



# AQUASTAR®

## CombiSolvent: A Safer and Faster Alternative to Methanol

Historically, the reagent used most frequently as a solvent in one-component volumetric Karl Fischer (KF) titration has been methanol. However, there have always been several well-known safety and performance issues associated with the use of methanol for KF analysis. First, methanol is a toxic poison that is absorbed readily through skin. Additionally, it is also highly hygroscopic, which makes it less than ideal for use in KF testing for water.

Recently, through collaboration with the extensive research efforts of our parent company, Merck KGaA, Darmstadt, Germany, EMD Chemicals has introduced **AQUASTAR®** CombiSolvent (Cat. No. 1.88008.1000), a methanol-free solvent for one-component volumetric KF. This innovative new reagent features a number of distinct advantages over methanol:

- Less toxic
- Less storage restrictions
- More environmentally favorable
- Less hygroscopic
- Sharper endpoints
- Faster titration times

Figure 1 shows a comparison of titration curves generated by using **AQUASTAR®** CombiSolvent and conventional methanol as solvents in conjunction with **AQUASTAR®** CombiTitrant 5 to analyze a liquid water standard sample.

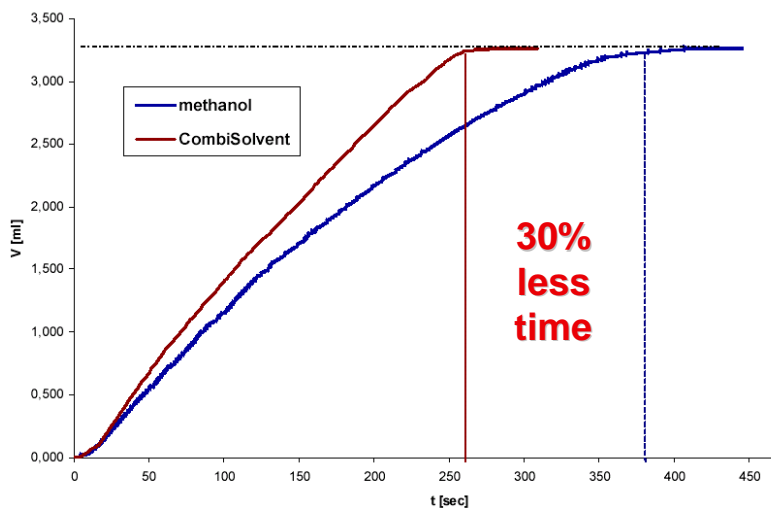


Figure 1. Titration curves of CombiSolvent and Methanol

The following Table compares the performance of a volumetric reagent system consisting of **AQUASTAR®** CombiTitrant 5 and **AQUASTAR®** CombiSolvent to that of a volumetric reagent system consisting of **AQUASTAR®** CombiTitrant 5 and **AQUASTAR®** CombiMethanol. Both reagent systems were tested by performing multiple injections of a 1% NIST-traceable water standard (**AQUASTAR®** Water Standard 1% NIST, Cat. No. 1.88052.0010) on a Mettler Toledo DL38 volumetric titrator. We found no statistical difference between using methanol and CombiSolvent, regardless of sample size.

Table1. Analysis of a 1% Liquid Water Standard Using CombiSolvent and Methanol

	ANALYSIS OF 1% WATER STANDARD (1.88052), C of A VALUE = 0.985% ( $\pm 0.009\%$ ) WATER			
	SAMPLE WEIGHT = ca. 0.5g		SAMPLE WEIGHT = ca. 4.5g	
	CombiTitrant 1.88005 CombiMethanol 1.88009	CombiTitrant 1.88005 CombiSolvent 1.88008	CombiTitrant 1.88005 CombiMethanol 1.88009	CombiTitrant 1.88005 CombiSolvent 1.88008
INJECTION 1	0.989	0.993	0.986	0.989
INJECTION 2	0.992	0.991	0.984	0.993
INJECTION 3	0.987	0.991	0.984	0.993
INJECTION 4	0.988	0.988	0.984	0.987
INJECTION 5	0.983	0.992	0.983	0.987
INJECTION 6	0.986	0.988	0.984	0.987
<b>MEAN WATER CONTENT (%)</b>	<b>0.988</b>	<b>0.991</b>	<b>0.984</b>	<b>0.989</b>
<b>STANDARD DEVIATION (%)</b>	<b>0.003</b>	<b>0.002</b>	<b>0.001</b>	<b>0.003</b>
INSTRUMENT: <b>METTLER TOLEDO DL38</b> METHOD: <b>I(pol) = 20 mA, U(stop) = 100 mV, rel drift &lt; 15 mL/min</b>				

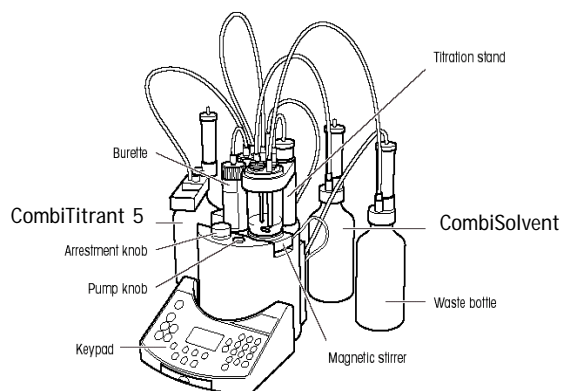


Figure 2. CombiSolvent and CombiTitrant 5 Bottles Connected to the AQUASTAR® AOV33 Volumetric Titrator

For additional **AQUASTAR®** product Technical and Applications Support call: **1-800-222-0342**