Pump Specific Speed and Suction Specific Speed

Specific speed nq (metric) and Ns (US), suction specific speed Nss, and the dimensionless value of a centrifugal pump at its best efficiency point.

Method: ANSI/HI 1.3 (specific speed); ANSI/HI 9.6.1 (suction specific speed)

Input parameters

Unit system: SI

Parameter	Value	Unit
Speed	2,950.0	rpm
Flow at best efficiency, per impeller eye For a double-suction impeller enter half the pump flow.	100.00	m³/h
Head at best efficiency, per stage For a multistage pump divide the total head by the number of stages.	80.000	m
NPSH required at best efficiency (first stage)	4.0000	m

Calculated results

Parameter	Value	Unit
Specific speed nq (rpm, m³/s, m)	18.380	
Specific speed Ns (rpm, US gpm, ft)	949.26	
Suction specific speed Nss (rpm, US gpm, ft)	8,977.5	
Dimensionless specific speed	0.34733	

Formula and method

$$n_q = \frac{n\sqrt{Q}}{H^{3/4}} \quad (\text{rpm},\ \text{m}^3/\text{s},\ \text{m}) \qquad N_s = \frac{n\sqrt{Q}}{H^{3/4}} \quad (\text{rpm},\ \text{US gpm},\ \text{ft})$$

$$N_{ss} = \frac{n\sqrt{Q}}{NPSH_r^{3/4}} \quad (\text{rpm},\ \text{US gpm},\ \text{ft}) \qquad \omega_s = \frac{\omega\sqrt{Q}}{(gH)^{3/4}},\quad \omega = 2\pi n$$

Variables

n	speed	1/s
Q	flow at best efficiency per impeller eye	m³/s
H	head at best efficiency per stage	m
$NPSH_r$	NPSH required at best efficiency, first stage	m
n_q	specific speed, metric	–
N_s	specific speed, US units	–
N_{ss}	suction specific speed, US units	–
ω_s	dimensionless specific speed	–
g	standard gravity, 9.806 65	m/s²

Method and standards

Definitions of ANSI/HI 1.3 (specific speed) and ANSI/HI 9.6.1 (suction specific speed). Unit conversions from FireCAD's unit registry (NIST SP 811 factors).

Assumptions and limits

- At the best efficiency point with the full impeller diameter.
- Per stage for multistage pumps and per impeller eye for double-suction impellers (enter half the flow).

References

• ANSI/HI 1.3 (specific speed)

• ANSI/HI 9.6.1 (suction specific speed)

Report details

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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/pump-specific-speed

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Reopens the calculator with the inputs of this report.