Karl Fischer Water Content: Volumetric and Coulometric

Titer of a volumetric Karl Fischer reagent from a water standard, water content of a sample in percent and ppm, and the water equivalent of a coulometric charge.

Method: Karl Fischer stoichiometry (1 H_2O : 1 I_2 : 2 e^-)

Input parameters

Unit system: SI

Parameter	Value	Unit
Water in the standard	30.000	mg
Titrant used on the standard	6.0200	mL
Titrant used on the sample	3.4500	mL
Blank (drift) volume	0.050000	mL
Sample mass	2.0000	g
Coulometric charge (0 to skip)	3.3333e-04	Ah

Calculated results

Parameter	Value	Unit
Titer (mg water per mL)	0.004983	
Water found	16.944	mg
Water content	0.84718	%
Water content (ppm by mass)	8,471.8	
Water from the coulometric charge	0.11203	mg

Notes for this case

• Volumetric: the titer F (mg water per mL) comes from a weighed water standard; water = (V − V_blank)·F and content = water/sample mass. Coulometric: iodine is generated electrically and one water molecule consumes one I_2, i.e. two electrons, so water = Q·M_w/(2F) (about 0.0933 mg per coulomb). Coulometry suits 10 µg–10 mg of water; volumetric suits larger amounts. Side reactions (ketones, aldehydes, oxidisers) need special reagents.

Formula and method

$$F = \frac{m_{std}}{V_{std}}, \quad w = \frac{(V - V_b)F}{m}, \quad m_{w,c} = \frac{QM_w}{2F_c}$$

Variables

m_{std}	Water in the standard	kg
V_{std}	Titrant used on the standard	m³
V	Titrant used on the sample	m³
V_b	Blank (drift) volume	m³
m	Sample mass	kg
Q	Coulometric charge (0 to skip)	C
F	Titer (mg water per mL)	-
m_w	Water found	kg
w	Water content	-
$m_{w,c}$	Water from the coulometric charge	kg

Method and standards

Karl Fischer.

Assumptions and limits

- Stoichiometric KF reaction; no side reactions.

References

Karl Fischer stoichiometry (1 H_2O : 1 I_2 : 2 e^-)

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/instrumentation/analysers/karl-fischer-water-content

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.