Vortex Flowmeter Shedding Frequency (Strouhal)

Vortex shedding frequency behind a bluff body from the flow velocity, bluff body width and Strouhal number, with the K-factor and flow per pulse.

Method: Strouhal relation f = St v / d (von Kármán vortex street)

Input parameters

Unit system: SI

Parameter	Value	Unit
Volume flow	50.000	m³/h
Pipe inside diameter	77.900	mm
Bluff body width	22.000	mm
Strouhal number About 0.2 for many bluff bodies over a wide Reynolds range; the meter maker gives the exact value.	0.20000	

Calculated results

Parameter	Value	Unit
Mean velocity in the pipe	2.9141	m/s
Shedding frequency St v / d	26.492	Hz
Pulses per m³	1,907.4	

Notes for this case

- Uses the mean pipe velocity; real meters are calibrated, and the blockage of the body raises the local velocity.

Formula and method

$$f = \frac{St\, v}{d}, \quad K = \frac{f}{Q} = \frac{St}{d\, A}$$

Variables

Q	Volume flow	m³/s
D	Pipe inside diameter	m
d	Bluff body width	m
St	Strouhal number	-
v	Mean velocity in the pipe	m/s
f	Shedding frequency St v / d	1/s
K	Pulses per m³	-

Method and standards

Strouhal relation for periodic vortex shedding.

Assumptions and limits

- The mean pipe velocity is used. The real shedding frequency depends on the gap velocity past the body (higher than the pipe mean because of blockage), which the meter's calibrated K-factor includes.
- No Reynolds-number check: shedding is regular only above a minimum Reynolds number given by the meter maker (typically a few thousand to about 20 000); below it the meter cuts off.
- Constant Strouhal number.

References

- Strouhal relation f = St v / d (von Kármán vortex street)

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/instrumentation/flow/vortex-shedding-frequency

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.