Reduction Water to Bring Spirit to Bottling Strength (OIML)

Water to add to a spirit of known % vol to reach a bottling strength, and the final volume at 20 °C, by mass balance with OIML R 22 densities (contraction included).

Method: OIML R 22 (1973); Alcoholometry; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Spirit volume at 20 °C	1,000.0	L
Spirit strength	96.000	%
Bottling strength	40.000	%

Calculated results

Parameter	Value	Unit
Water to add	1,467.9	kg
Water to add at 20 °C	1,470.5	L
Final volume at 20 °C	2,400.0	L
Water by the naive volume rule	1,400.0	L

Notes for this case

- Add the water slowly with mixing and check the strength after the blend has returned to 20 °C.

Formula and method

$$p_2 m_2 = p_1 m_1, \quad m_w = m_2 - m_1, \quad V_2 = \frac{m_2}{\rho_{20}(p_2)}$$

Variables

V_1	Spirit volume at 20 °C	m³
q_1	Spirit strength	-
q_2	Bottling strength	-
m_w	Water to add	kg
V_w	Water to add at 20 °C	m³
V_2	Final volume at 20 °C	m³
$V_1(q_1/q_2 - 1)$	Water by the naive volume rule	m³

Method and standards

Mass balance with R 22 densities.

Assumptions and limits

- Volumes at 20 °C; pure water.

References

- OIML R 22 (1973)
- Alcoholometry
- and International Alcoholometric Tables (1975): formula of Wagenbreth and Blanke
- pp. 12–13

Report details

Report reference	FCC-P3A2-8RBB (the same inputs always give the same reference)
Generated	17 November 2026, 19:50 UTC
Calculator	Reduction Water to Bring Spirit to Bottling Strength (OIML)
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/sugar-ethanol/alcoholometry/spirit-reduction-water-oiml

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.