IREF
32mm

CROSS REFERENCE FACTOR MANUAL
- MT4287 -

Rev: 6

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1. Introduction

This document is applicable only to IREF 32 mm refrigerant gas sensors with 2.000 ppm as full-scale range.
It is meant to provide support and instructions to gas detector manufacturers to use these specific sensors to measure many refrigerant gasses with their instruments.

This document has the aim to give some information on cross interference of the actual refrigerant gasses detected by N.E.T sensors. Many refrigerant gasses have been tested with different sensors, to identify functionality of the most common sensors produced by N.E.T.

Test have been performed with IREF 32 mm sensors calibrated with 6 different refrigerant gasses (R125, R134a, R32, R507, R1234yf and R1234ze). Each sensor is calibrated with its specific gas and the related cross reference factor has been calculated.

Correction factors have been calculated on the above list of sensors that at the moment correspond to the most common sensors requested by the market and to the most suitable sensors used to calculate correction factors. This list could be subjected to changes based on the customer's request or N.E.T decision.

Tests are performed at different temperatures to cover the complete functional temperature range (-20° C to 50 °C) of IREF sensors. It's calculated a factor for each temperature, in some cases if the factors are very similar, it's possible to use a single factor for every temperature, in other cases the factors are too much different, thus different factors for every specific temperature.
Some examples of extended calculation of the cross factor are reported to describe the calculation method used.
All data are reported on a summary table at the end of each chapter for each type of sensors.
Data measured at 60°C have been collected to show the variation of the correction factors in case the sensor is working in condition outside higher temperature range.

Due to the different composition and different spectra of many refrigerant gases, in some cases it is not possible to use any correction factor and is preferable to use a specific sensor.

N.E.T recommend the customer to perform accurate test in order to define the best correction factor useful for their application, related to temperature range and gas concentration levels.
This document should be used only as a guide for the customer to increase the flexibility of his gas detector, it should not be considered as absolute values; it will be updated thoroughly as new test data will be available. Cross reference factors reported in this document are related only to IREF 32 mm sensors.

2. Description

Test have been performed with sensors calibrated with the following gasses (for each gas, test is performed using 24 sensors):

- **R125** (C_2HF_5)
- **R134a** ($C_2H_2F_4$)
- **R32** (CH_2F_2)
- **R507** (R-125/R-143a 50/50)
- **R1234yf** ($C_3H_2F_4$ ($CF_3CF=CH_2$))
- **R1234ze** ($C_3H_2F_4$ ($CF_3CH=CHF$))

Cross factors have been calculated on these gases:

Gas	Composition/Formula	Percentage (%weight)
R404a	R125/R143a/R134a	44/52/4
R134a	$C_2H_2F_4$ (CH_2FCF_3)	
R125	C_2HF_5 (CHF_2CF_3)	
R407a	R32/R125/R134a	20/40/40
R417a	R125/R134a/R600	46.6/50.0/3.4
R448a	1234yf/1234ze/R32/R125/R134a	20/7/26/26/21
R1234ze	$C_3H_2F_4$ ($CF_3CH=CHF$)	
R32	CH_2F_2 (CH_2F_2)	
R407f	R134a/R125/R32	40/30/30
R1234yf	$C_3H_2F_4$ ($CF_3CF=CH_2$)	
R449a	R32/R125/R1234yf/R134A	24.3/24.7/25.3/25.7
R507	R125/R143a	50/50
R123	$C_2HF_3Cl_2$	
R410a	R32/R125	50/50
R452b	R32/R125/R1234yf	67/7/26
R227	CF_3CHFCF_3	
R143	$C_2H_3F_3$	
R22	$CHClF_2$	
R513a	R1234yf/R134a	56/44
R422d	R134a/R125/R600a	31.5/65.1/3.4
R1233zd	$C_3H_2ClF_3$	
R407c	R134a/R125/R32	52/25/23

Tests have been performed in climatic chamber using 24 sensors calibrated with the specific gasses of the first list. To these sensors have been applied the interference gas at different concentrations (500, 1.000, 1.500 and 2.000 ppm) and different temperatures (-20, 0, 25, 40 and 60 °C) to cover the entire full scale and temperature ranges.

Performances of the sensors have been checked using a single factor or multiple factors depending on temperatures.
Three different cases have been identified:

- It's possible to calculate a single factor for whole temperature range (underlined in green)
- It's possible to calculate a factor proportional to the temperature of the sensor (underlined in orange)

- It's not possible to calculate any factor to detect target gas (underlined in red)

All the considerations made to calculate single or multiple factors are related to the possibility to obtain an accuracy of ±10 % of ideal reading.
In following pages are reported some examples of extended factor calculations, one for each case.
All data are reported in following paragraphs and at the end the factors are reported into a summary table.

3. Consideration

Here are following some considerations related to the calculations used to generate cross reference factors and the related conclusion based on the test results.

3.1 R125 SENSOR and TARGET GAS R404a (Single factor)

R404a gas has been applied to 24 sensors calibrated with R125; the average readings are reported in the table below:

Readings Applying R404a to an R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C (ppm)	0 °C (ppm)	25 °C (ppm)	40 °C (ppm)	60 °C (ppm)
500	25	355,6	351,6	353,0	343,3	352,0
1000	50	687,0	684,3	687,6	674,3	688,3
1500	75	1009,0	1010,3	1022,3	1011,3	1028,0
2000	100	1322,3	1331,6	1358,0	1350,0	1377,3

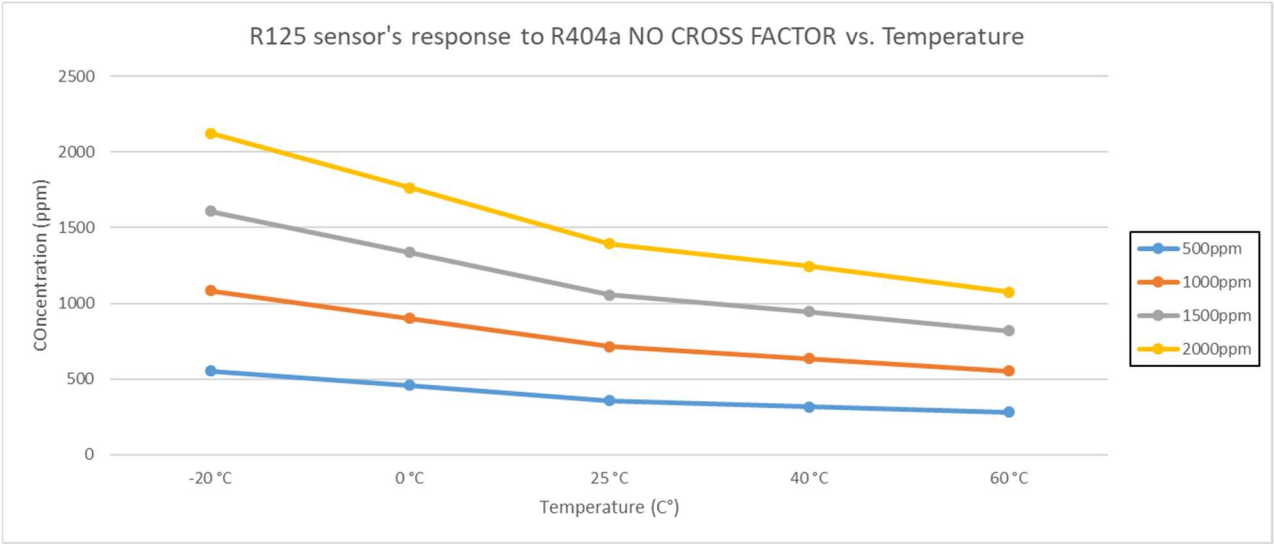
It's calculated a cross factor at each temperature and each point of gas concentration applied:

Cross Factor Calculation (R404a to R125 sensor)						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	1,4058	1,4218	1,4164	1,4563	1,4205
1000	50	1,4556	1,4613	1,4542	1,4829	1,4528
1500	75	1,4866	1,4847	1,4672	1,4832	1,4591
2000	100	1,5125	1,5019	1,4728	1,4812	1,4521
Cross Factor for each temperature						
Average		1,47	1,47	1,45	1,46	1,45

It's calculated the average cross factor for the complete temperature range:

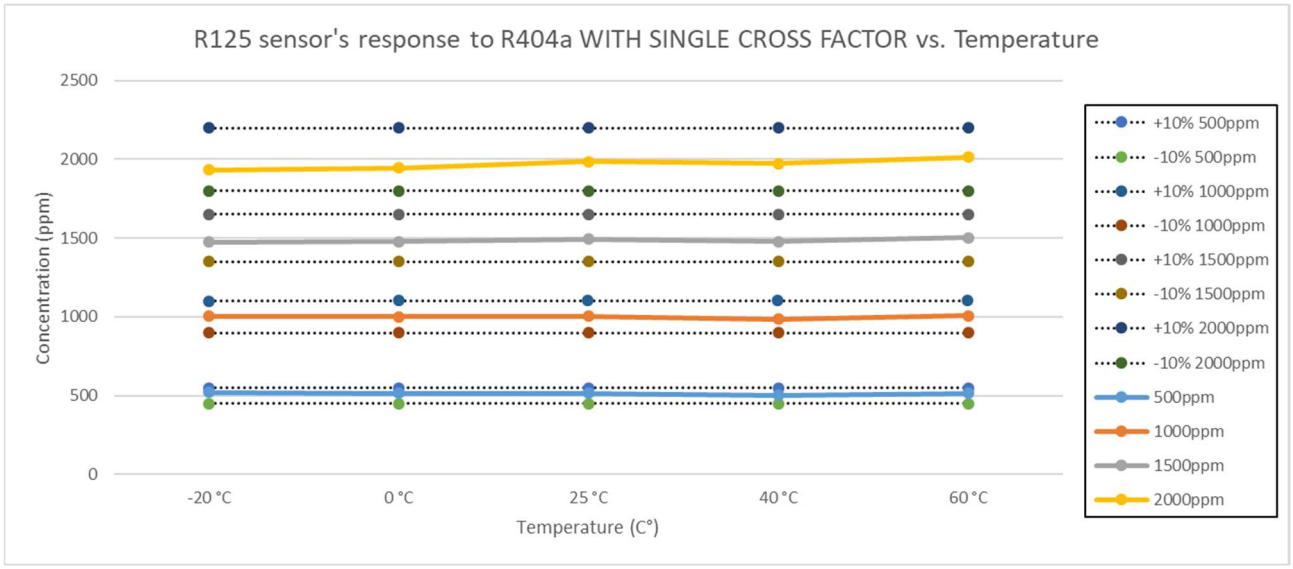
Temperature Cross Factor (R404a to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,47	1,47	1,45	1,46	1,45
Average Cross Factor				
1,46				

In the graph below is reported the response of R125 sensor applying R404a without any cross factor applied.



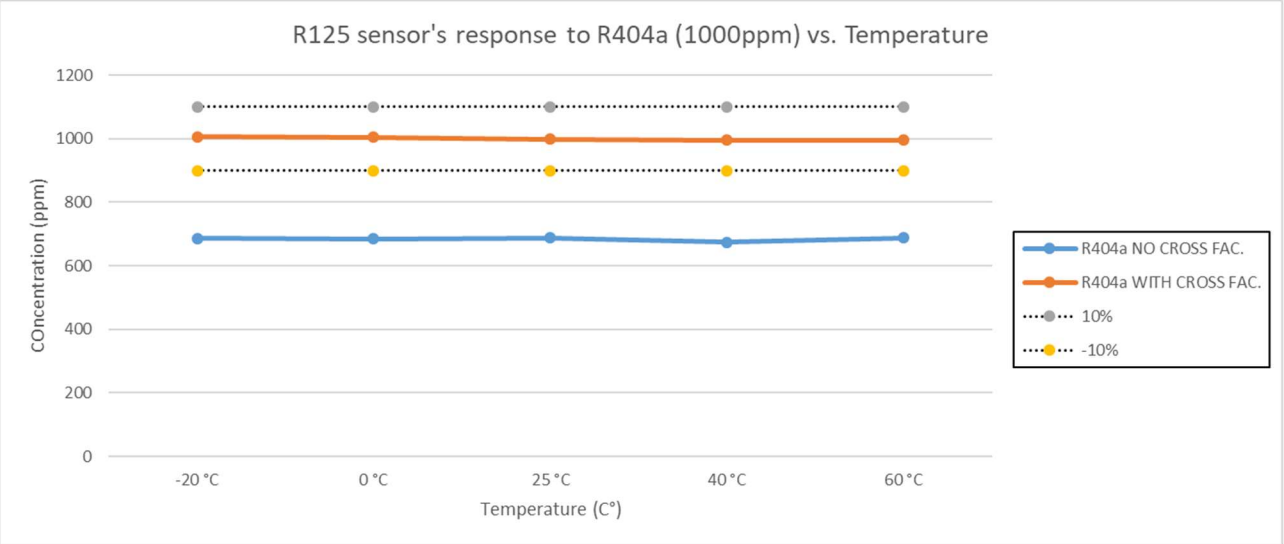
Applying R404a gas to R125 sensors and multiplying results with single cross reference factor (1,46) it is possible to obtain the following values:

R404a Readings applying single cross factor						
App. Gas (ppm)	**App. Gas (% F.S.)**	**-20 °C (ppm)**	**0 °C (ppm)**	**25 °C (ppm)**	**40 °C (ppm)**	**60 °C (ppm)**
500	**25**	519,6	514,0	516,0	501,6	514,3
1000	**50**	1004,0	1000,0	1005,0	985,6	1006,0
1500	**75**	1474,6	1476,6	1494,0	1478,0	1503,3
2000	**100**	1932,6	1946,3	1984,6	1973,0	2013,0



Average cross factor is very similar to the cross factors calculated at different temperatures, graph show that applying a single cross factor to the R404a reading, the results are inside a range of ±10% F.S.
It can be considered that in this case it can be suitable to use a single cross factor to detect R404a with a sensor calibrated with R125.

Applying a single cross factor to detect 1.000 ppm of R404a for the whole temperature range it can be obtained the response of the below graph. The following graph shows the real reading curve of R404a (blue) and the response calculated with cross factor (orange):



3.2 R125 SENSOR and TARGET GAS R449a (Factor proportional to temp)

Applying R449a to 24 sensors calibrated for R125, the average readings are reported in the table below:

Readings Applying R449a to a R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	295,6	321,0	353,0	374,3	431,0
1000	50	583,0	639,3	716,6	773,3	878,6
1500	75	875,0	967,0	1099,6	1195,6	1369,6
2000	100	1171,0	1302,3	1502,6	1648,0	1905,0

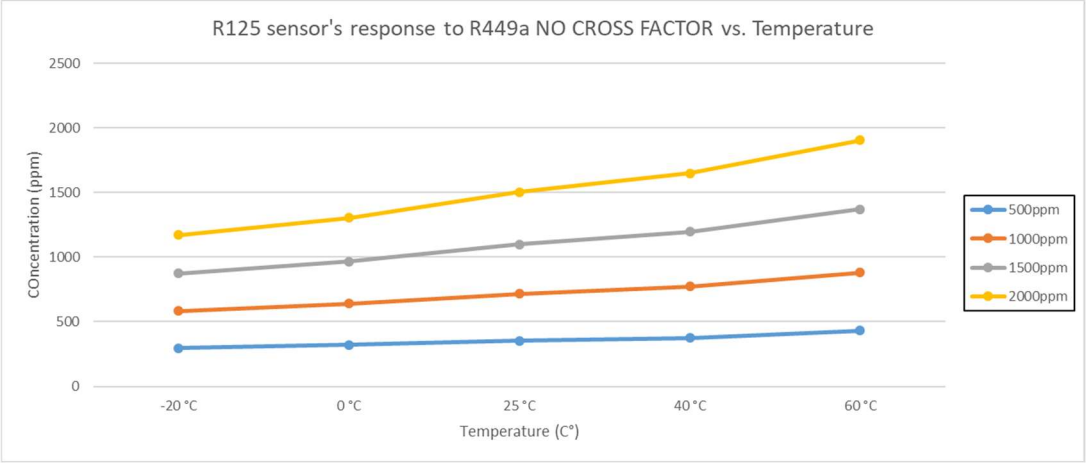
It's calculated a cross factor for each gas concentration level and each temperature:

Cross Factor Calculation (R449a to R125 sensor)						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	1,6911	1,5576	1,4164	1,3357	1,1601
1000	50	1,7153	1,5641	1,3954	1,2931	1,1381
1500	75	1,7143	1,5512	1,3641	1,2545	1,0952
2000	100	1,7079	1,5357	1,3310	1,2136	1,0499
Cross Factor for each temperature						
Average		1,71	1,55	1,38	1,27	1,11

Average cross factors for the entire temperature range are:

Temperature Cross Factor (R449a to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,71	1,55	1,38	1,27	1,11
Average Cross Factor				
1,40				

In the graph below is reported the response of R125 sensor applying R449a:



Observing values of the previous table it is clear that correction factor changes significantly with temperature, indeed it passes from **1,11 @ 60°C till 1,71 @-20°C**.
Applying a single cross reference factor to the response of R125 sensor the average calculated values are:

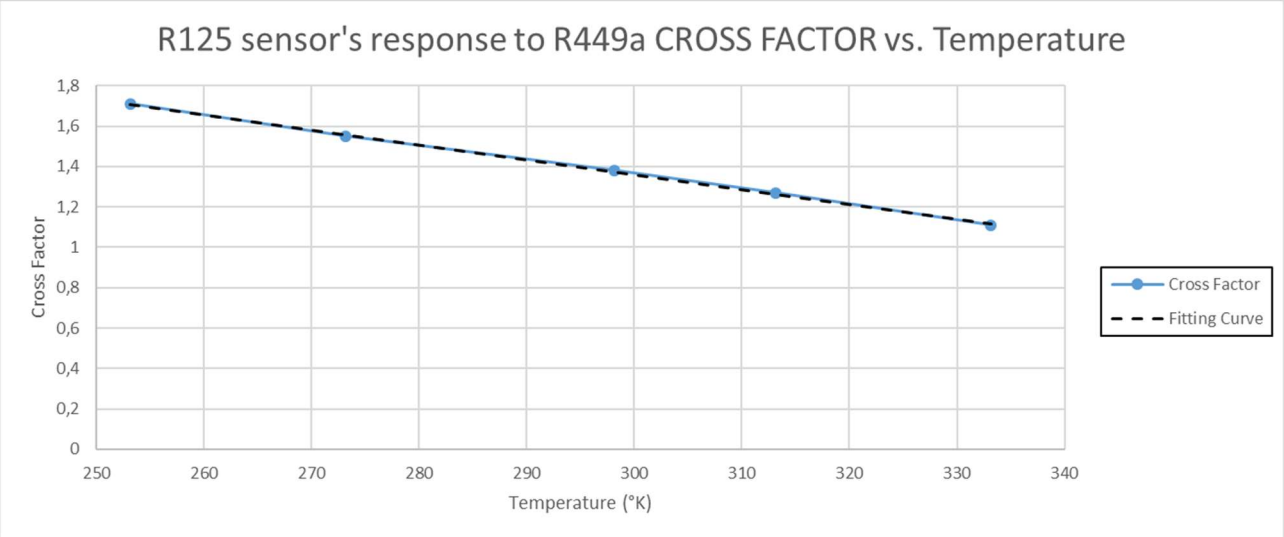
R449a Readings applying single cross factor						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C (ppm)	0 °C (ppm)	25 °C (ppm)	40 °C (ppm)	60 °C (ppm)
500	25	415,0	450,6	495,6	525,6	605,3
1000	50	818,6	897,6	1006,3	1086,0	1234,0
1500	75	1228,6	1358,0	1544,0	1679,0	1923,3
2000	100	1644,3	1828,6	2110,0	2314,0	2675,0

In this case it is clear that specially increasing gas concentration level of R449a it is not possible to obtain a correct response over the complete temperature range.
In this case, it's possible to calculate a factor proportional to absolute temperature (expressed in Kelvin degrees). Factors are plotted in a graph and it's calculated a linear fitting. The results are:

$K = \alpha T + \beta$

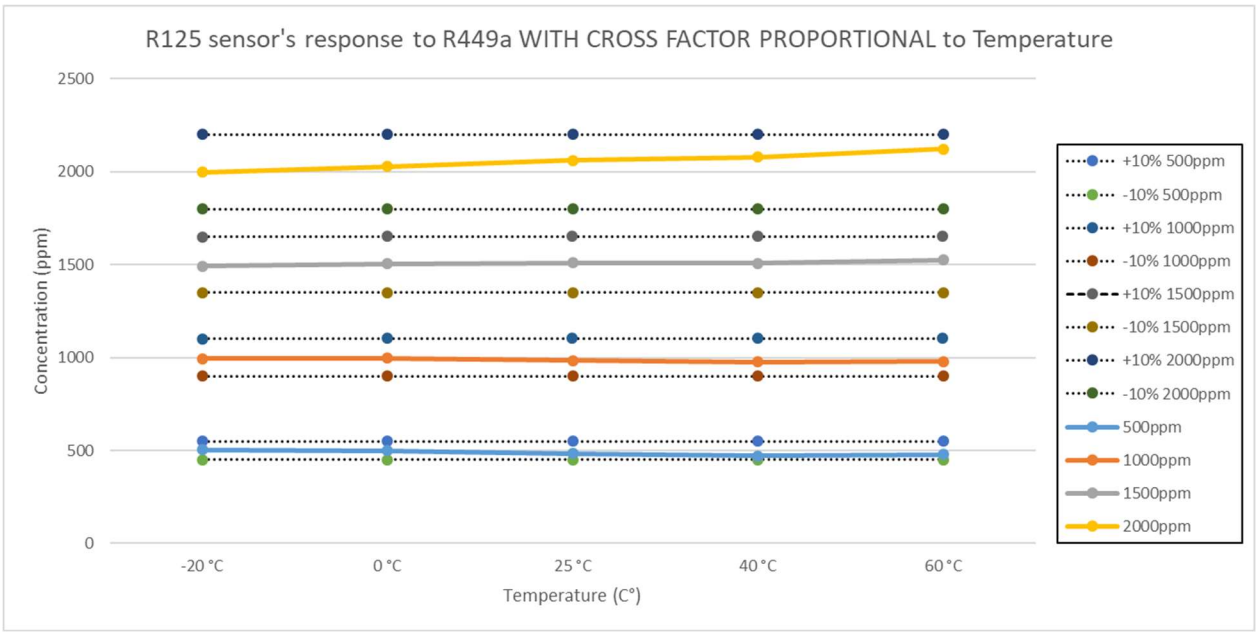
Where:
K= factor proportional to absolute temperature
T= temperature expressed in Kelvin degrees (please consider that IR sensor indicate a temperature expressed in °C)

α, β = fitting coefficient

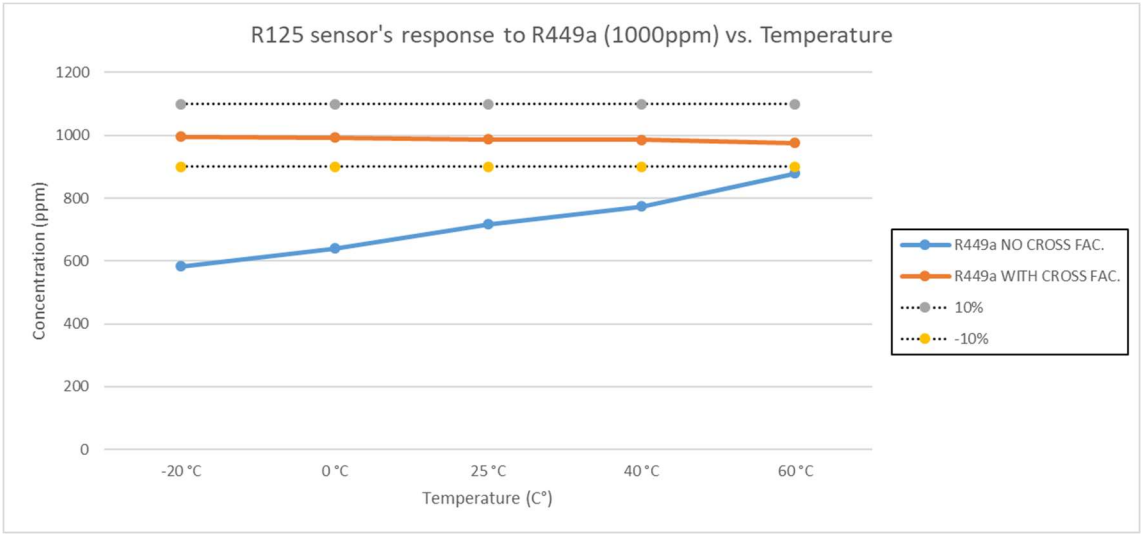


Temperature Cross Factor (R449a to R125 sensor)				
-20 °C	**0 °C**	**25 °C**	**40 °C**	**60 °C**
1,71	1,55	1,38	1,27	1,11
Cross Factor Fitting				
K=-0,0074**T[°K]** +3,5785				
Average Cross Factor				
1,67				

Cross Factor calculation for each temperature (**K**=-0,0074**T[°K]** +3,5785)					
Temp °K	253,15	273,15	293,15	313,15	333,15
Calculated Factor	1,71	1,56	1,37	1,26	1,11
R449a Readings applying cross factors proportional to temperature					
App. Gas (ppm)	**App. Gas (% F.S.)**	**-20 °C (ppm)**	**0 °C (ppm)**	**25 °C (ppm)**	**40 °C (ppm)**	**60 °C (ppm)**
500	**25**	504,3	500,0	484,3	472,3	480,0
1000	**50**	994,3	995,6	983,6	975,3	978,3
1500	**75**	1492,3	1506,0	1509,0	1508,3	1525,0
2000	**100**	1997,0	2028,3	2062,3	2078,6	2121,0



Applying a cross factor proportional to absolute temperature it's possible to reach ±10 % of accuracy over the complete temperature range.
Graph below shows the real reading curve of R125 sensor applying R449a (blue) and the response calculated with two cross factors (orange):



3.3 R32 SENSOR and TARGET GAS R410a (single factor, only below 1500 ppm)

Applying R410a at 24 sensors calibrated with R32, the average readings are reported in the table below:

Applying R410a to a R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	789,6	731,6	681,6	641,3	651,0
1000	50	1527,0	1413,3	1292,0	1232,0	1215,6
1500	75	2258,3	2121,3	1926,6	1843,0	1798,6
2000	100	2400,0	2400,0	2392,3	2369,6	2337,3

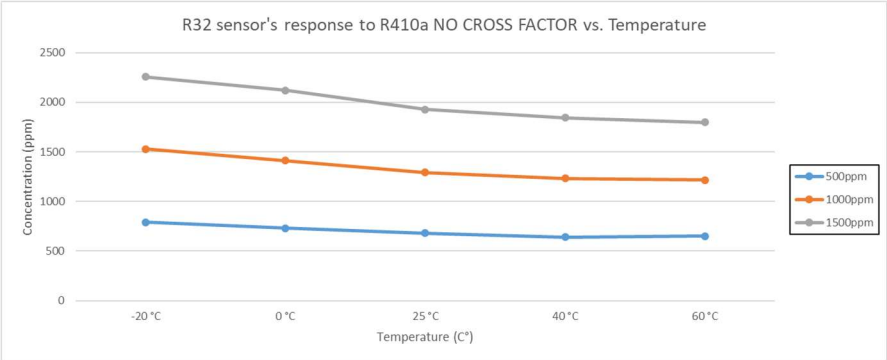
At temperatures below 25°C, sensors reach over range condition 2.400 ppm (120 % F.S.), in this case it is possible to use a cross factor only for value lower than 1.500 ppm. Cross factor calculation is considered only for value lower than 1.500 ppm as follow:

Cross Factor Calculation (R410a to R32 sensor)						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	0,6331	0,6835	0,7334	0,7796	0,7679
1000	50	0,6548	0,7075	0,7740	0,8117	0,8227
1500	75	0,6642	0,7071	0,7785	0,8138	0,8340
2000	100	-	-	-	-	-
Cross Factor for each temperature						
Average		0,65	0,70	0,76	0,80	0,81

Average cross factors for the entire temperature range are:

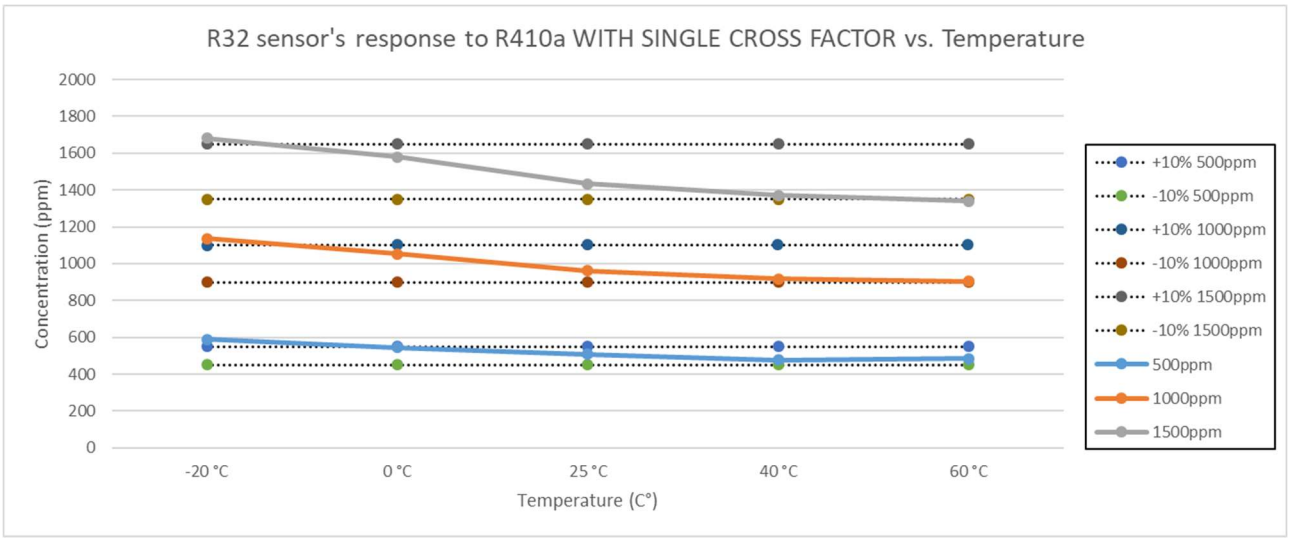
Temperature Cross Factor (R410a to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,65	0,70	0,76	0,80	0,81
Average Cross Factor (1.500 ppm)				
0,74				

In the graph below is reported the response of R32 sensor applying R410a up to 1500ppm:

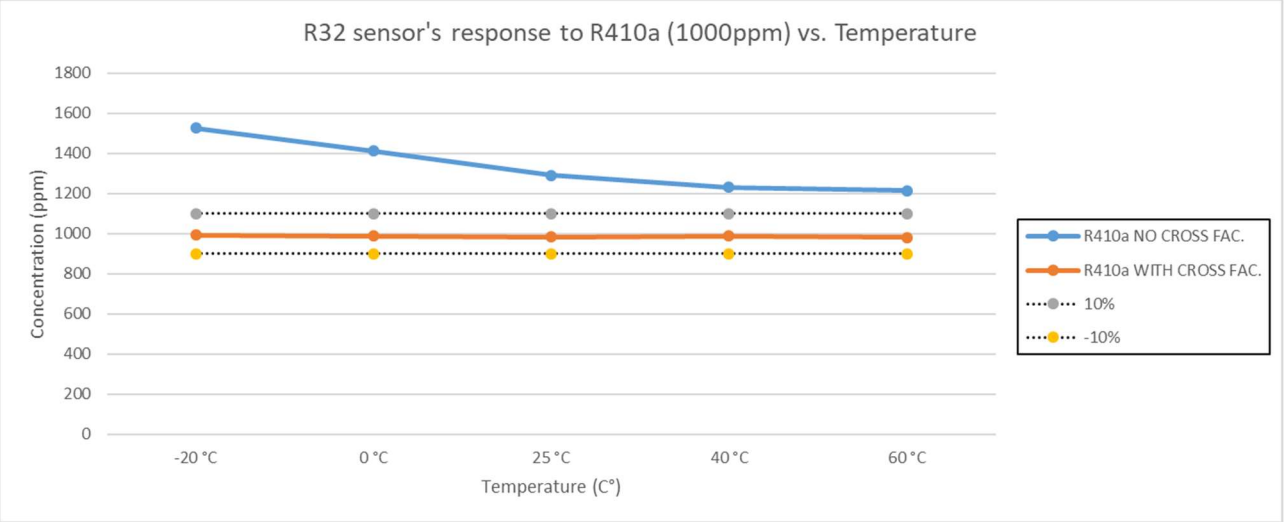


Applying a single cross reference factor to the response of R32 sensor, the average calculated values are:

R410a Readings applying single cross factor						
App. Gas (ppm)	**App. Gas (% F.S.)**	**-20 °C (ppm)**	**0 °C (ppm)**	**25 °C (ppm)**	**40 °C (ppm)**	**60 °C (ppm)**
500	**25**	588,0	544,6	507,6	477,3	484,6
1000	**50**	1136,6	1052,0	961,6	917,0	905,0
1500	**75**	1681,0	1579,0	1434,3	1372,0	1339,0
2000	**100**	-	-	-	-	-



Considering a range of 0-1.500 ppm it's possible to use R32 sensor to detect R410a using a single cross factor. In this case, maximum detectable range is limited by the higher absorption of test gas (R410a) than the calibrated gas (R32), indeed, the average cross factor is 0,74, lower than 1.
This condition is highlighted in green in the summary table (Chapter. 8.) and the value of the maximum gas concentration range is indicated (1.500 ppm as for working range).


R32 sensor's response to R410a (1000ppm) vs. Temperature
1800
1600
1400
1200
1000
800
600
400
200
0
Concentration (ppm)
-20 °C
0 °C
25 °C
40 °C
60 °C
Temperature (C°)
R410a NO CROSS FAC.
R410a WITH CROSS FAC.
10%
-10%

3.4 R125 SENSOR and TARGET GAS R32 (no response)

Applying R32 to 24 sensors calibrated with R125, the average readings are reported in the table below:

Applying R32 to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

In this case sensors have no response to R32.

Temperature Cross Factor (R32 to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

In table is reported - (No Reading) and it's highlighted in red.
In this case it is clear that is not possible to detect R32 using a sensor calibrated for R125.

4. Cross Reference Factor for R125 sensors

In this paragraph are reported cross reference data collected using 24 sensors calibrated with R125.

R404a

Applying R404a to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	355,6	351,6	353,0	343,3	352,0
1000	50	687,0	684,3	687,66	674,3	688,3
1500	75	1009,0	1010,3	1022,3	1011,3	1028,0
2000	100	1322,3	1331,6	1358,0	1350,0	1377,3

Temperature Cross Factor (R404a to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,47	1,47	1,45	1,46	1,45
Average Cross Factor				
1,46				

Good results using single cross factor.

R134a

Applying R134a to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	315,0	377,3	472,0	521,0	612,0
1000	50	609,3	740,0	943,0	1059,0	1259,3
1500	75	895,0	1100,0	1431,0	1636,3	1980,3
2000	100	1170,6	1457,6	1940,6	2229,6	2387,0

Temperature Cross Factor (R134a to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,65	1,35	1,05	0,93	0,80
Cross Factor Fitting				
K=-0.0107**T[°K]** +4,2973				
Average Cross Factor				
1,16				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407a

Applying R407a to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	267,0	282,0	306,0	319,0	355,6
1000	50	524,3	554,3	600,0	629,0	690,3
1500	75	782,6	829,3	904,3	950,6	1045,0
2000	100	1042,0	1111,3	1219,3	1286,0	1419,3

Temperature Cross Factor (R407a to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,90	1,80	1,65	1,57	1,42
Cross Factor Fitting				
K=-0,0059T[°K] +3,4161				
Average Cross Factor				
1,67				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R417a

Applying R417a to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	419,6	442,6	478,3	499,3	554,0
1000	50	830,6	881,0	957,6	1006,0	1104,3
1500	75	1248,0	1336,3	1467,0	1552,6	1716,6
2000	100	1671,6	1808,0	2011,3	2138,6	2336,0

Temperature Cross Factor (R417a to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,20	1,12	1,03	0,97	0,88
Cross Factor Fitting				
K=-0,0039T[°K] +2,1998				
Average Cross Factor				
1,04				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R448a

Applying R448a to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	240,0	264,0	280,0	318,3	318,3
1000	50	468,3	515,0	545,6	613,6	613,6
1500	75	700,3	773,3	823,3	922,0	922,0
2000	100	936,0	1040,0	1111,3	1246,3	1246,3

Temperature Cross Factor (R448a to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,27	2,12	1,92	1,81	1,61
Cross Factor Fitting				
K=-0,0081T[°K] +4,3409				
Average Cross Factor				
1,95				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1234ze

Applying R1234ze to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	152,0	186,3	239,3	274,3	348,0
1000	50	276,3	336,0	432,0	500,6	634,0
1500	75	408,3	497,3	643,3	751,0	957,0
2000	100	540,3	661,0	859,3	1010,3	1297,0

Temperature Cross Factor (R1234ze to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
3,57	2,93	2,27	1,95	1,53
Cross Factor Fitting				
K=-0,0250T[°K] +9,8847				
Average Cross Factor				
2,45				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R32

Applying R32 to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R32 to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response to this gas.

R407f

Applying R407f to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	221,0	240,6	257,6	271,0	309,6
1000	50	433,6	475,3	521,6	554,6	626,6
1500	75	649,6	714,6	796,3	853,0	959,0
2000	100	866,3	957,3	1080,0	1161,0	1316,3

Temperature Cross Factor (R407f to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,30	2,09	1,90	1,78	1,57
Cross Factor Fitting				
K=-0,0088T[°K] +4,5285				
Average Cross Factor				
1,93				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1234yf

Applying R1234yf to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	484,3	544,0	627,6	689,6	808,0
1000	50	971,0	1102,6	1310,3	1465,3	1746,3
1500	75	1462,0	1684,3	2058,0	2292,0	2400,0
2000	100	1957,3	2278,3	2400,0	2400,0	2400,0

Temperature Cross Factor (R1234yf to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,03	0,91	0,78	0,70	0,60
Cross Factor Fitting				
K=-0,0054T[°K] +2,3787				
Average Cross Factor (1.000 ppm)				
0,80				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R449a

Applying R449a to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	295,6	321,0	353,0	374,3	431,0
1000	50	583,0	639,3	716,6	773,3	878,6
1500	75	875,0	967,0	1099,6	1195,6	1369,6
2000	100	1171,0	1302,3	1502,6	1648,0	1905,0

Temperature Cross Factor (R449a to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,71	1,55	1,38	1,27	1,11
Cross Factor Fitting				
K=-0,0074T[°K] +3,5787				
Average Cross Factor				
1,40				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R507

Applying R507 to R125 sensors						
App. Gas (ppm)	**App. Gas (% F.S.)**	**-20 °C**	**0 °C**	**25 °C**	**40 °C**	**60 °C**
500	**25**	361,3	354,6	339,3	332,0	343,6
1000	**50**	696,0	685,6	667,0	657,3	670,0
1500	**75**	1020,0	1012,0	995,3	985,3	1002,0
2000	**100**	1334,6	1332,0	1320,3	1314,0	1338,0

Temperature Cross Factor (R507 to R125 sensor)				
-20 °C	**0 °C**	**25 °C**	**40 °C**	**60 °C**
1,45	1,46	1,50	1,52	1,48
Average Cross Factor				
1,48				

Good results using single cross factor.

R123

Applying R123 to R125 sensors						
App. Gas (ppm)	**App. Gas (% F.S.)**	**-20 °C**	**0 °C**	**25 °C**	**40 °C**	**60 °C**
500	**25**	235,3	275,0	321,3	344,3	390,0
1000	**50**	466,6	543,0	635,6	686,3	768,6
1500	**75**	695,6	812,0	960,0	1040,0	1170,0
2000	**100**	922,0	1079,6	1289,3	1407,0	1593,6

Temperature Cross Factor (R123 to R125 sensor)				
-20 °C	**0 °C**	**25 °C**	**40 °C**	**60 °C**
2,15	1,84	1,56	1,44	1,28
Cross Factor Fitting				
K=-0,0108**T[°K]** +4,8201				
Average Cross Factor				
1,65				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R410a

Applying R410a to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	193,3	192,3	193,3	196,6	212,0
1000	50	365,3	365,3	367,3	370,6	388,0
1500	75	538,0	539,6	543,0	547,6	568,6
2000	100	709,0	712,3	719,6	725,0	751,0

Temperature Cross Factor (R410a to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,73	2,73	2,71	2,68	2,56
Average Cross Factor				
2,68				

Good results using single cross factor.

R452b

Applying R452b to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	169,0	184,1	205,6	223,5	254,7
1000	50	341,7	375,5	424,0	462,1	526,6
1500	75	517,5	566,8	645,6	707,1	803,9
2000	100	692,3	763,1	874,4	956,9	1087,9

Temperature Cross Factor (R452b to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,92	2,66	2,35	2,15	1,89
Cross Factor Fitting				
K=-0,0141**T[°K]** +6,5662				
Average Cross Factor				
2,39				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R227

Applying R227 to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	308,7	297,3	279,6	280,9	284,3
1000	50	599,8	581,4	553,5	555,0	559,8
1500	75	869,5	845,9	810,5	812,0	823,7
2000	100	1120,6	1093,7	1056,8	1060,9	1078,2

Temperature Cross Factor (R227 to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,70	1,75	1,83	1,83	1,81
Average Cross Factor				
1,78				

Good results using single cross factor.

R143

Applying R143 to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R143 to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response to this gas.

R22

Applying R22 to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R22 to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response to this gas.

R513A

Applying R513 to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	358,85	406,26	486,81	550,08	641,58
1000	50	721,48	826,62	999,39	1135,49	1339,02
1500	75	1093,68	1263,44	1543,83	1761,20	2092,25
2000	100	1479,14	1722,37	2125,47	**2400,0**	**2400,0**

Temperature Cross Factor (R513a to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,38	1,20	0,99	0,86	0,73
Cross Factor Fitting				
K=-0,0089**T[°K]** +3,6673				
Average Cross Factor				
1.03				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results, moreover, it should be also considered that a sensor calibrated for R125a is able to detect R513a only up to 1500ppm because applying higher gas concentrations, at temperature higher than 40°C it reach over range condition.

R422d

Applying R422d to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	416,94	433,93	456,46	481,60	511,00
1000	50	847,46	884,57	942,07	991,88	1055,94
1500	75	1291,75	1355,18	1448,04	1526,54	1629,81
2000	100	1753,47	1845,93	1982,67	2090,72	2238,76

Temperature Cross Factor (R422d to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,17	1,12	1,05	1,00	0,93
Cross Factor Fitting				
K = -0,0033 T[°K] +2,0206				
Average Cross Factor				
1.05				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1233zd

Applying R1233zd to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
1250	25	98,49	116,85	148,81	175,46	227,67
2500	50	201,21	237,83	300,82	359,25	457,64
3750	75	305,96	361,52	458,04	542,30	695,68
5000	100	415,66	488,02	616,51	730,31	940,07

Temperature Cross Factor (R1233zd to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
12,35	10,46	8,25	6,96	5,42
Cross Factor Fitting				
K = -0,0954 T[°K] +36,92				
Average Cross Factor				
8,69				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407c

Applying R422d to R125 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	246,49	266,01	297,91	320,94	350,17
1000	50	490,96	536,86	601,32	650,86	716,33
1500	75	742,83	814,62	916,13	997,95	1097,54
2000	100	1000,83	1102,52	1246,46	1358,66	1499,48

Temperature Cross Factor (R422d to R125 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,02	1,85	1,65	1,52	1,38
Cross Factor Fitting				
K = -0,0089 T[°K] +4,303				
Average Cross Factor				
1,68				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

5. Cross Reference Factor for R134a sensors

In this paragraph are reported cross reference data collected using 24 sensors calibrated with R134a.

R404a

Applying R404a to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	553,3	458,6	359,0	317,0	281,0
1000	50	1085,6	902,6	713,6	634,6	552,6
1500	75	1609,0	1338,6	1057,3	944,0	819,0
2000	100	2124,6	1764,0	1393,6	1245,3	1076,6

Temperature Cross Factor (R404a to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,92	1,11	1,41	1,59	1,82
Cross Factor Fitting				
K=0,0113T[°K] -1,9502				
Average Cross Factor				
1,37				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R125

Applying R125 to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	804,6	672,6	534,3	476,0	421,3
1000	50	1586,0	1326,3	1053,6	942,3	819,0
1500	75	2301,0	1968,6	1555,6	1392,6	1204,6
2000	100	2400,0	2372,6	2043,6	1827,6	1574,3

Temperature Cross Factor (R125 to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,63	0,78	0,96	1,07	1,23
Cross Factor Fitting				
K=0,0073T[°K] -1,2240				
Average Cross Factor				
0,93				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

Sensor goes in over range condition applying 2.000 ppm @ - 20 °C. It works properly over the other temperatures. Considering that this condition happens at the limit of temperature and gas concentration range, it has been considered to be able to detect this gas over the complete range.

R407a

Applying R407a to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	409,6	359,6	300,0	286,6	277,6
1000	50	823,0	729,3	617,0	585,0	550,3
1500	75	1244,0	1101,3	932,6	883,0	826,6
2000	100	1671,6	1478,3	1253,6	1186,6	1107,0

Temperature Cross Factor (R407a to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,21	1,37	1,62	1,71	1,81
Cross Factor Fitting				
K=0,0078T[°K] -0,7375				
Average Cross Factor				
1,54				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R417a

Applying R417a to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	653,0	578,6	486,3	461,6	440,0
1000	50	1321,6	1169,6	988,0	933,6	873,3
1500	75	2014,6	1780,6	1499,6	1414,3	1313,0
2000	100	2400,0	2349,6	2021,0	1907,5	1761,6

Temperature Cross Factor (R417a to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,76	0,85	1,01	1,07	1,14
Cross Factor Fitting				
K=0,0049T[°K] -0,4843				
Average Cross Factor				
0,96				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

Sensor goes in over range condition applying 2.000 ppm @ - 20 °C. It works properly over the other temperatures. Considering that this condition happens at the limit of temperature and gas concentration range, it has been considered to be able to detect this gas over the complete range.

R448a

Applying R448a to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	341,0	304,6	257,3	248,6	247,0
1000	50	687,0	614,6	528,0	507,0	491,6
1500	75	1039,0	929,6	800,6	769,3	738,3
2000	100	1397,0	1249,3	1077,0	1033,3	983,0

Temperature Cross Factor (R448a to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,45	1,62	1,89	1,97	2,03
Cross Factor Fitting				
K=0,0076T[°K] -0,4536				
Average Cross Factor				
1,79				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1234ze

Applying R1234ze to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	221,3	223,0	219,0	234,3	264,6
1000	50	441,3	450,6	451,6	478,3	523,0
1500	75	663,6	680,6	686,6	725,3	788,0
2000	100	884,6	908,0	921,0	972,6	1052,6

Temperature Cross Factor (R1234ze to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,26	2,22	2,21	2,09	1,90
Average Cross Factor				
2,14				

Good results using single cross factor.

R32

Applying R32 to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R32 to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor (R32 to R134a sensor)				
-				

Sensor has no response for this gas.

R407f

Applying R407a to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	335,0	301,0	244,6	234,6	231,6
1000	50	677,3	619,0	531,0	510,3	492,0
1500	75	1028,0	945,0	819,0	791,0	756,0
2000	100	1383,6	1274,3	1112,6	1073,6	1020,6

Temperature Cross Factor (R407a to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,47	1,61	1,89	1,96	2,03
Cross Factor Fitting				
K=0,0074T[°K] -0,3951				
Average Cross Factor				
1,79				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1234yf

Applying R1234yf to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	761,0	719,0	649,0	645,6	643,6
1000	50	1559,0	1478,3	1357,3	1352,6	1341,0
1500	75	2348,6	2264,6	2087,6	2088,0	2069,3
2000	100	2400,0	2400,0	2400,0	2400,0	2400,0

Temperature Cross Factor (R1234yf to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,65	0,68	0,74	0,74	0,75
Average Cross Factor (1.500 ppm)				
0,71				

Good results using single cross factor. Range is limited at 1.500 ppm due to sensor Over Range.

R449a

Applying R449a to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	397,3	358,3	303,0	295,0	289,3
1000	50	808,6	741,6	649,3	633,0	609,3
1500	75	1231,0	1133,3	1001,6	975,0	936,6
2000	100	1666,3	1534,3	1360,0	1325,6	1270,3

Temperature Cross Factor (R449a to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,23	1,34	1,54	1,58	1,64
Cross Factor Fitting				
K=0,0054T[°K] -0,1123				
Average Cross Factor				
1,47				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R507

Applying R507 to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	495,6	404,6	297,6	262,6	229,6
1000	50	975,6	804,6	610,0	543,3	469,3
1500	75	1446,6	1192,6	912,0	814,6	702,6
2000	100	1909,3	1570,0	1204,6	1077,3	925,3

Temperature Cross Factor (R507 to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,03	1,25	1,66	1,86	2,15
Cross Factor Fitting				
K=0,0054T[°K] -0,1123				
Average Cross Factor				
1,59				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R123

Applying R123 to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	349,3	341,0	313,3	304,0	291,6
1000	50	724,0	706,3	649,6	629,0	594,6
1500	75	1100,6	1069,6	984,0	952,0	899,0
2000	100	1473,0	1433,3	1317,0	1276,0	1202,3

Temperature Cross Factor (R123 to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,38	1,42	1,54	1,59	1,68
Average Cross Factor				
1,52				

Good results using single cross factor.

R410a

Applying R410a to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	276	222,3	172,0	157,0	145,6
1000	50	545,3	455,0	358,6	328,5	293,6
1500	75	815,5	684,5	543,5	495,0	439,5
2000	100	1086,6	913,3	725,6	661,3	585,0

Temperature Cross Factor (R410a to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,83	2,21	2,80	3,07	3,42
Cross Factor Fitting				
K=0,0204T[°K] -3,2953				
Average Cross Factor				
2,67				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R452b

Applying R452b to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	270,1	250,5	228,2	221,2	227,3
1000	50	547,4	507,2	464,2	450,6	462,3
1500	75	832,2	762,7	700,1	681,5	696,1
2000	100	1118,2	1024,7	940,4	912,5	929,9

Temperature Cross Factor (R452b to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,82	1,97	2,15	2,22	2,17
Average Cross Factor				
2,07				

Good results using single cross factor.

R227

Applying R227 to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	494,3	402,5	308,7	276,8	253,2
1000	50	966,4	782,2	602,4	538,7	490,5
1500	75	1411,4	1135,2	873,6	779,1	712,5
2000	100	1833,3	1466,2	1129,8	1007,4	922,0

Temperature Cross Factor (R227 to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,05	1,30	1,69	1,89	2,07
Cross Factor Fitting				
K=0,0145T[°K] -2,6984				
Average Cross Factor				
1,60				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R143

Applying R143 to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R143 to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response to this gas.

R22

Applying R22 to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R22 to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response to this gas.

R513a

Applying R513a to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	575	548	531	534	560
1000	50	1166	1109	1070	1075	1132
1500	75	1788	1693	1627	1627	1713
2000	100	2451	2310	2203	2200	2318

Temperature Cross Factor (R513a to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,85	0,89	0,93	0,92	0,88
Average Cross Factor				
0,89				

Good results using single cross factor.

R422d

Applying R422d to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	668,96	585,30	498,98	469,16	448,93
1000	50	1374,72	1186,82	1010,86	944,56	903,86
1500	75	2125,68	1816,14	1529,91	1423,21	1360,92
2000	100	2400,0	2400,0	2063,19	1906,84	1821,67

Temperature Cross Factor (R422d to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,72	0,83	0,99	1,06	1,11
Cross Factor Fitting				
K = 0,0055 T[°K] -0,6914				
Average Cross Factor				
0,94				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results, moreover, it should be also considered that a sensor calibrated for R134a is able to detect R513a only up to 1500ppm because applying higher gas concentrations, at temperature lower than 0°C it reach over range condition.

R1233zd

Applying R1233zd to R134 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
1250	25	157,39	159,86	166,07	174,31	203,61
2500	50	321,66	322,75	331,61	352,31	403,23
3750	75	489,84	488,48	500,66	526,70	605,47
5000	100	666,89	657,56	669,28	703,20	808,87

Temperature Cross Factor (R1233zd to R134 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
7,72	7,71	7,51	7,12	6,18
Cross Factor Fitting				
K = -0,0205 T[°K] +13,32				
Average Cross Factor				
7,25				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407c

Applying R407c to R134a sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	394,26	360,56	328,46	315,46	310,51
1000	50	789,01	722,78	653,19	628,94	622,81
1500	75	1201,42	1093,46	983,87	950,11	937,74
2000	100	1631,04	1477,94	1324,80	1275,03	1259,07

Temperature Cross Factor (R407c to R134a sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,25	1,37	1,52	1,58	1,60
Cross Factor Fitting				
K=0,0049T[°K] +0,0025				
Average Cross Factor				
1,47				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

6. Cross Reference Factor for R32 sensors

In this paragraph are reported cross reference data collected using 24 sensors calibrated with R32.

R404a

Applying R404a to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	391,6	302,6	208,6	140,6	149,6
1000	50	689,6	532,3	380,0	284,6	262,0
1500	75	986,0	758,6	550,0	430,3	378,0
2000	100	1284,0	996,3	718,6	578,6	489,3

Temperature Cross Factor (R404a to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,45	1,88	2,63	3,50	3,80
Cross Factor Fitting				
K=0,0314T[°K] -6,5888				
Average Cross Factor				
2,65				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R134a

Applying R134a to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	254,0	224,0	200,6	172,0	185,0
1000	50	436,0	400,6	366,6	319,0	329,6
1500	75	619,6	576,0	537,6	484,6	495,0
2000	100	803,0	750,6	701,6	650,0	659,0

Temperature Cross Factor (R134a to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,29	2,50	2,72	3,05	2,95
Cross Factor Fitting				
K=0,0093T[°K] -0,0412				
Average Cross Factor				
2,70				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R125

Applying R125 to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	876,0	672,0	486,0	375,6	327,6
1000	50	1634,3	1274,6	921,6	747,3	628,6
1500	75	2176,0	1842,0	1353,6	1112,0	926,0
2000	100	2400,0	2211,6	1782,3	1475,6	1214,6

Temperature Cross Factor (R125 to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,62	0,81	1,09	1,34	1,60
Cross Factor Fitting				
K=0,0124T[°K] -2,5512				
Average Cross Factor				
1,09				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407a

Applying R407a to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	596,3	518,6	452,0	395,0	381,0
1000	50	1158,6	1017,7	880,0	797,6	756,0
1500	75	1743,6	1528,3	1313,6	1208,0	1143,0
2000	100	2262,3	2054,6	1761,6	1627,0	1534,3

Temperature Cross Factor (R407a to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,86	0,98	1,13	1,25	1,31
Cross Factor Fitting				
K=0,0059T[°K] -0,6150				
Average Cross Factor				
1,11				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R417a

Applying R417a to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	557,6	467,0	366,6	291,0	266,0
1000	50	1054,3	871,0	674,0	539,6	496,0
1500	75	1574,6	1285,6	984,6	831,0	729,0
2000	100	2086,0	1703,0	1268,3	1111,0	967,6

Temperature Cross Factor (R417a to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,94	1,14	1,49	1,79	2,01
Cross Factor Fitting				
K=0,0139T[°K] -2,6148				
Average Cross Factor				
1,47				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R448a

Applying R448a to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	669,0	596,0	531,0	470,6	460,6
1000	50	1281,6	1146,0	1012,6	933,0	903,6
1500	75	1920,0	1715,6	1511,0	1407,0	1353,6
2000	100	2365,3	2252,6	2032,3	1922,0	1836,0

Temperature Cross Factor (R448a to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,79	0,87	0,98	1,06	1,10
Cross Factor Fitting				
K=0,0041T[°K] -0,2327				
Average Cross Factor				
0,96				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1234ze

Applying R1234ze to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	1197,0	1080,0	965,6	899,3	881,6
1000	50	2291,3	2125,0	1896,6	1796,0	1736,0
1500	75	2400,0	2400,0	2400,0	2400,0	2400,0
2000	100	2400,0	2400,0	2400,0	2400,0	2400,0

Temperature Cross Factor (R1234ze to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,43	0,47	0,52	0,56	0,57
Average Cross Factor (1.000 ppm)				
0,51				

Good results using single cross factor. Range is limited at 1.000 ppm due to sensor Over Range.

R407f

Applying R407f to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	608,0	566,6	494,0	464,0	508,0
1000	50	1091,6	1008,3	881,6	832,6	876,3
1500	75	1590,0	1460,6	1288,3	1223,6	1249,3
2000	100	2042,3	1902,6	1710,6	1626,3	1631,6

Temperature Cross Factor (R407f to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,92	0,99	1,12	1,18	1,14
Cross Factor Fitting				
K=0,0032T[°K] -0,1297				
Average Cross Factor				
1,07				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1234yf

Applying R1234yf to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	421,0	329,0	248,0	188,3	199,0
1000	50	757,0	575,0	413,6	323,6	306,3
1500	75	1086,6	811,0	573,6	458,6	406,6
2000	100	1407,6	1041,0	727,6	585,0	505,0

Temperature Cross Factor (R1234yf to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,33	1,76	2,45	3,11	3,36
Cross Factor Fitting				
K=0,0027T[°K] -5,5327				
Average Cross Factor				
2,40				

Sensor can be used (considering an error of ±15 % instead of ±10 %) with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R449a

Applying R449a to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	574,6	520,0	461,3	413,0	434,3
1000	50	1085,6	972,3	853,3	785,6	781,6
1500	75	1622,3	1440,0	1254,6	1167,6	1140,3
2000	100	2148,3	1922,6	1664,3	1557,3	1507,0

Temperature Cross Factor (R449a to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,91	1,02	1,16	1,26	1,27
Cross Factor Fitting				
K=0,0048T[°K] -0,2941				
Average Cross Factor				
1,12				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R507

Applying R507 to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	381,6	317,0	255,0	202,3	216,3
1000	50	683,6	553,0	428,0	351,0	332,0
1500	75	984,0	788,3	599,6	497,0	454,6
2000	100	1289,0	1022,6	769,6	644,0	570,6

Temperature Cross Factor (R507 to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,46	1,81	2,35	2,86	3,03
Cross Factor Fitting				
K=0,0209T[°K] -3,8473				
Average Cross Factor				
2,30				

Sensor can be used (considering an error of ±15 % instead of ±10 %) with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R123

Applying R123 to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	416,0	336,0	273,3	215,0	217,0
1000	50	769,6	602,6	453,0	365,0	328,3
1500	75	1121,3	858,6	630,3	510,3	440,0
2000	100	1465,3	1115,6	807,6	651,0	547,0

Temperature Cross Factor (R123 to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,30	1,67	2,22	2,77	3,10
Cross Factor Fitting				
K=0,0234T[°K] -4,6691				
Average Cross Factor				
2,21				

Sensor can be used (considering an error of ±15 % instead of ±10 %) with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R410a

Applying R410a to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	789,6	731,6	681,6	641,3	651,0
1000	50	1527,0	1413,3	1292,0	1232,0	1215,6
1500	75	2258,3	2121,3	1926,6	1843,0	1798,6
2000	100	2400,0	2400,0	2392,3	2369,6	2337,3

Temperature Cross Factor (R410a to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,65	0,70	0,76	0,80	0,81
Average Cross Factor (1.500 ppm)				
0,74				

Good results using single cross factor. Range is limited at 1.500 ppm due to sensor Over Range.

R452b

Applying R452b to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	479,7	436,6	402,3	390,6	378,4
1000	50	972,1	885,3	814,5	782,1	754,4
1500	75	1490,8	1353,6	1240,0	1190,6	1145,6
2000	100	2036,4	1840,4	1676,1	1610,0	1539,5

Temperature Cross Factor (R452b to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,01	1,12	1,22	1,27	1,31
Cross Factor Fitting				
K=0,0041T[°K] -0,0204				
Average Cross Factor				
1,19				

Good results using single cross factor.

R227

Applying R227 to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	957,2	837,7	709,4	667,3	583,9
1000	50	1991,2	1701,5	1452,1	1355,6	1174,2
1500	75	2400,0	2400,0	2224,9	2037,8	1788,7
2000	100	2400,0	2400,0	2400,0	2400,0	2400,0

Temperature Cross Factor (R227 to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,51	0,59	0,69	0,74	0,85
Cross Factor Fitting				
K=0,0045T[°K] -0,6639				
Average Cross Factor				
0,68				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results. Range is limited at 1.000 ppm due to sensor Over Range.

R143

Applying R143 to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R143 to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response to this gas.

R22

Applying R22 to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	1323,8	1188,1	1073,9	990,2	903,0
1000	50	2400,0	2400,0	2136,0	2013,6	1838,1
1500	75	2400,0	2400,0	2400,0	2400,0	2400,0
2000	100	2400,0	2400,0	2400,0	2400,0	2400,0

Temperature Cross Factor (R22 to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,38	0,42	0,47	0,50	0,55
Cross Factor Fitting				
K=0,0023T[°K] -0,2239				
Average Cross Factor				
0,46				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results. Range is limited at 500 ppm due to sensor Over Range.
R32 sensor goes over range very quickly applying R22 gas due to very high sensitivity. To detect R22 gas, NET Srl suggest using R1234ze sensors (See Cap. 9 to details).

R513A

Applying R513A to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	338,07	269,82	210,02	193,77	170,62
1000	50	671,37	531,84	420,42	381,48	337,13
1500	75	1002,23	795,62	629,80	571,52	502,25
2000	100	1341,26	1063,15	840,61	759,68	668,75

Temperature Cross Factor (R513A to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,49	1,87	2,38	2,61	2,97
Cross Factor Fitting				
K=0,0204T[°K] -3,7611				
Average Cross Factor				
2,27				

It's not possible to detect gas concentration lower than 500ppm. Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R422d

Applying R422d to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	515,96	419,82	336,49	302,40	263,49
1000	50	1047,73	850,61	674,73	605,74	532,35
1500	75	1592,49	1287,68	1022,73	909,88	795,70
2000	100	2157,78	1731,25	1371,02	1215,83	1060,77

Temperature Cross Factor (R422d to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,95	1,17	1,47	1,65	1,89
Cross Factor Fitting				
K = 0,013 T[°K] -2,4148				
Average Cross Factor				
1,43				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1233zd

Applying R1233zd to R32 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
1250	25	1547,76	1216,62	907,09	779,02	647,13
2500	50	2400,0	2315,05	1700,72	1451,61	1202,15
3750	75	2400,0	2400,0	2397,86	2042,95	1682,21
5000	100	2400,0	2400,0	2400,0	2400,0	2103,64

Temperature Cross Factor (R1233zd to R32 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,83	1,10	1,52	1,78	2,15
Cross Factor Fitting				
K = 0,0184 T[°K] -3,9768				
Average Cross Factor				
1,47				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results, moreover, it should be also considered that a sensor calibrated for R32 is able to detect R1233zd only up to 2000ppm because applying higher gas concentrations, it can reaches over range condition.

R407c

Applying R407c to R32 sensors						
App. Gas (ppm)	**App. Gas (% F.S.)**	**-20 °C**	**0 °C**	**25 °C**	**40 °C**	**60 °C**
500	**25**	373,72	329,24	296,24	283,62	279,97
1000	**50**	744,29	658,31	594,11	572,76	553,07
1500	**75**	1129,29	999,43	901,88	864,48	840,58
2000	**100**	1527,00	1349,65	1216,77	1167,64	1131,52

Temperature Cross Factor (R407c to R32 sensor)				
-20 °C	**0 °C**	**25 °C**	**40 °C**	**60 °C**
1,33	1,51	1,67	1,74	1,79
Cross Factor Fitting				
K = 0,0063 T[°K] - 0,2442				
Average Cross Factor				
1,61				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

7. Cross Reference Factor for R507 sensors

In this paragraph are reported cross reference data collected using 24 sensors calibrated with R507.

R404a

Applying R404a to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	521,5	507,0	529,5	526,5	533,5
1000	50	1025,5	1013,5	1038,5	1040,0	1049,0
1500	75	1517,0	1519,0	1554,0	1565,0	1579,0
2000	100	1999,0	2019,5	2072,0	2101,0	2126,5

Temperature Cross Factor (R404a to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,98	0,99	0,96	0,96	0,95
Average Cross Factor				
0,97				

Good results using single cross factor.

R134a

Applying R134a to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	79,0	63,0	88,5	89,5	105,5
1000	50	149,5	131,0	157,5	159,0	180,0
1500	75	216,5	197,0	225,0	228,0	255,0
2000	100	281,0	261,0	289,0	297,0	328,0

Temperature Cross Factor (R134a to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
6,77	7,71	6,40	6,30	5,57
Cross Factor Fitting				
K=-0,0192T[°K] +12,199				
Average Cross Factor				
6,55				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R125

Applying R125 to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	342,5	346,5	399,0	412,0	447,0
1000	50	661,0	686,0	764,0	800,0	862,0
1500	75	957,5	1005,0	1116,0	1175,5	1271,0
2000	100	1233,5	1309,5	1455,0	1543,0	1676,5

Temperature Cross Factor (R125 to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,54	1,48	1,32	1,26	1,16
Cross Factor Fitting				
K=-0,0049T[°K] +2,7979				
Average Cross Factor				
1,35				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407a

Applying R407a to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	145,5	131,5	162,0	155,5	171,0
1000	50	278,5	268,0	306,5	306,5	330,5
1500	75	404,5	400,5	448,5	456,0	490,5
2000	100	531,0	534,5	591,0	605,5	648,5

Temperature Cross Factor (R407a to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
3,63	3,76	3,27	3,27	3,03
Average Cross Factor				
3,39				

Good results using single cross factor.

R417a

Applying R417a to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	219,0	208,5	241,0	240,5	261,0
1000	50	428,5	427,0	473,5	482,0	516,5
1500	75	631,5	640,5	700,0	719,0	769,5
2000	100	828,0	845,0	921,5	954,5	1022,0

Temperature Cross Factor (R417a to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,35	2,36	2,12	2,08	1,94
Average Cross Factor				
2,17				

Good results using single cross factor.

R448a

Applying R448a to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	111,5	98,5	128,5	121,5	137,0
1000	50	217,0	210,0	244,5	243,5	264,5
1500	75	320,5	317,0	360,5	364,0	393,5
2000	100	424,5	424,5	474,0	483,5	521,0

Temperature Cross Factor (R448a to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
4,62	4,82	4,09	4,12	3,77
Average Cross Factor				
4,28				

Good results using single cross factor.

R1234ze

Applying R1234ze to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	157,0	124,5	131,0	112,0	112,5
1000	50	309,5	262,0	252,0	227,5	220,5
1500	75	468,0	402,0	375,5	344,5	329,0
2000	100	623,5	542,0	497,0	460,0	438,5

Temperature Cross Factor (R1234ze to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
3,21	3,81	3,96	4,39	4,52
Cross Factor Fitting				
K=-0,0016T[°K] -0,7240				
Average Cross Factor				
3,98				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R32

Applying R32 to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R32 to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response for this gas.

R407f

Applying R407f to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	97,0	89,5	123,5	124,0	151,0
1000	50	192,5	188,0	223,0	229,5	263,5
1500	75	286,5	285,0	326,5	337,5	375,5
2000	100	379,0	380,0	426,0	440,5	486,5

Temperature Cross Factor (R407f to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
5,26	5,26	4,64	4,49	4,05
Cross Factor Fitting				
K=-0,016T[°K] +9,4449				
Average Cross Factor				
4,74				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1234yf

Applying R1234yf to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	132,0	135,0	180,5	189,5	228,5
1000	50	256,0	273,5	335,0	357,5	415,0
1500	75	375,5	404,5	484,5	521,5	595,5
2000	100	486,5	531,5	629,0	680,0	774,0

Temperature Cross Factor (R1234yf to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
4,05	3,74	3,14	2,91	2,55
Cross Factor Fitting				
K=-0,0192T[°K] +8,9334				
Average Cross Factor				
3,28				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R449a

Applying R449a to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	120,0	114,5	151,0	154,0	184,0
1000	50	234,5	234,0	278,0	288,5	328,5
1500	75	346,5	351,5	404,0	422,0	470,5
2000	100	455,0	467,0	527,5	553,0	614,0

Temperature Cross Factor (R449a to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
4,36	4,28	3,75	3,59	3,22
Cross Factor Fitting				
K=-0,0149T[°K] +8,2193				
Average Cross Factor				
3,84				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R123

Applying R123 to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	110,0	95,5	124,0	126,0	148,0
1000	50	221,0	201,5	225,5	226,5	248,5
1500	75	330,5	306,0	326,5	326,0	348,0
2000	100	439,0	409,5	425,0	424,0	447,0

Temperature Cross Factor (R123 to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
4,55	4,89	4,65	4,66	4,39
Average Cross Factor				
4,63				

Good results using single cross factor.

R410a

Applying R410a to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	125,5	116,0	153,0	164,0	193,0
1000	50	239,0	237,0	282,5	298,5	334,5
1500	75	351,5	354,0	409,0	433,0	477,5
2000	100	458,5	470,0	535,0	564,5	618,0

Temperature Cross Factor (R410a to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
4,31	4,25	3,70	3,50	3,19
Cross Factor Fitting				
K=-0,0151T[°K] +8,2306				
Average Cross Factor				
3,79				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R452b

Applying R452b to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	70,8	68,8	71,3	75,7	84,6
1000	50	124,1	131,3	142,3	153,4	167,2
1500	75	182,1	195,8	215,4	228,8	249,8
2000	100	240,7	258,8	284,8	303,6	332,0

Temperature Cross Factor (R452b to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

It's not possible to detect R452b with R507 sensors, due to very low sensitivity.

R227

Applying R227 to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	760,1	721,0	681,1	657,7	634,4
1000	50	1600,0	1498,3	1397,2	1344,8	1288,1
1500	75	2400,0	2329,2	2146,1	2053,8	1959,5
2000	100	2400,0	2400,0	2400,0	2400,0	2400,0

Temperature Cross Factor (R227 to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,64	0,67	0,72	0,74	0,78
Cross Factor Fitting				
K=0,0019T[°K] +0,1417				
Average Cross Factor				
0,71				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results. Range is limited at 1.500 ppm due to sensor Over Range.

R143

Applying R143 to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	608,8	594,2	579,5	550,4	537,5
1000	50	1210,6	1182,8	1146,0	1112,3	1067,5
1500	75	1811,7	1765,1	1707,7	1655,4	1587,4
2000	100	2400,0	2350,6	2265,3	2194,1	2104,2

Temperature Cross Factor (R143 to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,83	0,85	0,87	0,91	0,94
Average Cross Factor				
0,88				

Good results using single cross factor.

R22

Applying R22 to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R22 to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response to this gas.

R513a

Applying R513a to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	120,50	111,52	122,15	131,30	146,43
1000	50	214,65	219,28	241,58	256,82	284,69
1500	75	313,54	325,28	358,64	381,96	422,81
2000	100	411,93	433,13	475,80	506,26	558,27

Temperature Cross Factor (R513a to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
4,61	4,61	4,61	4,61	4,61
Cross Factor Fitting				
K=-0,0161T[°K] +8,9054				
Average Cross Factor				
4,15				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R422d

Applying R422d to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	250,67	254,86	270,49	280,69	296,86
1000	50	498,33	510,72	537,64	559,13	591,80
1500	75	740,99	763,98	803,40	835,40	881,84
2000	100	980,13	1013,51	1064,72	1109,08	1173,59

Temperature Cross Factor (R422d to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,02	1,96	1,86	1,79	1,69
Cross Factor Fitting				
K=-0,0045T[°K] +3,2036				
Average Cross Factor				
1,87				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1233zd

Applying R1233zd to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
1250	25	265,12	241,17	218,66	206,84	196,75
2500	50	542,21	495,20	441,21	417,01	393,26
3750	75	832,86	752,45	665,76	626,58	590,03
5000	100	1145,99	1027,78	905,23	850,71	800,46

Temperature Cross Factor (R1233zd to R1234yfsensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
4,56	5,03	5,65	5,99	6,34
Cross Factor Fitting				
K = 0,0249 T[°K] - 1,8539				
Average Cross Factor				
5,51				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407c

Applying R407c to R507 sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	90,40	90,92	96,39	100,18	108,74
1000	50	179,65	182,75	192,23	200,81	214,51
1500	75	270,58	273,58	288,52	300,74	322,58
2000	100	359,87	364,89	384,27	400,24	429,84

Temperature Cross Factor (R407c to R507 sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
5,55	5,48	5,20	4,99	4,64
Cross Factor Fitting				
K=-0,0129T[°K] +8,9939				
Average Cross Factor				
5,17				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

8. Cross Reference Factor for R1234yf sensors

In this paragraph are reported cross reference data collected using 24 sensors calibrated with R1234yf.

R404a

Applying R404a to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	356	313	269	243	212
1000	50	699	617	528	476	417
1500	75	1027	906	775	670	612
2000	100	1343	1184	1013	913	780

Temperature Cross Factor (R404a to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,45	1,64	1,92	2,12	2,43
Cross Factor Fitting				
K=-0,0135T[°K] -2,0905				
Average Cross Factor				
1,91				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R134a

Applying R134a to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	329	347	368	373	375
1000	50	640	682	728	737	743
1500	75	938	1006	1077	1095	1104
2000	100	1224	1318	1419	1445	1460

Temperature Cross Factor (R134a to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,58	1,48	1,38	1,36	1,35
Average Cross Factor				
1,43				

Good results using single cross factor.

R125

Applying R125 to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	522	465	401	363	320
1000	50	1020	905	778	702	616
1500	75	1500	1326	1135	1023	897
2000	100	1963	1729	1474	1327	1161

Temperature Cross Factor (R125 to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,99	1,12	1,30	1,44	1,65
Cross Factor Fitting				
K= 0,0091T[°K] -1,3819				
Average Cross Factor				
1,30				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407a

Applying R407a to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	274	255	234	222	208
1000	50	543	506	464	441	413
1500	75	810	755	692	657	616
2000	100	1076	1004	920	872	817

Temperature Cross Factor (R407a to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,84	1,98	2,16	2,27	2,43
Cross Factor Fitting				
K= 0,0081T[°K] -0,2514				
Average Cross Factor				
2,14				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R417a

Applying R417a to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	426	399	366	347	326
1000	50	851	796	728	689	645
1500	75	1277	1194	1088	1029	961
2000	100	1707	1593	1448	1367	1275

Temperature Cross Factor (R417a to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,17	1,26	1,38	1,45	1,55
Cross Factor Fitting				
K= 0,0053T[°K] -0,2022				
Average Cross Factor				
1.36				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R448a

Applying R448a to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	223	212	198	191	183
1000	50	449	425	396	382	366
1500	75	675	637	594	571	547
2000	100	898	848	790	759	725

Temperature Cross Factor (R448a to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,23	2,36	2,53	2,62	2,74
Average Cross Factor				
2,50				

Good results using single cross factor.

R1234ze

Applying R1234ze to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	138	152	167	176	191
1000	50	282	305	335	353	381
1500	75	423	458	502	528	572
2000	100	563	609	667	702	760

Temperature Cross Factor (R1234ze to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
3,56	3,28	2,99	2,84	2,62
Cross Factor Fitting				
K=-0,0127T[°K] +6,821				
Average Cross Factor				
3,06				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R32

Applying R32 to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R32 to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response for this gas.

R407f

Applying R407f to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	223	219	210	205	197
1000	50	447	437	418	407	393
1500	75	670	655	627	611	587
2000	100	893	872	835	812	781

Temperature Cross Factor (R407f to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,24	2,29	2,39	2,45	2,55
Average Cross Factor				
2,38				

Good results using single cross factor.

R449a

Applying R449a to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	284	285	280	275	270
1000	50	584	578	562	552	537
1500	75	884	871	845	828	805
2000	100	1185	1163	1127	1104	1072

Temperature Cross Factor (R449a to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,71	1,73	1,78	1,81	1,86
Average Cross Factor				
1,78				

Good results using single cross factor.

R507

Applying R507 to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	362	318	270	243	213
1000	50	707	621	524	473	414
1500	75	1035	910	767	692	606
2000	100	1350	1186	999	901	788

Temperature Cross Factor (R507 to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,43	1,63	1,93	2,14	2,44
Cross Factor Fitting				
K= 0,014T[°K] -2,2302				
Average Cross Factor				
1,91				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R123

Applying R123 to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	139	152	167	176	191
1000	50	282	305	335	353	381
1500	75	423	458	502	528	572
2000	100	563	609	667	702	760

Temperature Cross Factor (R123 to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
3,56	3,28	2,99	2,84	2,62
Cross Factor Fitting				
K= 0,0091T[°K] -1,3819				
Average Cross Factor				
1,30				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R410a

Applying R410a to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	177	164	147	126	115
1000	50	357	326	281	253	228
1500	75	534	484	417	377	338
2000	100	708	639	550	498	447

Temperature Cross Factor (R410a to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,82	3,09	3,57	3,98	4,42
Cross Factor Fitting				
K=-0,0226T[°K] -3,1286				
Average Cross Factor				
3,58				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R452b

Applying R452b to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	180,6	175,9	169,6	166,1	166,8
1000	50	358,8	352,1	342,4	336,2	335,7
1500	75	537,1	524,7	513,2	505,8	502,0
2000	100	711,9	698,6	685,1	673,9	666,7

Temperature Cross Factor (R452b to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,79	2,85	2,93	2,98	2,99
Average Cross Factor				
2,91				

Good results using single cross factor.

R227

Applying R227 to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	325,1	280,7	228,8	207,5	185,5
1000	50	619,6	537,7	442,7	401,1	355,9
1500	75	886,7	770,9	637,5	576,9	513,7
2000	100	1130,7	984,5	819,3	742,5	661,2

Temperature Cross Factor (R227 to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,65	1,90	2,31	2,55	2,86
Cross Factor Fitting				
K=0,0169T[°K] -2,7536				
Average Cross Factor				
2,26				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R143

Applying R143 to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R143 to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response to this gas.

R22

Applying R22 to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R22 to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response to this gas.

R513A

Applying R513a to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	376,33	380,13	391,26	397,70	405,37
1000	50	740,82	754,07	777,35	791,19	807,98
1500	75	1104,78	1128,16	1165,33	1184,04	1207,97
2000	100	1471,81	1506,13	1555,64	1582,47	1615,36

Temperature Cross Factor (R513a to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,35	1,32	1,28	1,26	1,24
Average Cross Factor				
1,29				

Good results using single cross factor.

R422d

Applying R422d to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	435,47	405,21	367,72	349,93	326,21
1000	50	865,08	804,52	735,22	697,05	648,47
1500	75	1294,62	1204,94	1098,66	1039,99	966,54
2000	100	1726,96	1605,27	1462,11	1379,74	1281,77

Temperature Cross Factor (R422d to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,16	1,24	1,36	1,44	1,55
Cross Factor Fitting				
K = 0,0054 T[°K] -0,2509				
Average Cross Factor				
1,35				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1233zd

Applying R1233zd to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
1250	25	106,47	112,79	123,73	131,17	149,58
2500	50	214,07	225,81	245,59	263,58	293,48
3750	75	322,20	339,42	368,94	392,29	437,79
5000	100	434,17	454,03	490,98	521,63	581,67

Temperature Cross Factor (R1233zd to R1234yfsensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
11,64	11,05	10,16	9,54	8,51
Cross Factor Fitting				
K = -0,043 T[°K] +22,917				
Average Cross Factor				
10,18				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407c

Applying R407c to R1234yf sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	260,97	251,84	243,28	236,25	226,84
1000	50	510,37	497,89	479,38	467,32	450,11
1500	75	761,96	743,59	716,06	701,05	672,23
2000	100	1014,87	991,99	956,16	934,53	896,12

Temperature Cross Factor (R407c to R1234yf sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,95	2,01	2,08	2,13	2,22
Average Cross Factor				
2,08				

Good results using single cross factor.

9. Cross Reference Factor for R1234ze sensors

In this paragraph are reported cross reference data collected using 24 sensors calibrated with R1234ze.

R404a

Applying R404a to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	135	117	95	84	67
1000	50	272	232	191	168	135
1500	75	405	344	287	253	205
2000	100	536	461	380	338	273

Temperature Cross Factor (R404a to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
3,70	4,32	5,25	5,95	7,37
Cross Factor Fitting				
K=0,0496T[°K] -9,3523				
Average Cross Factor				
5,32				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R134a

Applying R134a to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	94	93	955	98	96
1000	50	182	184	190	196	198
1500	75	264	270	285	294	298
2000	100	349	361	378	390	395

Temperature Cross Factor (R134a to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
5,56	5,48	5,28	5,11	5,09
Average Cross Factor				
5,21				

Good results using single cross factor.

R125

Applying R125 to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	353	299	250	221	186
1000	50	693	593	491	434	367
1500	75	1022	876	724	641	544
2000	100	1347	1153	952	843	713

Temperature Cross Factor (R125 to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,45	1,70	2,05	2,32	2,74
Cross Factor Fitting				
K= 0,0176T[°K] -3,1668				
Average Cross Factor				
2,05				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407a

Applying R407a to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	257	243	239	234	225
1000	50	518	498	478	469	452
1500	75	780	752	720	704	680
2000	100	1047	1008	962	943	918

Temperature Cross Factor (R407a to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,93	2,01	2,09	2,13	2,20
Average Cross Factor				
2,07				

Good results using single cross factor.

R417a

Applying R417a to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	217	199	170	158	140
1000	50	447	402	342	315	278
1500	75	675	606	514	473	421
2000	100	907	809	686	632	565

Temperature Cross Factor (R417a to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,25	2,49	2,92	3,17	3,57
Cross Factor Fitting				
K= 0,0183T[°K] -2,5428				
Average Cross Factor				
2,88				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R448a

Applying R448a to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	276	269	269	266	264
1000	50	553	546	535	532	527
1500	75	835	821	810	802	789
2000	100	1120	1105	1081	1072	1053

Temperature Cross Factor (R448a to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,80	1,83	1,86	1,87	1,90
Average Cross Factor				
1,85				

Good results using single cross factor.

R32

Applying R32 to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	241	263	289	298	302
1000	50	474	519	568	591	605
1500	75	697	768	842	875	903
2000	100	914	1009	1109	1154	1200

Temperature Cross Factor (R32 to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,13	1,94	1,77	1,70	1,66
Cross Factor Fitting				
K= -0,0064T[°K] +3,7433				
Average Cross Factor				
1,84				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407f

Applying R407f to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	222	221	224	223	222
1000	50	442	441	440	436	442
1500	75	665	663	662	657	662
2000	100	883	888	888	881	883

Temperature Cross Factor (R407f to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,26	2,26	2,26	2,27	2,26
Average Cross Factor				
2,26				

Good results using single cross factor.

R1234yf

Applying R1234yf to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	167	128	101	84	62
1000	50	326	261	198	165	132
1500	75	479	378	290	246	191
2000	100	624	493	380	323	253

Temperature Cross Factor (R1234yf to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
3,10	3,94	5,11	6,07	7,84
Cross Factor Fitting				
K= 0,0642T[°K] -13,802				
Average Cross Factor				
5,21				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R449a

Applying R449a to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	234	219	215	220	209
1000	50	472	452	438	436	424
1500	75	714	683	658	656	638
2000	100	957	917	882	877	854

Temperature Cross Factor (R449a to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,11	2,22	2,29	2,28	2,36
Average Cross Factor				
2,25				

Good results using single cross factor.

R507

Applying R507 to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	145	122	103	91	70
1000	50	286	243	201	180	136
1500	75	426	359	297	266	214
2000	100	563	480	395	352	286

Temperature Cross Factor (R507 to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
3,51	4,14	5,00	5,58	7,11
Cross Factor Fitting				
K= 0,0479T[°K] -9,1005				
Average Cross Factor				
5,07				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R123

Applying R123 to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	166	138	110	90	67
1000	50	334	272	217	182	138
1500	75	496	402	315	265	205
2000	100	654	532	416	349	264

Temperature Cross Factor (R123 to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
3,02	3,70	4,68	5,61	7,40
Cross Factor Fitting				
K= 0,059T[°K] -12,583				
Average Cross Factor				
4,88				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R410a

Applying R410a to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	331	338	339	336	333
1000	50	666	678	676	673	663
1500	75	1004	1021	1015	1016	1004
2000	100	1351	1369	1358	1353	1345

Temperature Cross Factor (R410a to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,50	1,47	1,48	1,48	1,50
Average Cross Factor				
1,48				

Good results using single cross factor.

R452b

Applying R452b to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	231,8	230,2	233,1	233,6	229,0
1000	50	460,7	461,1	465,3	464,1	456,4
1500	75	693,6	695,7	700,2	700,1	691,8
2000	100	929,5	932,4	936,5	937,4	927,1

Temperature Cross Factor (R452b to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,16	2,16	2,14	2,14	2,18
Average Cross Factor				
2,16				

Good results using single cross factor.

R227

Applying R227 to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	454,0	436,9	406,5	397,0	353,4
1000	50	910,3	865,6	815,7	794,1	708,9
1500	75	1359,7	1285,5	1227,4	1174,2	1075,0
2000	100	1811,4	1719,7	1620,9	1559,0	1427,3

Temperature Cross Factor (R227 to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,10	1,16	1,23	1,27	1,41
Cross Factor Fitting				
K=0,004T[°K] +0,0533				
Average Cross Factor				
1,23				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R143

Applying R143 to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	-	-	-	-	-
1000	50	-	-	-	-	-
1500	75	-	-	-	-	-
2000	100	-	-	-	-	-

Temperature Cross Factor (R143 to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
-	-	-	-	-
Average Cross Factor				
-				

Sensor has no response to this gas.

R22

Applying R22 to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	619,6	613,6	609,0	584,9	546,0
1000	50	1218,8	1209,4	1180,7	1160,9	1104,3
1500	75	1845,7	1823,2	1762,8	1740,5	1676,2
2000	100	2400,0	2400,0	2369,0	2327,1	2263,4

Temperature Cross Factor (R22 to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
0,81	0,82	0,84	0,86	0,90
Average Cross Factor				
0,85				

Good results using single cross factor.

R513a

Applying R513a to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	0	0	0	0	0
1000	50	167	150	131	121	108
1500	75	333	248	256	236	223
2000	100	496	437	380	352	327

Temperature Cross Factor (R513a to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
3,01	3,56	3,91	4,23	4,59
Cross Factor Fitting				
K=0,019T[°K] -1,7346				
Average Cross Factor				
3,86				

It's not possible to detect gas concentration lower than 500ppm. Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R422d

Applying R422d to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	278	243	220	155	161
1000	50	535	473	414	334	324
1500	75	789	702	613	514	483
2000	100	1042	927	810	693	646

Temperature Cross Factor (R422d to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,82	2,06	2,37	3,00	3,10
Cross Factor Fitting				
K = 0,0173 T[°K] -2,6218				
Average Cross Factor				
2,47				

It's not possible to detect gas concentration lower than 500ppm. Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R1233zd

Applying R1233zd to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
1250	25	746	647	500	453	375
2500	50	1388	1197	945	848	715
3750	75	1896	1669	1325	1188	1010
5000	100	2159	1979	1659	1489	1270

Temperature Cross Factor (R1233zd to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
1,88	2,13	2,71	2,98	3,58
Cross Factor Fitting				
K = 0,0212 T[°K] -3,5711				
Average Cross Factor				
2,66				

Sensor can be used with a cross factor proportional to the absolute temperature; using a single factor is not possible to obtain good linearity results.

R407c

Applying R407c to R1234ze sensors						
App. Gas (ppm)	App. Gas (% F.S.)	-20 °C	0 °C	25 °C	40 °C	60 °C
500	25	181,52	174,10	172,50	169,99	169,30
1000	50	355,83	345,04	341,74	341,36	334,76
1500	75	532,21	518,89	513,89	512,04	508,41
2000	100	709,54	693,75	687,50	686,93	683,36

Temperature Cross Factor (R407c to R1234ze sensor)				
-20 °C	0 °C	25 °C	40 °C	60 °C
2,80	2,89	2,91	2,93	2,95
Average Cross Factor				
2,90				

Good results using single cross factor.

Summary Table

In the following table are indicated types of correction factors available:

APPLIED GAS	SENSORS		
	R125	R134a	R32
R404a	Single	Proportional	Proportional
R134a	Proportional	No Correction	Proportional
R125	No Correction	Proportional **	Proportional **
R407a	Proportional	Proportional	Proportional
R417a	Proportional	Proportional **	Proportional
R448a	Proportional	Proportional	Proportional
R1234ze	Proportional	Single	1.000 ppm
R32	-	-	No Correction
R407f	Proportional	Proportional	Proportional
R1234yf	1.000 ppm	1.500 ppm	Proportional*
R449a	Proportional	Proportional	Proportional
R507	Single	Proportional	Proportional*
R123	Proportional	Single	Proportional*
R410a	Single	Proportional	1.500 ppm
R452b	Proportional	Single	Proportional
R227	Single	Proportional	1.000 ppm
R143	-	-	-
R22	-	-	500 ppm
R513a	1500 ppm	Single	Proportional
R422d	Proportional	1500 ppm	Proportional
R1233zd^	Proportional	Proportional	2000 ppm
R407c	Proportional	Proportional	Proportional

APPLIED GAS	SENSORS		
	R507	R1234yf	R1234ze
R404a	Single	Proportional	Proportional
R134a	Proportional	Single	Single
R125	Proportional	Proportional	Proportional
R407a	Single	Proportional	Single
R417a	Single	Proportional	Proportional
R448a	Single	Single	Single
R1234ze	Proportional	Proportional	No Correction
R32	-	-	Proportional
R407f	Proportional	Single	Single
R1234yf	Proportional	No Correction	Proportional
R449a	Proportional	Single	Single
R507	No Correction	Proportional	Proportional
R123	Single	Proportional	Proportional
R410a	Proportional	Proportional	Single
R452b	-	Single	Single
R227	1.500 ppm	Proportional	Proportional
R143	Single	-	-
R22	-	-	Single***
R513a	Proportional	Single	Proportional****
R422d	Proportional	Proportional	Proportional
R1233zd	Proportional	Proportional	Proportional
R407c	Proportional	Single	Single

** Sensor can be used considering ±15 % of accuracy*
*** Sensor goes out of range at 2.000 ppm and -20 °C. Data are calculated without considering this point*
**** NET Srl suggest detecting R22 gas with R1234ze sensors. R32 sensors goes over-range very quickly*
***** It's not possible to detect gas concentration lower than 500ppm*
^test performed at with gas concentrations up to 5000ppm

LEGEND

Single	Gas DETECTABLE with single cross factor
Proportional	Gas DETECTABLE with cross factor proportional to absolute temperature
1.000/1.500 ppm	Gas DETECTABLE only up to 1.000/1.500 ppm (due to Over Range)
-	Gas NOT DETECTABLE due NO reading

Each case described in the above table, is reported with the related example in Chapter 3.
All the calculated cross reference factors are reported in Chapter 4, 5, 6 and 7.

In case of Proportional response, it is not possible to use a single cross factor for complete range. It should be possible to find a suitable single cross factor only in a limited range (of temperature and gas concentration). **In this case, choice of the factors to be used is demanded to the customer's application.**

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.