Thoma Cavitation Parameter and NPSH Required from Specific Speeds

Thoma cavitation number sigma = NPSHR/H, from the specific speed and suction specific speed, the NPSH required and the margin against an available NPSH.

Input parameters

Unit system: SI

Parameter	Value	Unit
Pump head per stage	60.000	m
Speed	1,480.0	rpm
Flow per impeller eye	360.00	m³/h
Suction specific speed (US units)	9,000.0	
NPSH available	6.0000	m

Calculated results

Parameter	Value	Unit
Specific speed (US units)	1,121.2	
Thoma parameter	0.062218	
NPSH required	3.7331	m
NPSH margin ratio	1.6073	

Notes for this case

• Both specific speeds are in US units (rpm, gpm, ft) at best efficiency; for a double-suction impeller use half the flow. Suction specific speeds of 8,500-11,000 are common; higher values need more care with recirculation at low flow. NPSHR here is the 3 % head-drop value; keep a margin above it.

Formula and method

$$\sigma = \frac{NPSH_R}{H} = \left(\frac{n_s}{S}\right)^{4/3}, \quad n_s = \frac{n\sqrt{Q}}{H^{3/4}}, \quad S = \frac{n\sqrt{Q}}{NPSH_R^{3/4}}$$

Variables

H	Pump head per stage	m
n	Speed	rad/s
Q	Flow per impeller eye	m³/s
S	Suction specific speed (US units)	-
$NPSH_A$	NPSH available	m
n_s	Specific speed (US units)	-
σ	Thoma parameter	-
$NPSH_R$	NPSH required	m
$NPSH_A/NPSH_R$	NPSH margin ratio	-

Method and standards

Thoma parameter and suction specific speed.

Assumptions and limits

- Best-efficiency point; 3 % head-drop criterion.

Report details

Report reference	FCC-R31G-7CPZ (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Thoma Cavitation Parameter and NPSH Required from Specific Speeds
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
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/mechanical/pumps/thoma-cavitation-parameter

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.