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Gas Sensing Elements
Proudly 100% Developed and Manufactured in Italy

IRNET 20 mm Methane 100% Vol

CROSS INTERFERENCE MANUAL

- MT4319 -

REV. 1



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1.Introduction

This document is applicable only to IRNET 20 mm Methane sensor with 100 % Volume as full scale range.

It is meant to this document to provide support and instructions to gas detector manufacturers to identify cross interference between this specific sensor and others Hydrocarbon gasses in LEL range.

It is important to note that IRNET 20 mm Methane sensors are not gas specific sensors, this means that they are sensitive to all the Hydrocarbon gases present in the test environment, as they share the same detection principle. So, it is impossible to discern a single gas in an environment in which is present a mixture of various hydrocarbon gases, for the use of the IRNET 20 mm sensors in such environments please contact NET.

Due to the different composition and different spectra of many hydrocarbon gasses, IRNET 20 mm Methane 100%vol sensor has a response not linear in terms of temperatures and gas concentration of other gasses.

2. Description

Cross interference tests have been performed on these hydrocarbon gases:

Gas	Formula	CAS Number	LEL (% Vol)	Flash Point (°C)
Benzene	C ₆ H ₆	71-43-2	4,0	-11
Cyclopentane	C ₅ H ₁₀	287-92-3	1,4	-37
Difluoroethane (R152a)	C ₂ H ₄ F ₂	75-37-6	3,7	N/A
Dimethy Ether	C ₂ H ₆ O	115-10-6	2,7	-42
Ethane	C ₂ H ₆	74-84-0	2,4	-135
Ethylene	C ₂ H ₄	74-85-1	2,7	-136
Isobutylene	C ₄ H ₈	115-11-7	1,6	-80
Isobutane	C ₄ H ₁₀	75-28-5	1,3	-83
Methanol	CH ₃ OH	67-56-1	6,0	9
N-Butane	C ₄ H ₁₀	106-97-8	1,4	-60
Pentane	C ₅ H ₁₂	109-66-0	1,1	-49
Propylene	C ₃ H ₆	115-07-1	2,0	-108
Toluene	C ₇ H ₈	108-88-3	1,0	4

Tests have been performed in climatic chamber using 24 IRNET 20 mm sensors calibrated with Methane with 100 %Vol as full scale range. To these sensors have been applied the interference gas at different concentrations 25, 50, 75 and 100% of LEL and different temperatures (-40, -20, 0, 25, 40 and 60 °C) to cover the complete LEL range and temperature ranges.

LOWER FLAMMABLE LIMIT (LEL)

Concentration of flammable gas or vapour in air, below which an explosive gas atmosphere does not form.

**Data reported in table above are extracted from IEC 60079-20-1 (2016).
Difluoroethane (R152a) is not present in IEC 60079-20-1 (2016).**

FLASH POINT

The flash point of a volatile material is the lowest temperature at which vapours of the material will ignite, when given an ignition source.

At temperatures lower than flash point, sensor head's response decreases very quickly, indeed the response to this gas became very low.

TEST PERFORMED

In Chapter 3 are reported data collected for each gas applied.

In Chapter 4 are reported graphs of IRNET 20mm Methane sensor response in terms of absorbance and % Vol for data collected in Chapter 3.

Please note that the sensor doesn't detect value lower than 1 %Vol, due to Dead Band activated.

3. Cross Interference Test

In this paragraph are reported cross interference data collected using 24 IRNET 20 mm Methane sensors.

Benzene

LEL = 1,2 % Vol

FLASH POINT = -11 °C

Readings Applying Benzene							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,3	25	-	-	0,153	0,173	0,147	0,145
0,6	50	-	-	0,599	0,606	0,531	1,034
0,9	75	-	-	1,340	1,320	1,149	0,876
1,2	100	-	-	2,322	2,277	1,993	1,540

Measurements at -40°C and -20°C are below the flash point.

Cyclopentane

LEL = 1,4 % Vol

FLASH POINT = -37 °C

Readings Applying Cyclopentane							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,35	25	0,809	4,018	1,973	2,327	2,545	2,745
0,70	50	3,636	5,727	6,618	7,927	8,545	9,291
1,05	75	6,545	10,191	12,845	15,691	16,900	18,636
1,40	100	9,018	15,518	19,945	24,609	26,873	29,927

Difluoroethane (R152a)

LEL = 3,7 % Vol

FLASH POINT = -37 °C

Readings Applying Difluoroethane (R152a)							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
1	27	0,655	0,684	0,768	0,837	0,759	0,785
2	54	2,632	2,707	2,900	3,115	2,899	2,945
3	81	5,552	5,737	6,107	6,490	6,173	6,220
4	108	9,228	9,565	10,169	10,830	10,429	10,467

Dimethyl Ether

LEL = 2,7 % Vol

FLASH POINT = -42 °C

Readings Applying Dimethyl Ether							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,675	27	1,353	1,551	1,893	2,362	2,411	2,753
1,350	54	4,748	5,673	6,918	8,650	9,174	10,370
2,025	81	10,027	11,972	14,467	18,046	19,378	21,958
2,700	108	16,457	19,717	23,849	29,818	32,431	36,763

Ethane

LEL = 2,4 % Vol

FLASH POINT = -135 °C

Readings Applying Ethane							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,6	25	1,802	1,914	2,157	2,307	2,263	2,385
1,2	50	6,704	7,166	7,916	8,576	8,583	8,900
1,8	75	13,602	14,701	16,218	17,763	18,004	18,652
2,4	100	21,839	23,836	26,398	29,214	29,886	31,099

Ethylene

LEL = 2,7 % Vol

FLASH POINT = -136 °C

Readings Applying Ethylene							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,675	25	0,097	0,100	0,125	0,101	0,076	0,087
1,350	50	0,552	0,505	0,508	0,429	0,357	0,336
2,025	75	1,361	1,198	1,145	0,978	0,819	0,759
2,700	100	2,484	2,166	2,019	1,733	1,480	1,358

Isobutylene

LEL = 1,6 % Vol

FLASH POINT = -80 °C

Readings Applying Isobutylene							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,4	25	0,437	0,508	0,612	0,651	0,650	0,699
0,8	50	2,112	2,284	2,567	2,670	2,701	2,787
1,2	75	4,899	5,201	5,709	5,948	6,017	6,208
1,6	100	8,628	9,163	9,951	10,381	10,584	10,848

Isobutane

LEL = 1,3 % Vol

FLASH POINT = -83 °C

Readings Applying Isobutane							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,325	27	0,877	0,382	0,827	1,382	1,409	1,700
0,650	54	3,145	3,645	4,373	5,382	5,491	6,000
0,975	81	5,909	7,036	8,464	10,400	11,018	12,000
1,400	108	8,843	11,909	14,591	18,173	19,373	21,564

Methanol

LEL = 6,0 % Vol

FLASH POINT = 9 °C

Readings Applying Methanol							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
1	16,6	0,081	0,782	1,263	1,095	1,325	1,433
2	33,3	0,079	1,115	5,754	6,163	6,509	7,035
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

Measurements at -40°C, -20°C and 0 °C are below the flash point. Data are collected up to 2 % Vol (33,3 % LEL), due to condensation of the gas in the cylinder for higher concentration

N-Butane

LEL = 1,4 % Vol

FLASH POINT = -60 °C

Readings Applying N-Butane							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,35	25	1,336	1,436	1,818	2,155	2,155	2,309
0,70	50	4,318	5,036	5,873	7,155	7,327	7,964
1,05	75	8,536	10,082	11,864	14,218	15,009	16,391
1,40	100	13,073	15,709	18,682	22,818	24,264	26,727

Pentane

LEL = 1,1 % Vol

FLASH POINT = -49 °C

Readings Applying Pentane							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,5	45,5	2,455	3,173	3,873	4,864	5,673	6,155
1,0	91,0	7,455	10,364	13,000	16,036	17,845	19,845
1,5	136,5	13,364	19,064	24,291	30,227	33,745	38,018
2,0	182,0	18,945	27,982	35,836	45,436	51,309	58,455

Propylene

LEL = 2,0 % Vol

FLASH POINT = -108 °C

Readings Applying Propylene							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,5	25	0,754	0,615	0,588	0,507	0,468	0,481
1,0	50	2,143	1,984	2,039	1,939	1,879	1,857
1,5	75	4,737	4,523	4,592	4,430	4,282	4,216
2,0	100	8,398	8,121	8,177	7,904	7,710	7,477

Toluene

LEL = 1,0 % Vol

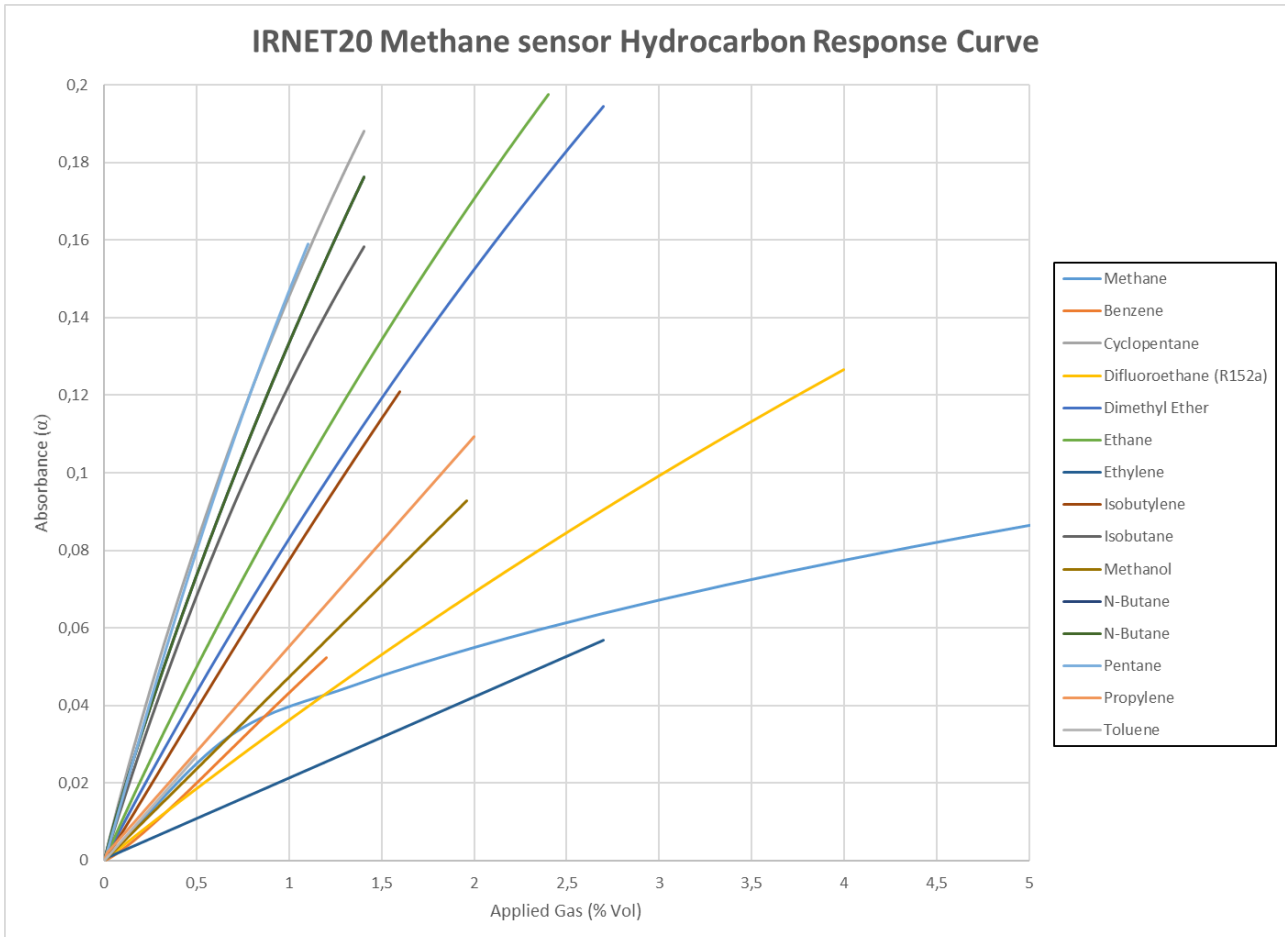
FLASH POINT = 4 °C

Readings Applying Toluene							
Applied. Gas (% Vol)	Applied. Gas (% LEL)	Concentration @ -40 °C (% Vol)	Concentration @ -20 °C (% Vol)	Concentration @ 0 °C (% Vol)	Concentration @ 25 °C (% Vol)	Concentration @ 40 °C (% Vol)	Concentration @ 60 °C (% Vol)
0,25	25	-	-	-	0,159	0,196	0,225
0,50	50	-	-	-	0,653	0,714	0,773
0,75	75	-	-	-	-	-	-
1,00	100	-	-	-	-	-	-

Measurements at -40°C, -20°C and 0 °C are below the flash point. Data are collected up to 0,5 % Vol (50 % LEL), due to condensation of the gas in the cylinder for higher concentration.

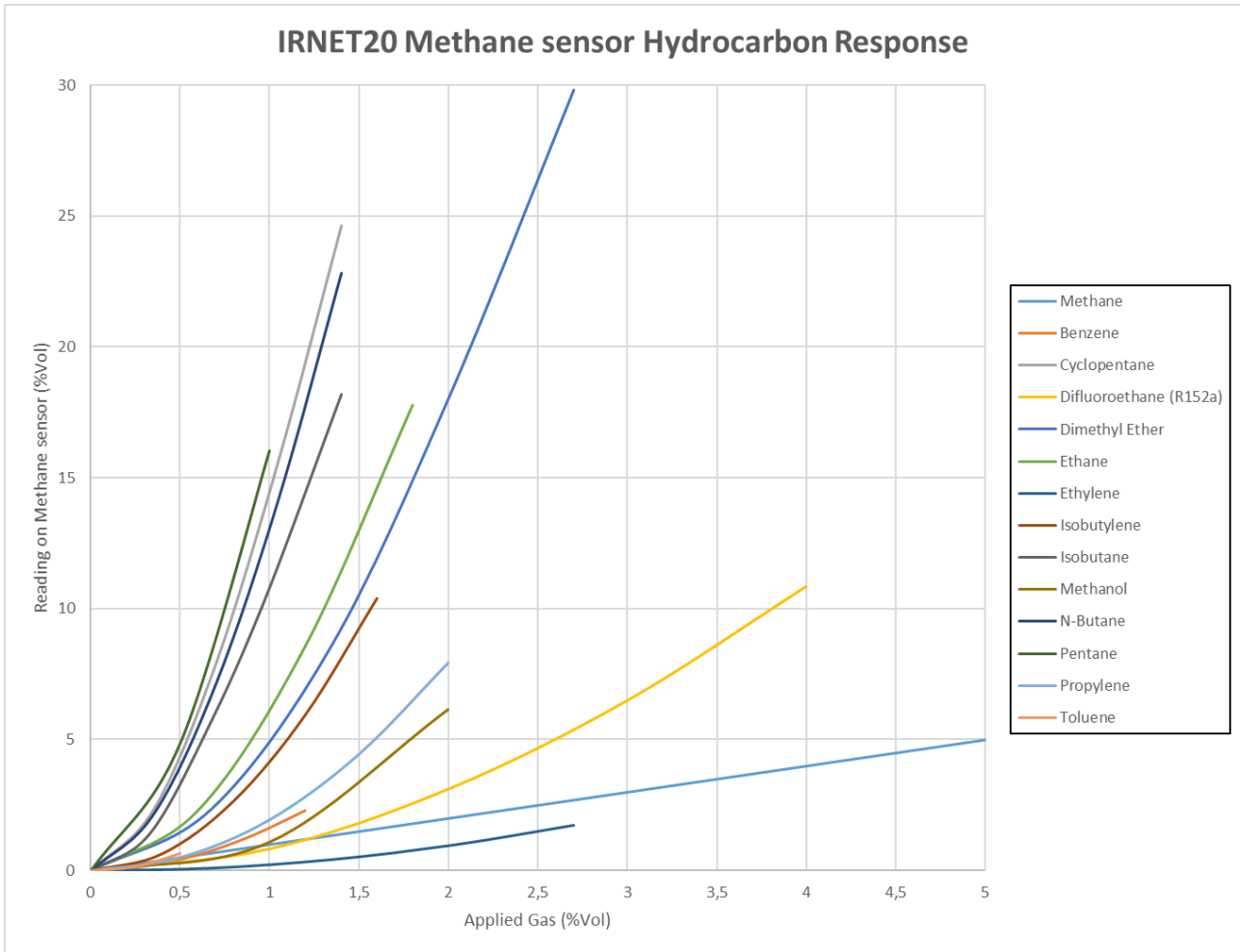
4. Hydrocarbon Interference on IRNET 20 mm Methane 100%vol sensor

First graph shows the IRNET 20 mm Methane sensor response in terms of absorbance at 25 °C. The data are reported up to 5 % Vol of applied gas:



In blue is represented the absorbance curve of Methane. Other Hydrocarbon gasses has a different absorbance curve respect Methane, this causes a not linear behaviour of response in terms of response.

The graph shows the sensor behaviour in terms of % Vol reading. Not linear response of sensor absorbance causes bigger linearity error in terms of % Vol reading:



N.E.T. has a policy of continuous development and improvement of its products. As such the specification for the device outlined in this manual may be changed without notice.