Equilibrium Moisture Content by the GAB Isotherm

Equilibrium moisture of a food, grain or other hygroscopic solid at a water activity by the Guggenheim–Anderson–de Boer isotherm with user constants.

Method: Perry's Chemical Engineers' Handbook; 9th ed. (McGraw-Hill, 2019); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Water activity (relative humidity)	60.000	%
Monolayer moisture (dry basis)	0.070000	kg/kg
GAB constant C	10.000	
GAB constant K	0.85000	

Calculated results

Parameter	Value	Unit
Equilibrium moisture, dry basis	0.13033	kg/kg
Equilibrium moisture, wet basis	11.531	%

Notes for this case

- GAB constants come from fitting sorption data for the material at the temperature of interest; they change with temperature.

Formula and method

$$M = \frac{M_m C K a_w}{(1 - K a_w)(1 - K a_w + C K a_w)}, \quad w = \frac{M}{1 + M}$$

Variables

a_w	Water activity (relative humidity)	-
M_m	Monolayer moisture (dry basis)	kg/kg
C	GAB constant C	-
K	GAB constant K	-
M	Equilibrium moisture, dry basis	kg/kg
w	Equilibrium moisture, wet basis	-

Method and standards

GAB isotherm.

Assumptions and limits

- Constants valid over the fitted range.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 12 (equilibrium moisture and sorption isotherms)
- van den Berg and Bruin (1981)
- GAB equation

Report details

Report reference	FCC-X0TB-80FF (the same inputs always give the same reference)
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Calculator	Equilibrium Moisture Content by the GAB Isotherm
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/chemical/unit-operations/equilibrium-moisture-gab

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.