectors are able to detect at longer distances (up to 65m) but there are times when that is not preferred due to the possibility of detection overlap when working with specific fire zones or areas of detection that adjoin each other with separate extinguishing systems e.g. aircraft hangars. However, it is possible to set the detection sensitivity to detect a standard fire at different distances e.g. 15, 30, 45 or 65m for heptane. We set a factory default of 30m for heptane but the sensitivity can be changed, either prior to shipment or at site using a laptop/PC with free Spectrex software and special connection cable (with RS485/232 converter).

Sensitivity settings are selectable - High being the longest detection distance, low being the shortest:

High   – 4 (100%)
Medium high   – 3 (75%)
Medium low   – 2 (50%) default
Low   – 1 (25%)

For the 40/40I & 40/40M models, you can see from table 1 below that, dependent upon the material being detected, the maximum detection distance is very different. **Please therefore consider this carefully when choosing your sensitivity setting for the specific duty you have planned for the detectors on your plant.**

Example - using the 40/40I as a reference, and comparing say heptane and methane fires. Here, the maximum detection sensitivity is for heptane is 65m and for methane is 30m; whilst the factory default sensitivity setting is 30m for heptane and 15m for methane.

The 40/40I and the 40/40M have 4 sensitivity settings approx. 100%, 75%, 50% and 25% of full sensitivity e.g. heptane 65, 45, 30 (default) and 15m respectively. The same calculation must be done for all other materials e.g. ethanol would be 40, 30, 20 (default) and 10m.

As previously mentioned, the sensitivity settings can be changed prior to shipment or at site using your laptop/PC with free Spectrex software and special connection cable (with RS485/232 converter).

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Sensitivity settings / detection distances for models 40/40I and 40/40M only
- for selected fuels, **in ft. (m)**

Table 1**.**

Fuel	Fire size	Sensitivity Settings			
		4 High	3 Medium High	2 Medium Low *(Factory Default)*	1 Low
n-Heptane	1ft² (0.1 m²) pan fire	**215 (65)**	**150 (45)**	**100 (30)**	**50 (15)**
Gasoline		**215 (65)**	**150 (45)**	**100 (30)**	**50 (15)**
Diesel Fuel		150 (45)	109 (33)	74 (22.5)	36 (11)
JP5		150 (45)	109 (33)	74 (22.5)	36 (11)
Kerosene		150 (45)	109 (33)	74 (22.5)	36 (11)
Ethanol		135 (40)	100 (30)	66 (20)	33 (10)
Isopropyl Alcohol		130 (40)	100 (30)	66 (20)	33 (10)
Methanol		116 (35)	94 (28.5)	58 (17.5)	30 (9)
Methane/LNG	20" (0.5 m) Plume fire	100 (30)	74 (22.5)	50 (15)	25 (7.5)
Propane/Butane /LPG		100 (30)	74 (22.5)	50(15)	25 (7.5)
Hydrogen *(only 40/40M)*		100 (30	74 (22.5)	50(15)	25 (7.5)
Polypropylene Pellets	8" (0.2m) Ø pan fire	16 (5)	12 (3.75)	8 (2.5)	4 (1.25)
Office Paper	1ft² (0.1m²)	33 (10)	25 (7.5)	16 (5)	8 (2.5)

* Please contact us to discuss other fuels or combinations of fuels

This is why it is important for you to fully understand the <u>different responses to various materials,</u> what detection distance you require and/or can achieve with each detector type.

When you contact us for prices or to place orders, we will ask about your application and try to assess the best settings for you.

Note: *All the figures provided refer to detection of standard size fires (1ft²/0.1m²). If you wish to wait until the fire is larger, then detection distances can be increased.*

For reference, here is a table covering all our 40/40 Series models:

Fire Size and Maximum Detection Distances for 40/40 Series Detectors
– typical for selected fuels, **in ft. (m)**, set at **maximum 'High'sensitivity**, where available.

Table 2.

Fuel	Fire size	40/40I IR3 4 sensitivities	40/40 L-LB UV/IR	40/40 L4-L4B UV/IR	40/40 U-UB UV	40/40R IR	40/40M Multi IR 4 sensitivities
n-Heptane	1ft² (0.1 m²) pan fire	**215 (65)**	**50 (15)**	**66 (20)**	**50 (15)**	**50 (15)**	**215 (65)**
Gasoline		**215 (65)**	**50 (15)**	**66 (20)**	**50 (15)**	**50 (15)**	**215 (65)**
Diesel Fuel		150 (45)	36 (11)	50 (15)	36 (11)	36 (11)	150 (45)
JP5		150 (45)	36 (11)	50 (15)	36 (11)	36 (11)	150 (45)
Kerosene		150 (45)	36 (11)	50 (15)	36 (11)	36 (11)	150 (45)
Ethanol		135 (40)	25 (7.5)	40 (12)	36 (11)	25 (7.5)	135 (40)
Isopropyl Alcohol		130 (40)	25 (7.5)	53 (16)	36 (11)	25 (7.5)	135 (40)
Methanol		116 (35)	25 (7.5)	40 (12)	25 (7.5)	25 (7.5)	116 (35)
Methane/LNG	20" (0.5 m) Plume fire	100 (30)	16 (5)	26 (8)	40 (12)	16 (5)	100 (30)
LPG (Propane)		100 (30)	16 (5)	23 (7)	40 (12)	16 (5)	100 (30)
Hydrogen		-	16 (5)	-	33 (10)	-	100 (30)
Polypropylene Pellets	8" (0.2m) Ø pan fire	16 (5)	16 (5)	16 (5)	20 (6)	13 (4)	16 (5)
Office Paper	1ft² (0.1m²) pan fire	33 (10)	16 (5)	23 (7)	20 (6)	20 (6)	33 (10)

- Does not detect