






## Revolutionary new technologies and new products - your excellent analysis assistant

-  Simplify the test of carbon compounds
-  Make analysis process higher efficient and data more reliable
-  Make your GC technology stronger.



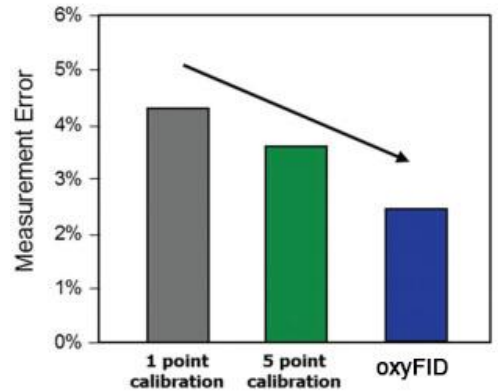
oxyFID - A significant technological change



### oxyFID provides more reliable data

Improve data accuracy ; simplify and reduce the tedious steps that result in mistakes

With a unified FID detection method, we improve the response accuracy, precision and sensitivity. Better data quality which gives you more confidence can help you make informed production decisions in quality control and product management.



### oxyFID brings you time-saving and highly efficient working methods

oxyFID is system-specific working methods, which means it could help you finish more complex analysis, more efficiently implement your analysis requirements; for example, after one time sample injection, the analysis of CO, CO<sub>2</sub>, CS<sub>2</sub>, COS, HCN, CH<sub>3</sub>NO, formic acid, formaldehyde and other organic samples could be achieved. ; oxyFID could provide you the new, high efficient and time-saving working methods.



### oxyFID is more economical and more energy efficient

oxyFID is highly efficient and simplify your analysis process. Its seamless design and practicality could effectively simplify your GC configuration requirements and is your best choice for economy and energy saving.



### oxyFID, how to work efficiently?

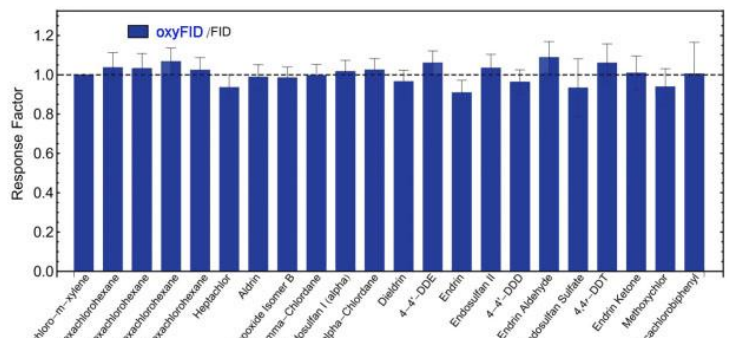
oxyFID, the unique catalytic micro-reaction device, will convert target components (CO, CO<sub>2</sub> and all other organic Analytes) to be methane to get the chromatography signals from the FID detector. What is the conversion efficiency?

From the traditional organic reactions, we got the conclusion:

The conversion efficiency > 99.99%.

The characteristics of the oxyFID response determine the response factors of all substances.

That is, the RF value is "1"



the oxyFID response factor of 22 organochlorine pesticides components

The following equation indicates the relationship between carbon content and substance concentration:

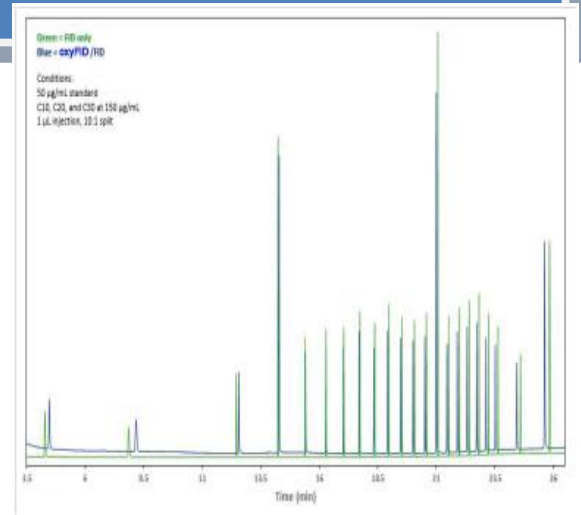
$$RF = 1 = \frac{mol\ C / area}{mol\ C_{std} / area_{std}} \Rightarrow mol\ C = \frac{area * mol\ C_{std}}{area_{std}}$$

'std' = internal standard

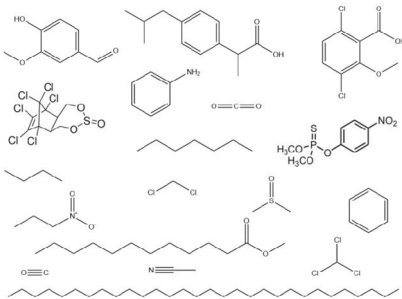
# oxyFID - hardware structure and performance determining it is easy to install, easy to debug

oxyFID using microreactors is made with proprietary 3D printing technology and the newest catalyst. The entire device could be seamlessly integrated into your existing GC equipments.

Optimized interior design and the catalyst microstructure could provide you the good separation performance, good peak shapes, help improve the analysis sensitivity and guarantee accurate quantification without calibration.



Comparison of the n-alkanes response on traditional FID and oxy FID



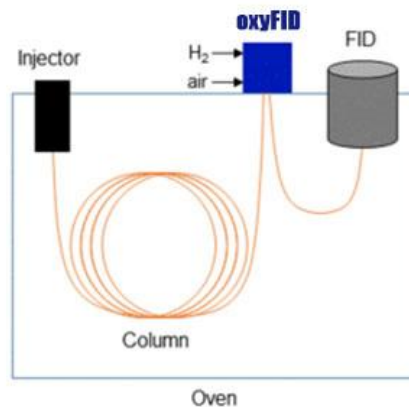
oxyFID effectively breaks the limitations of the original FID detector,

Substances which could not be detected by FID or have very low sensitivity, such as CO, CO<sub>2</sub>, COS, HCN, CH<sub>3</sub>NO, formic acid and formaldehyde, can be analyzed in our system.

The new catalysts application could meet the analysis diversity requirement including heterocyclic compounds and toxin-containing

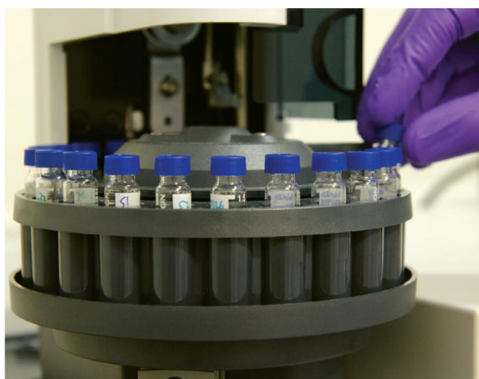
compounds (such as S).

oxyFID is installed at the end of the column, the front of GC FID detector, as shown in the following figure.



oxyFID could be used in all types of Agilent and SHIMADZU GC instruments.

oxyFID can be equipped with gas flow controller , the gas flow and other parameters have been adjusted before delivery , It could be used immediately once connected with gas.



Only after several simple steps, the installation could be finished.

oxyFID is modular and it is easy to install.

oxyFID has undergone rigorous factory inspection. After installation, they can be used directly without calibration.

The whole process is as simple as column installation and linear change but could help you solve many problems.

## oxyFID -excellent performances

### Comparison of oxyFID and the methane reformer

Performance comparison is recorded in the following table:

| comparison                      | oxyFID  | methane reformer  |
|---------------------------------|---|---|
| Component applicability         | All substances containing carbon <sup>1</sup>   | Only CO, CO <sub>2</sub>  |
| Sulfur components applicability | Could be used for sulfur components   | Sulfur poisons the catalyst                                       |
| Column applicability            | Capillary and packed columns  | packed columns  |
| Conversion efficiency           | >99.9%  | >99.9%  |
| benefit comparison              | More applicable especially for CO, CO <sub>2</sub> , CS <sub>2</sub> , COS, HCN, CH <sub>3</sub> NO, formic acid, formaldehyde and other compounds with high sensitivity and repeatability<br>For other carbon containing compounds, it also provides good responses and helps improve working efficiency without traditional calibration requirements. | Just used for FID detector and analysis of CO and CO <sub>2</sub> |
| GC system applicability         | GC with FID detector <sup>2</sup>   | GC with FID detector  |

note:

1. Currently all carbon compounds could be converted to be methane to be tested.

2. Compatible with Agilent and Shimadzu GC instruments.

## Sensitivity comparison of oxyFID and FID

Performance comparison is recorded in the following table:

| Analyte         | Response Factor (RF) |             | Limit of Quantification <sup>1</sup> (ppm) |        | Limit of Quantification (pg C) |        |
|-----------------|----------------------|-------------|--|--------|--------------------------------|--------|
|                 | FID                  | oxyFID      | FID  | oxyFID | FID                            | oxyFID |
| CO              | 0.00                 | 1.00 ± 0.02 | ND <sup>2</sup>                            | 1.7    | ND                             | 9      |
| CO <sub>2</sub> | 0.00                 | 1.00 ± 0.02 | ND   | 2.7    | ND                             | 14     |
| Formamide       | 0.18 ± 0.01          | 0.96 ± 0.01 | 211  | 29     | 62                             | 8      |
| Formaldehyde    | 0.11 ± 0.01          | 0.98 ± 0.02 | 155  | 26     | 68                             | 11     |
| Formic Acid     | 0.008 ± 0.002        | 0.98 ± 0.02 | 2138                                       | 27     | 620                            | 8      |

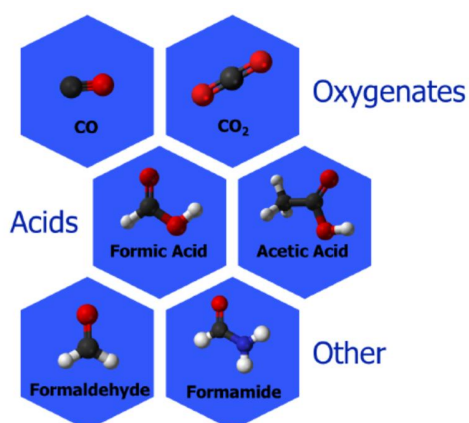
Note:

1. The calculation method using conventional quantitative limit is 10 times SNR.
2. ND indicates it could not be tested or could not be detected.

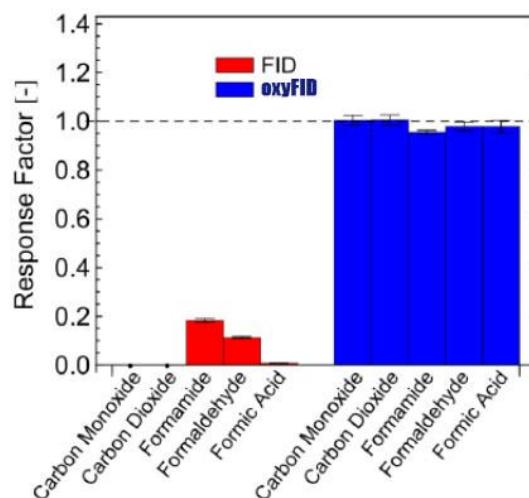
## oxyFID- Actual test report



Test subject: targeted component analysis



For the actual detection of formaldehyde, formic acid, CO, and CO<sub>2</sub>, the test results of oxyFID are much better than those of traditional FID. The special reaction mechanism (RF=1) guarantee its excellent performance.



## Formic acid testing results (with FID comparison)

Formic acid analysis:

Instrumentation condition:

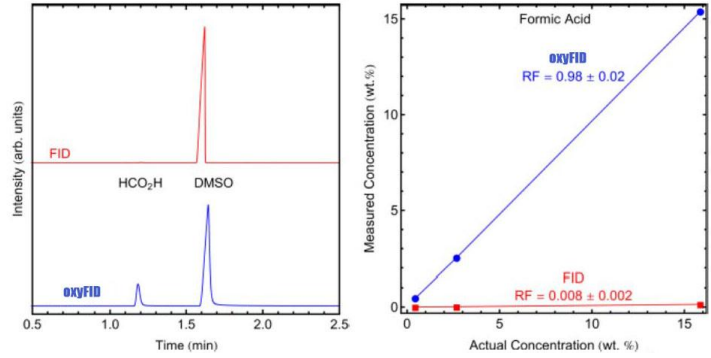
sample: 0.4 to 16 wt. % formic acid (88% in H<sub>2</sub>O) in DMSO

Carrier gas: He

injector: 0.1ul split (100:1) 250°C injection temperature

Oven: 100°C (hold 2 min) to 140°C/10°C min<sup>-1</sup>

FID detector: 300°C



According to the above figure, the FID RF value of formic acid is 0.008, while the oxyFID RF value is 1, resulting in a significant difference in chromatograms. Based on the comparison of the chromatograms, there is no response on the FID but excellent chromatograms can be obtained on oxyFID.

## Formaldehyde testing results (with FID comparison)

Formaldehyde analysis:

Instrumentation condition

sample: 0.2 to 6.2 wt. % formaldehyde/methanol

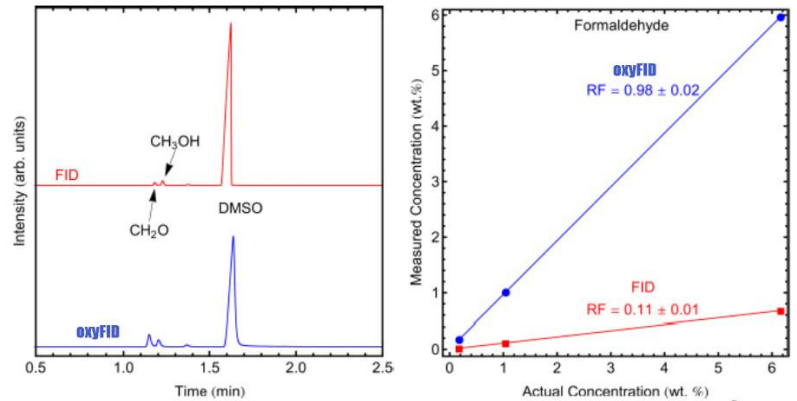
(37.5%/12.5% in H<sub>2</sub>O) in DMSO

Carrier gas: He

injector: 0.1ul split(100:1), 250°C injection temperature

oven: 100°C (hold 2 min) to 140°C/10°C min<sup>-1</sup>

FID detector: 300°C



According to the above figure, the RF value of formaldehyde on FID is 0.11, and the RF value on oxyFID is 1, resulting in chromatograms with a nearly ten time sensitivity difference. Based on the comparison of chromatograms, the FID responses of formaldehyde and methanol are poor, and the formaldehyde response on oxyFID is increased by nearly ten times while the sensitivity of methanol is also increased to some extent.

## OxyFID-CO and CO<sub>2</sub> testing results (with FID comparison)

CO and CO<sub>2</sub> inorganic gas analysis:

instrumentation condition

Sample: Gas sample cylinder – 5 % CO, 5 % CH<sub>4</sub>, 5 % CO<sub>2</sub>, 5 %

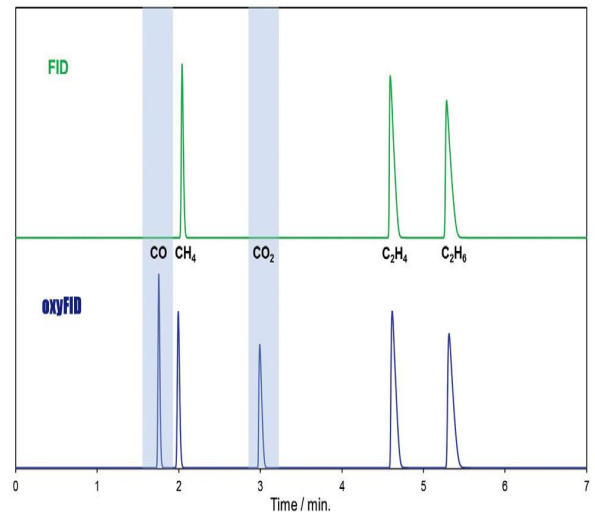
C<sub>2</sub>H<sub>4</sub>, 5 % C<sub>2</sub>H<sub>6</sub>, 5 % H<sub>2</sub>, balance He

Carrier gas: He

Injector: 100ul split(10:1), 60°C injection temperature

Oven: 35 °C (hold 2 min) to 100 °C @ 20 °C min<sup>-1</sup> (hold 2 min)

FID detector: 300°C



According to the principle of FID, CO and CO<sub>2</sub> have no response on FID, but TCD can only detect constant (ie, high concentration of) CO and CO<sub>2</sub>, and for low concentrations of CO and CO<sub>2</sub>, it cannot be detected; oxyFID perfectly solves this problem. According to the peaks in the above figure, CO and CO<sub>2</sub> have excellent



sensitivity on oxyFID and can meet the detection requirements for ppm level compounds.

oxyFID--- Your most effective analytical assistant

We do our best to provide you with  
the best products and best service

Ordering method

Email: [info@gs-tek.com](mailto:info@gs-tek.com) or [orders@gs-tek.com](mailto:orders@gs-tek.com)

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625 Dawson Drive, Suite A, Newark, DE 19713 USA

Tel: (302) 533-5646

Website: [www.gs-tek.com](http://www.gs-tek.com)

GS-Tek also provides columns for formaldehyde, formic acid, CO, and CO2 samples

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