



Scharlau

The wise choice

Aquagent[®]

The Scharlau comprehensive
pyridine-free solutions range
for a reliable Karl Fischer Titration



Karl Fischer titration is a well known and globally accepted method for water determination since the beginning of the 20th century. KF titration uses volumetric or coulometric titration to determine the water content in a wide variety of samples including chemicals, pharmaceuticals, food and oils. It is used both in industrial processes as well as in quality control laboratories.

The first KF reagents that were developed contained pyridine, which was assumed to be essential for the reaction. Further experiments demonstrated that pyridine could be replaced by other basic compounds, which were able to play the same role providing less toxicity.

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



Aquagent[®]: An appropriate product range

AQUAGENT[®] is the comprehensive product range of Scharlau pyridine-free volumetric and coulometric Karl Fischer reagents for water analysis. We offer a wide range of safe, reliable and easy-to-use pyridine-free solutions and standards to meet any requirement of current laboratories for Karl Fischer titration.

Aquagent[®] comprises:

- 💧 Volumetric titration with One and Two-component reagents
- 💧 Coulometric titration with cells with and without diaphragm
- 💧 Water Standards

Suitable for the following applications:

- 💧 Ketones and Aldehydes
- 💧 Carbohydrates, Inorganic Salts and Proteins
- 💧 Oils and Fats
- 💧 Crude and related products
- 💧 Strong acids

Why to use Aquagent[®]

Water content can affect product quality, texture, shelf life, chemical stability and reactivity. So Aquagent[®] provides an accurate water content determination in volumetric and coulometric titration with unique performance.

- 💧 Less toxicity, more safety
- 💧 End point stability
- 💧 Accuracy and reproducibility
- 💧 Faster titration
- 💧 No bad and noxious smells
- 💧 Wide range of capacities
- 💧 Decreased environmental impact
- 💧 Wide applicability
- 💧 Outstanding quality: quality control under rigorous standards
- 💧 Selected raw materials
- 💧 Globally available: international sales network
- 💧 30 years experience

**Aquagent[®] providing you reliable results
in volumetric and coulometric Karl Fischer titration**



Two methods are available for the determination of water content based on the Karl Fischer reaction: volumetric and coulometric. The choice of the method primarily depends of the amount of water expected in the sample. It is known that the choice of the right product is a key factor in obtaining reliable and reproducible results.

Aquagent[®] volumetric solutions

In case of higher water content (0,1- 100%), the volumetric titration is the method to choice. It is the most used for water titration, which is determined by measuring the required volume of Karl Fischer reagent consumed to reach the titration end-point. This end-point is indicated by an excess of iodine and measured potentiometrically.

Scharlau supplies both one-component and two-component reagents for volumetric titration.



Aquagent[®] One-component

In one-component Karl Fischer titration, all substances involved in the reaction are mixed in one reagent: the titrant. The one-component reagents are user-friendly and allow more flexibility in the choice of the more suitable solvent according to the type of sample; on the other hand, they should be frequently titrated due to the reactivity of their components.

Scharlau offers a range of one-component solutions suitable for general use as well as for specific applications.

GENERAL USE

Reagents:

Aquagent[®] Complet 2

A general purpose reagent for samples with low and medium water content. Each mL titrates approx. 2 mg water. Generally used together with methanol as a solvent.

Aquagent[®] Complet 5

A general purpose reagent for samples with high and medium water content. Each mL titrates approx. 5 mg water. Generally used together with methanol as a solvent.

DESCRIPTION	CAPACITY	ART. NO.
Aquagent [®] Complet 2	500mL	AQ00070500
	1L	AQ00071000
	2,5L	AQ00072500
Aquagent [®] Complet 5	500mL	AQ00030500
	1L	AQ00031000
	2,5L	AQ00032500

Solvents:

Dry Methanol

The sample should always be dissolved in a dry solvent to be titrated. The most common is dry methanol. If the sample is not soluble in methanol, any other dry solvent should be used (see specific applications on next page).

Aquagent[®] Methanol Fast

An improved formulation for a faster KF volumetric titration.

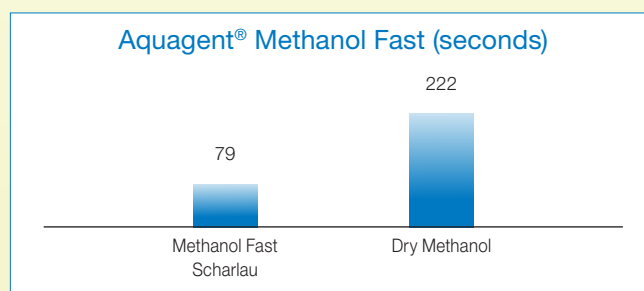
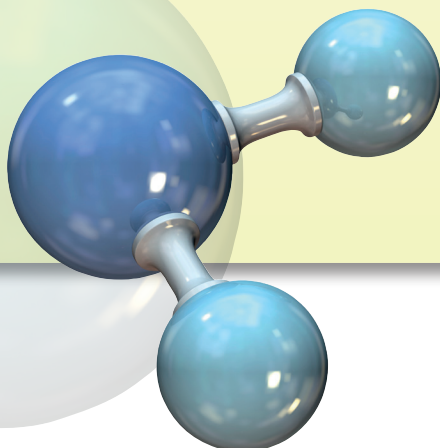


FIGURE 1: Shows the time to achieve the end-point in the KF volumetric one-component titration using different types of methanol solvent. Sample: 20 mg H₂O injection by weight.

DESCRIPTION	CAPACITY	ART. NO.
Methanol, dry (max. 0,005% H ₂ O), reagent grade	1L	ME03041000
	2,5L	ME03042500
Aquagent [®] Methanol Fast	1L	AQ00111000
	2,5L	AQ00112500



Aquagent® volumetric solutions



Aquagent® One-component

SPECIFIC APPLICATIONS

Aquagent® Complet 5K

Aldehydes and ketones react with methanol releasing water as by-product of this reaction. Hence, when the sample contains aldehydes or ketones erroneous results might be 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. The usual titre is 5 mg water/mL.

DESCRIPTION	CAPACITY	ART. NO.
Aquagent® Complet 5K	500mL	AQ00040500
	1L	AQ00041000

Aquagent® Medium K

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

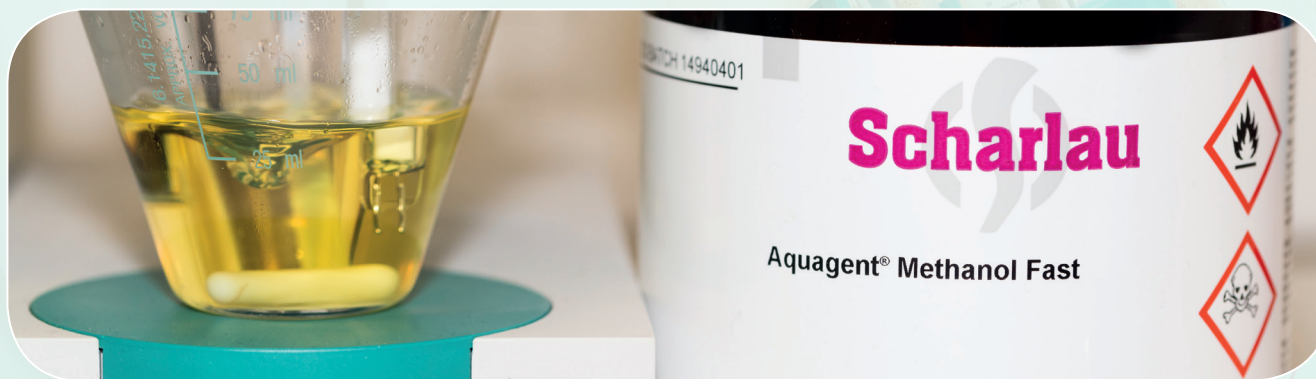
Aquagent® Buffer Acid (additive)

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





Dry formamide (additive)

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	ART. NO.
Aquagent® Buffer, acid	500mL	AQ00090500
	1L	AQ00091000
Aquagent® Medium K	500mL	AQ00050500
	1L	AQ00051000
Formamide, dry (max. 0,02% H ₂ O), reagent grade	1L	FO00281000



Aquagent® One-component reagents:

-  High titration rate for fast analyses
-  Ensure reproducible and consistent high quality results
-  Flexibility: the solvent can be suited to the sample matrix
-  Unlimited water capacity compared to two components reagent





Aquagent® Two-component

In two-component systems, the solvent component does not act just as 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 offers advantages, compared to one-component reagents: faster titration, less consumption of titration reagents and better long-term stability of the reagents.

Scharlau offers a range of titrants and solvents which are suitable for general use as well as for specific applications.

GENERAL USE

Aquagent® Titrant 2

A general purpose reagent that contains iodine and methanol. Titre is approx. 2 mg water/mL. Shall be used in conjunction with Aquagent® Solvent.

Aquagent® Titrant 5

A general purpose reagent that contains iodine and methanol. Titre is approx. 5 mg water/mL. Shall be used in conjunction with Aquagent® Solvent.

Scharlau offers several products to be used as the solvent-component in conjunction with Aquagent® Titrant:

Aquagent® Solvent

A general reagent that contains SO₂, imidazole and methanol. Shall be used in conjunction with Aquagent® Titrant.

DESCRIPTION	CAPACITY	ART. NO.
Aquagent® Titrant 2	500mL	AQ00060500
	1L	AQ00061000
Aquagent® Titrant 5	500mL	AQ00010500
	1L	AQ00011000
	2,5L	AQ00012500

DESCRIPTION	CAPACITY	ART. NO.
Aquagent® Solvent	1L	AQ00021000
	2,5L	AQ00022500

Aquagent® Metanol Fast

SPECIFIC APPLICATIONS

Aquagent® Solvent CM

Solvent-component for titration of fats and oils, with additives to facilitate solubility of long-chained hydrocarbons.

DESCRIPTION	CAPACITY	ART. NO.
Aquagent® Solvent CM	1L	AQ00081000
	2,5L	AQ00082500

Aquagent® Solvent OIL

Solvent-component for titration of fats and oils, free from halogenated hydrocarbons.

DESCRIPTION	CAPACITY	ART. NO.
Aquagent® Solvent OIL	1L	AQ00101000

Aquagent® Two-component reagents:

-  Faster titration in comparison to one-component reagents
-  High accuracy for high quality results
-  Titre more stable in comparison to one-component reagents



Coulometric Karl Fischer titration is indicated for low water content at ppm level (<0,1%) or for water determination in valuable samples. In coulometric titration, the iodine required for the reaction is formed at the electrode in the titration vessel itself by anodic oxidation. The water content is accurately calculated from the current used over a specific time period. The measuring cell contains an anode and a cathode compartment which can be separated by a membrane or diaphragm. The titrators cells can therefore be with or without diaphragm.

Aquagent® Coulometric solutions

Scharlau offers a suitable AQUAGENT® for both cell types.

Aquagent® for cells with diaphragm

Anolyte:

Aquagent® Coulometric A **Anolyte for coulometric KF titration**

Suitable for cells with diaphragm. This general purpose reagent contains the reaction compounds for the anodic compartment from the electrolytic cell. Should be used in conjunction with Aquagent® Coulometric CG.

Aquagent® Coulometric Oil **Anolyte for coulometric KF titration**

Suitable for cells with diaphragm. This reagent for the anodic compartment is specially formulated for crude and related products samples. Should be used in conjunction with Aquagent® Coulometric CG.

Catholyte:

Aquagent® Coulometric CG **Catholyte for coulometric KF titration**

Suitable for cells with diaphragm. This reagent contains the reaction compounds for the cathodic compartment from the electrolytic cell. Should be used in conjunction with Aquagent® Coulometric A or Oil.

DESCRIPTION	CAPACITY	ART. NO.
Aquagent® Coulometric A, anolyte	500mL	AQ00220500
Aquagent® Coulometric Oil, anolyte	100mL	AQ00250100
Aquagent® Coulometric CG, catholyte	100mL 10x5mL	AQ00230100 AQ00230050



Aquagent® for cells without diaphragm

Aquagent® Coulometric AG, **for coulometric KF titration**

Suitable for cells without diaphragm. One single solution containing all reaction compounds.

DESCRIPTION	CAPACITY	ART. NO.
Aquagent® Coulometric AG	500mL	AQ00240500
	1L	AQ00241000



Scharlau Standards for Karl Fischer titration

Standards of a known water content are used to determine the titre of the reagents. They are more and more requested due to an increasing demand for more reliable and comparable results. Our Aquagent® product family includes:

- **Solid standards:** sodium tartrate dihydrate, stable, non-hygroscopic, with a water content about 15,66%.
- **Liquid standards:** Aquagent® Standard 1.0 for coulometric and Aquagent® Standard 10.0 for volumetric Karl Fischer titrations respectively. We pack our 1.0 and 10.0 standards in vials to maintain optimum conditions until they are opened. Each vial provides sufficient standard for one titration. Aquagent® Standard 5.0, suitable for daily titre control as well as for equipment validation. Shelf life is stable and included in the Certificate of Analysis.

DESCRIPTION	CAPACITY	ART. NO.
Aquagent® di-Sodium tartrate dihydrate	25g	AQ00300025
	100g	AQ00300100
Aquagent® standard solution 1.0* (1mg/g)	10 x 4mL	AQ00190040
Aquagent® standard solution 10.0* (10mg/g)	10 x 8mL	AQ00200080
Aquagent® standard solution 5.0 (5mg/mL)	100mL	AQ00210100
	500mL	AQ00210500

*Traceable to NIST



Benefits of Aquagent®

- Highest quality results
- Increased safety
- Time saving
- Flexibility: many applications and wide range of capacities
- No unpleasant and noxious odours

Benefits of Scharlau



- Outstanding quality
- Globally available: international sales network
- 30 years experience



Aquagent® User Guide

	ME0304 Methanol, dry	AQ0011 Aquagent® Methanol Fast	AQ0005 Aquagent® Medium K	AQ0009 Aquagent® Buffer	FO0028 Formamide, dry	AQ0002 Aquagent® Solvent	AQ0008 Aquagent® Solvent CM	AQ0010 Aquagent® Solvent OIL	AQ0023 Aquagent® Coulometric CG
AQ0007 Aquagent® Complet 2	💧	💧		💧	💧				
AQ0003 Aquagent® Complet 5	💧	💧		💧	💧				
AQ0004 Aquagent® Complet 5K			💧						
AQ0006 Aquagent® Titrant 2						💧	💧	💧	
AQ0001 Aquagent® Titrant 5						💧	💧	💧	
AQ0022 Aquagent® Coulometric A									💧
AQ0025 Aquagent® Coulometric Oil									💧
AQ0024 Aquagent® Coulometric AG									

Ordering information

AQUAGENT® PRODUCT RANGE			CAPACITY	ART. NO.		
Volumetric		Reagents	Aquagent® Complet 2	500mL	AQ00070500	
				1L	AQ00071000	
				2,5L	AQ00072500	
			Reagents	Aquagent® Complet 5	500mL	AQ00030500
				1L	AQ00031000	
				2,5L	AQ00032500	
			Reagents	Aquagent® Complet 5K	500mL	AQ00040500
				1L	AQ00041000	
				1L	ME03041000	
		Solvents	Methanol, dry (max. 0,005% H ₂ O), reagent grade	2,5L	ME03042500	
			Aquagent® Methanol Fast	1L	AQ00111000	
				2,5L	AQ00112500	
			Aquagent® Medium K	500mL	AQ00050500	
		Additives		1L	AQ00051000	
			Aquagent® Buffer, acid	500mL	AQ00090500	
				1L	AQ00091000	
			Formamide, dry (max. 0,02% H ₂ O), reagent grade	1L	FO00281000	
		Titrants	Aquagent® Titrant 2	500mL	AQ00060500	
			1L	AQ00061000		
			500mL	AQ00010500		
		Titrants	Aquagent® Titrant 5	1L	AQ00011000	
				2,5L	AQ00012500	
			Aquagent® Solvent	1L	AQ00021000	
		Solvents		2,5L	AQ00022500	
			Aquagent® Solvent CM	1L	AQ00081000	
				2,5L	AQ00082500	
		Aquagent® Solvent OIL	1L	AQ00101000		
Coulometric	Cells with diaphragm	Aquagent® Coulometric A, anolyte	500mL	AQ00220500		
			100mL	AQ00250100		
		Aquagent® Coulometric CG, catholyte	10 x 5mL	AQ00230050		
		100mL	AQ00230100			
	Cells without diaphragm	Aquagent® Coulometric AG	500mL	AQ00240500		
		1L	AQ00241000			
Standards	Liquids	Aquagent® standard solution 1.0	10 x 4mL	AQ00190040		
			10 x 8mL	AQ00200080		
			100mL	AQ00210100		
			500mL	AQ00210500		
	Solids	Aquagent® di-Sodium tartrate dihydrate	25 g	AQ00300025		
			100 g	AQ00300100		

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Complet Aquagent®
product information