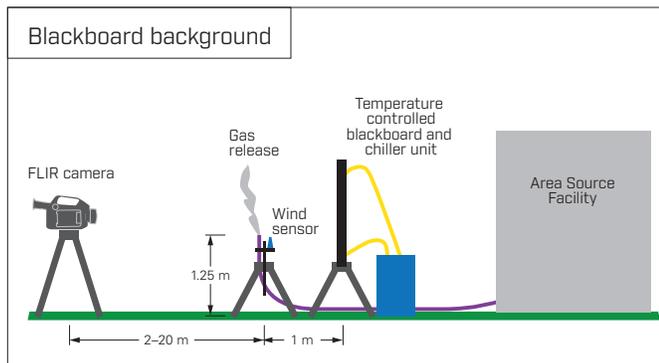


NPL Testing Demonstrates the FLIR GF320 Meets EPA 0000a Standards

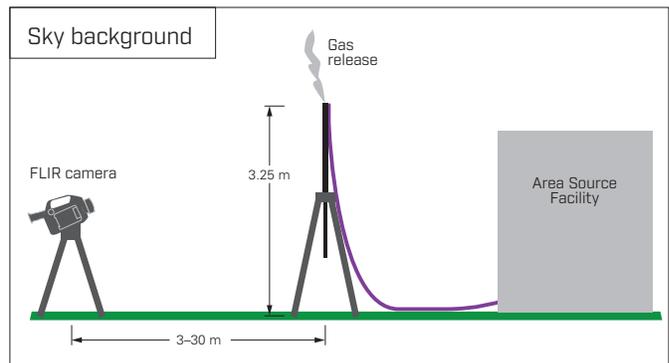
National Physical Laboratory (NPL) reports that through independent testing, it demonstrated the FLIR GF320 is capable of detecting gas emissions according to the standards set in the Environmental Protection Agency's (EPA) NSPS 40 CFR part 60, subpart 0000a sensitivity standard for optical gas imaging equipment.

NPL tested two GF320 cameras – with 23 mm and 38 mm lenses – to determine whether they could detect a half-methane, half-propane gas mixture at a concentration of 10,000 ppm and a flow rate of ≤ 60 g/hr from a quarter-inch diameter orifice. Part of this investigation included noting the effects of wind speed, distance, and contrasting temperature (ΔT) on the camera operator's ability to see the gas leak.

NPL used a wind machine to create wind speeds from 0 mph to more than 20 mph, and tested the cameras at intervals of five mph from 2.5 to 30 meters away. The examiners also varied the contrast between the gas clouds and the background scene from a low ΔT of just 4.5°F, to a high-contrast ΔT greater than 13.5°F.



Side view of camera position and temperature controlled background.



Experimental arrangement using the sky as background.

For each scenario, the camera operator used the following standards to record whether the gas emissions were visible.

Yes	
No data, assumed Yes	
No	
No data, assumed No	
No data, unknown	

RESULTS¹

Low ΔT : $\Delta T < 4.5^\circ$

Range in m (ft)	Wind speed in mph				
	0 to 5	5 to 10	10 to 15	15 to 20	>20
2.5 (8.2)	327, 104	354, 132	319, 96	355, 134	356, 135*
5 (16.4)	No Data	289, 62	No Data	No Data	No Data
10 (32.8)	341, 119	342, 120	321, 98, 343	344, 122	No Data
20 (65.6)	No Data	350, 128	351, 129	352, 130	No Data
30 (98.4)	75				

*plume not visible with camera plus 23 mm lens

(Cell values refer to individual tests conducted in NPL report, verifying findings)

Intermediate ΔT : $4.5^\circ\text{F} < \Delta T < 9.0^\circ\text{F}$

Range in m (ft)	Wind speed in mph				
	0 to 5	5 to 10	10 to 15	15 to 20	>20
2.5 (8.2)	No Data	286, 59	72	No Data	330, 107
5 (16.4)	290, 89	No Data	299, 76	No Data	300, 77
10 (32.8)	295, 68	296, 69	303, 82	No Data	334, 111
20 (65.6)	297, 70	73	306, 85	No Data	307, 86

High ΔT : $13.5^\circ < \Delta T < 18.0^\circ\text{F}$

Range in m (ft)	Wind speed in mph	
	0 to 5	5 to 10
2 (6.6)	248, 22	264, 36
5 (16.4)	254, 26	271, 43
10 (32.8)	No Data	283, 55
20 (65.6)	277, 63	282, 54

¹ Note: For the majority of conditions, 65.6 ft was the longest range tested. However, initial testing at 98.4 ft and low ΔT ($\Delta T < 4.5^\circ$) indicated it is possible for GF320 cameras to detect this gas mix and concentration at distances greater than 65.6 ft.

Postscript:

National Physical Laboratory is the United Kingdom's leading authority on accurate measurement standards. As the UK's national measurement institute, NPL researches measurement technology and solutions to help ensure accuracy, product quality, and consumer safety.