

Scharlau



Aquagent. Pyridine-free volumetric Karl Fischer reagents

One-component reagents ■ Two-component reagents ■ Reagents for aldehyde and ketone analysis
Working Media ■ Dry solvents ■ Standards

Pyridine-free ■ Fast titration ■ Stable titration end-points ■ Non toxic



Karl Fischer titration is well known from the beginning of 20th Century. It is widely used to quantify water content in many different samples. It is used both in industrial processes and in quality control laboratories.

The first Karl Fischer reagents that were developed contained pyridine, which was supposed to be essential for the reaction.

In the original K-F reaction, iodine reacts with SO_2 in presence of water, methanol and pyridine. Further experiments demonstrated that pyridine just acted as a buffer substance and could be substituted by other basic compounds, able to play the same role and, if possible, with less toxicity.

Most of the pyridine-free reagents, included our Aquagent®, contain imidazole instead of pyridine. Imidazole is a non toxic base, has a good buffer capacity and allows fast and stable titration end-points.

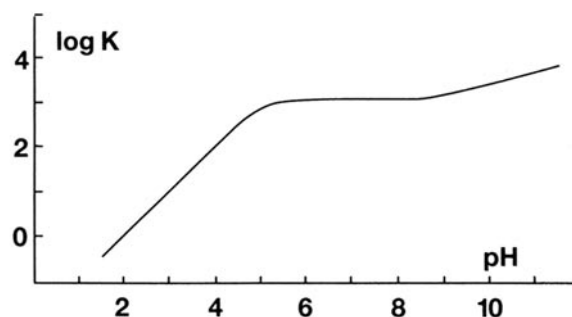
Why should you switch to Aquagent®?

The first reason to change from the classical KF reagents to Aquagent® seems to be to avoid the use of pyridine because of its toxicity. Nevertheless, there are other practical advantages that are very important to decide to change to Aquagent®.

Faster titration – End point stability – Accuracy

Kinetic studies demonstrate that KF reaction runs quickly and stoichiometrically at pH range of 5-7. The titration of water produces acidic intermediates that must be neutralized and pyridine is not the best base to do it. Pyridine has a low pH and poor buffering capacity and hence the KF reaction is very slow and end point is not stable.

Aquagent® reagents contain imidazole, which is proven to have a better buffer capacity than pyridine. This leads to a faster reaction, stable end points and more accurate and reproducible results.



ADVANTAGES OF AQUAGENT®

- Non toxic
- Stable titration end-points
- Fast titration
- Doesn't contain pyridine

BENEFITS OF AQUAGENT®

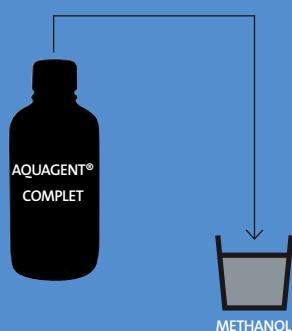
- Increases safety
- Accurate and reliable results
- Saves time
- No unpleasant odour

AQUAGENT® QUICK SELECTION GUIDE

AQUAGENT®

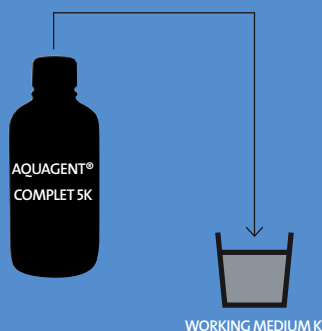
ONE-COMPONENT SYSTEM

GENERAL ANALYSIS



Aquagent Complet 5	AQ0003
Aquagent Complet 2	AQ0007
Methanol, dry, reagent grade	ME0304
Additional solvents to methanol	
Aquagent buffer acid	AQ0009
Formamide, dry	FO0028

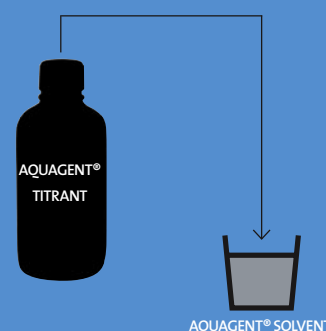
KETONE AND ALDEHYDE ANALYSIS



Aquagent Complet 5K	AQ0004
Working Medium K	AQ0005

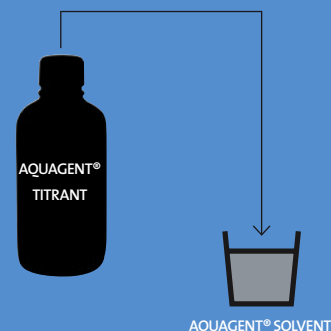
TWO-COMPONENT SYSTEM

GENERAL ANALYSIS



Aquagent Titrant 2	AQ0006
Aquagent Titrant 5	AQ0005
Aquagent Solvent	AQ0002

FAT AND OIL ANALYSIS



Aquagent Titrant 2	AQ0006
Aquagent Titrant 5	AQ0005
Aquagent Solvent CM	AQ0008
Aquagent Solvent Oil	AQ0010

Aquagent® is our family of pyridine-free Karl Fischer reagents. It offers reagents for both one-component and two-component systems.

One component system

All substances involved in the Karl Fischer reaction are mixed in one reagent. One-component reagents are very simple to use, but they must be re-titrated frequently due to the reactivity of their components.

Aquagent® Complet 5

Is a general purpose reagent for samples with high and medium water content. It has a titre of approx. 5 mg water / ml. Shelf life is two years.

It is generally used in conjunction with methanol as a solvent.

Aquagent® Complet 2

Is a general purpose reagent for samples with low water content. It has a titre of approx. 2 mg water / ml. Shelf life is two years. It is generally used in conjunction with methanol as a solvent.

Aquagent® Complet 5K

Aldehydes and ketones react with methanol and water is a by-product of this reaction. Hence erroneous results are obtained. To avoid this effect a specific reagent is needed: our Aquagent® Complet 5K. It is used in conjunction with Aquagent® Medium K, a specific solvent that does not contain methanol.

It has a titre of 5 mg water / ml and shelf life is 2 years.



Description	Capacity	Cat. no.
Aquagent® - Complet 2	500 ml	AQ00070500
(1 ml = 2 mg H ₂ O approx.)	1 l	AQ00071000
	2,5 l	AQ00072500
Aquagent® - Complet 5	500 ml	AQ00030500
(1 ml = 5 mg H ₂ O approx.)	1 l	AQ00031000
	2,5 l	AQ00032500
Aquagent® - Complet 5K	500 ml	AQ00040500
(1 ml = 5 mg H ₂ O approx.)	1 l	AQ00041000

The sample must always be dissolved in an anhydrous liquid to be titrated. The most common solvent is dry methanol. If the sample is not soluble in methanol, any other dry solvent can be used (see our ordering information on the rear of this brochure).

We also offer other solvents for specific applications:

Aquagent® MEDIUM K

Methanol reacts with both ketones or aldehydes and water is a by-product of these reactions. For this reason, methanol must be substituted by another solvent, our Aquagent® Medium K.

NEW Aquagent® BUFFER ACID

Karl-Fischer reaction runs optimally at pH between 5 and 7. When determining water in strong acidic compounds, it is recommended to neutralize the working medium with our Aquagent® Buffer Acid.

Dry formamide

Formamide improves the solubility of carbohydrates, proteins and inorganic salts. This solvent can be added to methanol in no more than 50% by volume.

Description	Capacity	Cat. no.
Methanol, dry, reagent grade	1 l	ME03041000
(max. 0,005% water)	2,5 l	ME03042500
Aquagent® Medium K	1 l	AQ00051000
(to be used with Aquagent® Complet 5K)		
NEW Aquagent® Buffer Acid	500 ml	AQ00090500
	1 l	AQ00091000
Formamide, dry (max. 0,02% water)	1 l	FO00281000



We add a label on each bottle of Aquagent® Complet, where the user can write down reagent titration dates and obtained titre. Thus, he has the whole titration history of each bottle at a glance.

her reagents for volumetric water determination.
 onent and two-component systems.

Two-component system

In two-component systems, the solvent-component doesn't act just as a solvent medium, but also contains part of the reagents. This allows longer shelf-life and avoids the need for frequent re-titration.

The use of two component reagents is more expensive but presents several advantages:

- **Faster reaction**
- **Less consumption of titration reagents**
- **Better stability of the reagents**



Aquagent® Titrant 5

It is a general purpose reagent that contains iodine and methanol. Titre is approx. 5 mg water / ml. Shelf life is 3 years. Must be used in conjunction with Aquagent® Solvent.

Aquagent® Titrant 2

It is a general purpose reagent that contains iodine and methanol. Titre is approx. 2 mg water / ml. Shelf life is 3 years. Must be used in conjunction with Aquagent® Solvent.

Description	Capacity	Cat. no.
Aquagent® Titrant 2	500 ml	AQ00060500
	1 l	AQ00061000
Aquagent® Titrant 5	500 ml	AQ00010500
	1 l	AQ00011000

We offer several products to be used as solvent-component in conjunction with Aquagent® Titrant:

Aquagent® SOLVENT

It is a general purpose reagent that contains SO₂, imidazole and methanol. It must be used in conjunction with Aquagent® Titrant. Shelf life is 5 years.

NEW Aquagent® SOLVENT CM

Solvent-component for titration of fats and oils. It contains chloroform, which improves solubility of long-chained hydrocarbons.

NEW Aquagent® SOLVENT OIL

Solvent-component for titration of fats and oils. It contains 1-hexanol and avoids use of halogenated reagents.

Description	Capacity	Cat. no.
Aquagent® Solvent	1 l	AQ00021000
	2,5 l	AQ00022500
NEW Aquagent® Solvent CM	1 l	AQ00081000
	2,5 l	AQ00082500
NEW Aquagent® Solvent Oil	1 l	AQ00101000

NEW Standards

To determine the factor of the reagents, standards of a known water content have to be used.

Our Aquagent® sodium tartrate dihydrate is a stable non-hygroscopic compound with a stoichiometric water content of 15,66%. These characteristics make it suitable as a volumetric standard in Karl Fischer determinations. However, this product does not easily dissolve in methanol, which is why some users prefer to use liquid standards such as our Aquagent® Standard 5.0 (5 mg/ml).

Description	Capacity	Cat. no.
NEW Sodium tartrate dihydrate	25 g	AQ00300025
	100 g	AQ00300100
NEW Aquagent® Standard 5.0	100 ml	AQ00210100
	500 ml	AQ00210500

Quick titration and stable end-points are the features highlighted by the users of Aquagent®.

Ordering information

One-component system

Description	Capacity	Cat. no.
Aquagent® - Complet 2 (1 ml = 2 mg H ₂ O approx.)	500 ml	AQ00070500
	1 l	AQ00071000
	2,5 l	AQ00072500
Aquagent® - Complet 5 (1 ml = 5 mg H ₂ O approx.)	500 ml	AQ00030500
	1 l	AQ00031000
	2,5 l	AQ00032500
Aquagent® - Complet 5K	500 ml	AQ00040500
	1 l	AQ00041000
Methanol, dry, reagent grade (max. 0,005% H ₂ O)	1 l	ME03041000
	2,5 l	ME03042500
Aquagent® Medium K (to be used with Aquagent Complet 5K)	1 l	AQ00051000
NEW Aquagent® Buffer Acid	500 ml	AQ00090500
	1 l	AQ00091000
Formamide, dry (max. 0,02% H ₂ O)	1 l	FO00281000

Two-component system

Description	Capacity	Cat. no.
Aquagent® Titrant 2	500 ml	AQ00060500
	1 l	AQ00061000
Aquagent® Titrant 5	500 ml	AQ00010500
	1 l	AQ00011000
Aquagent® Solvent	1 l	AQ00021000
	2,5 l	AQ00022500
NEW Aquagent® Solvent CM	1 l	AQ00081000
	2,5 l	AQ00082500
NEW Aquagent® Solvent Oil	1 l	AQ00101000

Dry solvents

Description	Capacity	Cat. no.
Acetone, dried, r.g. (max. 0,01% H ₂ O)	1 l	AC03161000
Acetonitrile, Multisolvent® (max. 0,03% H ₂ O)	1 l	AC03331000
Benzene, dried, r.g. (max. 0,01% H ₂ O)	1 l	BE00341000
Chloroform, Multisolvent®, stabilized with ethanol (max. 0,01% H ₂ O)	1 l	CL02181000
Cyclohexane, Multisolvent® (max. 0,01% H ₂ O)	1 l	CI00391000
Dichloromethane, dried, r.g. stabilized with approx. 50 ppm of amylene (max. 0,005% H ₂ O)	1 l	CL03381000
N,N-Dimethylformamide, dried, r.g. (max. 0,01% H ₂ O)	1 l	DI10711000
Dimethylsulfoxide, dried, r.g. (max. 0,01% H ₂ O)	1 l	SU01571000
1,4-Dioxan, dried, r.g. (max. 0,005% H ₂ O)	1 l	DI12901000
Ethanol, absolute, Multisolvent® (max. 0,1% H ₂ O)	1 l	ET00151000
Ethyl acetate, Multisolvent® (max. 0,03% H ₂ O)	1 l	ET01551000
n-Hexane, 96%, Multisolvent® (max. 0,005% H ₂ O)	1 l	HE02341000
Methanol, dried, r.g. (max. 0,005% H ₂ O)	1 l	ME03041000
Petroleum ether, Multisolvent®, boiling range 40-60°C (max. 0,01% H ₂ O)	1 l	ET00951000
2-Propanol, dried, r.g., ACS, ISO (max. 0,01% H ₂ O)	1 l	AL03161000
Tetrahydrofuran, dried, r.g., stabilized with 250 ppm of BHT (max. 0,005% H ₂ O)	1 l	TE02231000
Toluene, dried, r.g. (max. 0,0075% H ₂ O)	1 l	TO00741000

Standards

Description	Capacity	Cat. no.
NEW Sodium tartrate dihydrate	25 g	AQ00300025
	100 g	AQ00300100
NEW Aquagent® Standard 5.0	100 ml	AQ00210100
	500 ml	AQ00210500

CAT-AQEN06

Quality



All Aquagent® products are manufactured in our facilities under ISO 9001: 2000 and ISO 14001: 2004.

Availability

All Aquagent® products are available from stock.

www.scharlau.com

You can access to our catalogue on line and get copies of COA and MSDS whenever you need.