Acentric Factor from a Vapour Pressure

Pitzer's acentric factor from the vapour pressure at a reduced temperature of 0.7, interpolated from two measured vapour-pressure points.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Critical temperature	132.50	°C
Critical pressure	112.80	bar
Temperature of vapour-pressure point 1	-13.150	°C
Vapour pressure at T_1	2.5520	bar
Temperature of vapour-pressure point 2	26.850	°C
Vapour pressure at T_2	10.620	bar

Calculated results

Parameter	Value	Unit
Temperature at T_r = 0.7	10.805	°C
Vapour pressure at T_r = 0.7	6.2905	bar
Acentric factor	0.25362	

Formula and method

$$\omega = -\log_{10}\left(\frac{p_s}{p_c}\right)_{T_r=0.7} - 1, \quad \ln\frac{p_s}{p_1} = \beta\left(\frac{1}{T_1} - \frac{1}{T}\right)$$

Variables

T_c	Critical temperature	K
p_c	Critical pressure	Pa
T_1	Temperature of vapour-pressure point 1	K
p_1	Vapour pressure at T_1	Pa
T_2	Temperature of vapour-pressure point 2	K
p_2	Vapour pressure at T_2	Pa
$0.7T_c$	Temperature at T_r = 0.7	K
$p_s(0.7T_c)$	Vapour pressure at T_r = 0.7	Pa
ω	Acentric factor	-

Method and standards

Definition with two-point interpolation.

Assumptions and limits

- Clausius–Clapeyron between the points.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 2 (acentric factor definition ω = −log₁₀(p_s/p_c)|T_r=0.7 − 1)
- ln p linear in 1/T between the two points (Clausius–Clapeyron)

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/chemical/physical-properties/acentric-factor

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.