

# chrozen ASTM D4815 Player



Octane number is a standard measure of the knock resistance of gasoline. The higher the octane number, the lower knock resistance. Therefore, the gasoline with high octane number is marketed as a premium gasoline. Generally, 8-15% of fuel additives in the form of alcohol or ether are added to gasoline to increase the octane number.

Not like other additives such as olefins that can generate toxic pollutant like formaldehyde and acetaldehyde, oxygenates help fuel to burn more efficiently and reduce emission of air pollutants.

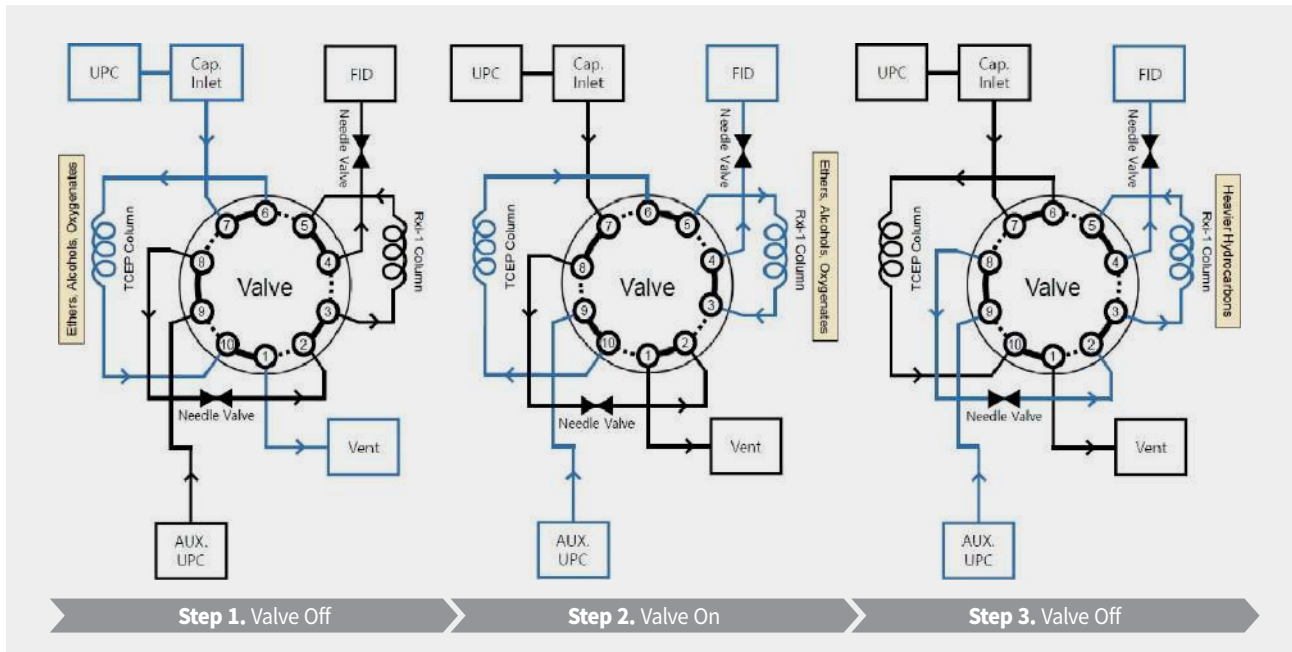
Among those oxygenates, most commonly used methyl tert-butylether (MTBE) produces nitrogen oxides and aldehydes causing air pollution, it is required to be regulated by ASTM D4815 to determine % concentrations.

ChroZen ASTM D4815 Player can analyze oxygenates in the form of ethers and alcohols in gasoline and meet regulatory requirements according to ASTM D4815.



# Summary of Test Method

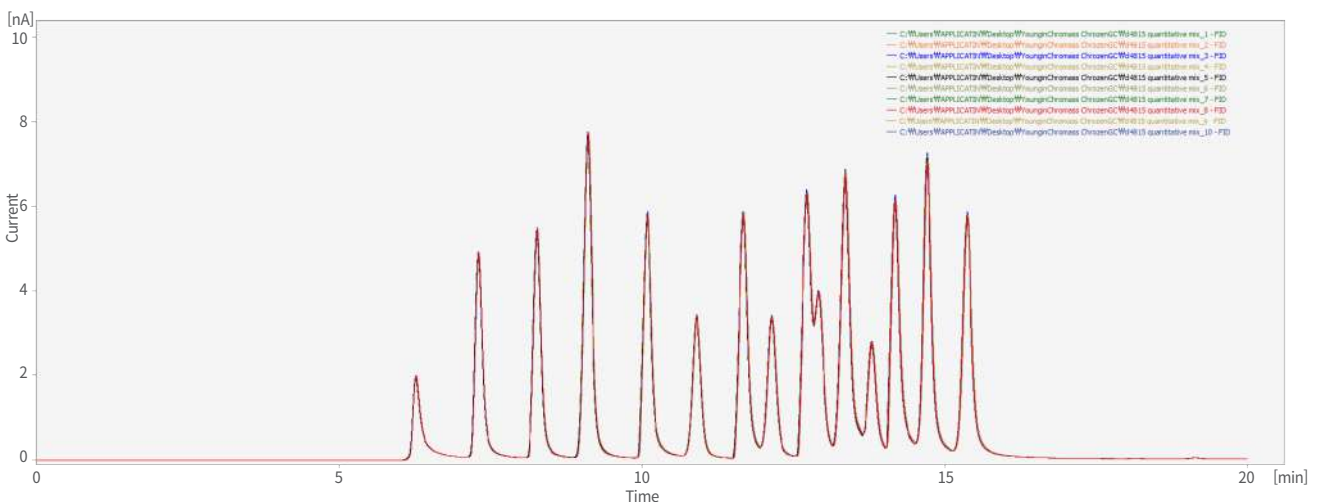
Alcohols and ethers in gasoline were analyzed by ChroZen GC/FID with column switching valve and two types of column were used; micro-packed TCEP as a pre-column and PDMS (Dimethylpolysiloxane) non-polar column according to ASTM D4815. In TCEP (tris(2-carboxyethyl)phosphine) column, lighter hydrocarbons are vented out but heavier hydrocarbons are retained. The remained heavy hydrocarbons are backflushed from TCEP to PDMS column by switching the valve for separation so that the FID (Flame Ionization Detector) can detect the oxygenates. The valve switching process in three steps is described by valve position as follows.



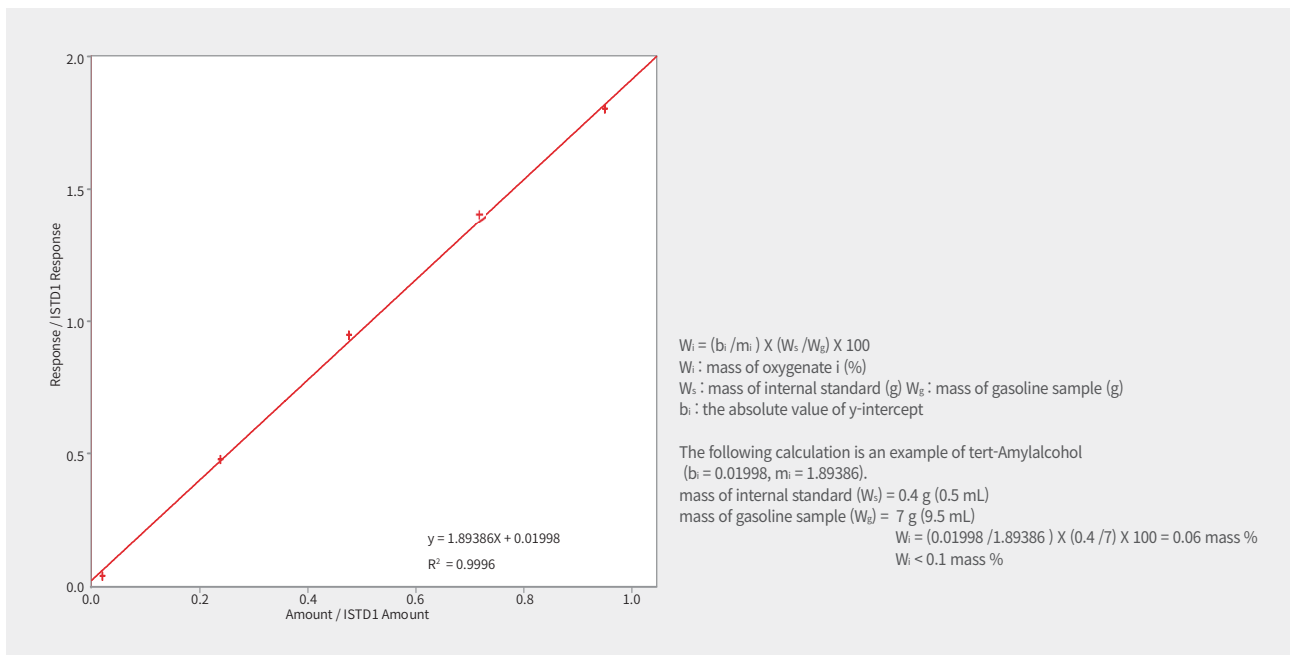
Valve Switching Setting in 3 Steps

# Analysis of Oxygenate Mixture

As shown in the result below, all kinds of oxygenates such as MTBE, TAME, DIPE, ETBE and the C1-C4 alcohols are separated clearly. The repeatability in 10 sequence injections satisfies with the regulation indicated in ASTM D4815.



Chromatogram of Oxygenates in Standards (47213) in 10 Sequence Injections



Calibration Curve (tert-Amyl Alcohol)

The calibration curve for each oxygenate plotted by five-point is established, as an example for tert-amylalcohol (1.19, 4.75, 2.38, 3.56, 0.095 wt %). It shows great linearity as the correlation coefficient over 0.999.

As the result, mass % of tert-amylalcohol ( $W_i$ ) is 0.06, which is less than 0.1 mass %. And mass % of all other oxygenates are under 0.1 mass %. (MTBE : 0.091 mass %, tert-butanol : 0.056 mass %, EtOH : 0.085 mass %)

According to ASTM D4815, the absolute value of the y-intercept must be at a minimum and the mass % of oxygenates must be less than or equal to 0.1 mass % for an optimum calibration. We verified an optimized calibration curve of all components in calibration standard (ethanol, tert-butanol, MTBE and tert-amylalcohol) by satisfying the criteria from ASTM D4815.

#### Repeatability Results for 10 Sequence Injections of Standards

Compound	Average (mass %)	Repeatability	Repeatability from ASTM D4815 specification
Ethanol	6.293	0.062	$0.06(X0.61) = 0.184$
tert-Butanol	6.468	0.090	$0.04(X0.56) = 0.114$
MTBE	3.401	0.063	$0.05(X0.56) = 0.099$
tert-Amyl Alcohol	6.867	0.110	$0.04(X0.61) = 0.130$

\* Repeatability : The difference between maximum and minimum mass %  
 X = the mean mass % of the component

\* The above table shows that the repeatability of each compound fully satisfies with the ASTM D4815 specification.

The analysis of oxygenates in gasoline by ChroZen GC with 10 port switching valve guarantees great repeatability and linearity by satisfying the specification of ASTM D4815. The correlation coefficients of calibration curve for all compounds in the calibration standards were determined to greater than 0.999 and the mass % of all components were under 0.1 mass %. Therefore, the ChroZen GC is the optimized system to analyze oxygenates in gasoline with the superior data reliability.

# ChroZen ASTM D4815 Player

Total Dream Solution Includes:

1. Smart Hardware Platform
2. Smart Software Control (Chromatography Data System)
3. All Related Consumables and Accessories
4. Columns
  - Column 1 : 20% TCEP Micro-Packed Column on 80/100 Chromosorb P (0.56 m, 750 mm, 1/16")
  - Column 2 : 100 % Dimethylpolysiloxane Non-Polar Column (30 m, 0.53 mm, 5 µm)

Target Compound Coverage	Methyl tert-butylether (MTBE)	ethyl tert-butylether (ETBE)
	tert-amylmethylether (TAME)	diisopropylether (DIPE)
	methanol	ethanol
	isopropanol	n-propanol
	isobutanol	tert-butanol
	sec-butanol	n-butanol
	tert-pentanol (tert-amylalcohol)	





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