# Isokinetic Sampling: Nozzle Flow and Meter Reading

Sample flow through a nozzle for isokinetic dust sampling, converted to dry gas meter conditions, and the nozzle size for a target meter flow.

**Method:** Isokinetic condition and ideal-gas correction to meter conditions (EPA Method 5 principle; ISO 9096)

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Stack gas velocity at the point | 15.000 | m/s |
| Nozzle diameter | 6.0000 | mm |
| Stack gas temperature | 140.00 | °C |
| Stack pressure (absolute) | 100.00 | kPa |
| Gas meter temperature | 25.000 | °C |
| Gas meter pressure (absolute) | 99.000 | kPa |
| Stack moisture (removed before the meter) | 10.000 | % |
| Target meter flow (for nozzle choice) | 15.000 | L/min |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Sample flow at stack conditions | 25.447 | L/min |
| Dry flow at the meter | 16.694 | L/min |
| Nozzle for the target meter flow | 5.6874 | mm |

**Notes for this case**

- Isokinetic: gas enters the nozzle at the stack velocity, so particles are neither over- nor under-sampled.

## Formula and method

$$\dot{V}_s = v_s \frac{\pi d_n^2}{4}, \quad \dot{V}_m = \dot{V}_s \frac{T_m}{T_s} \cdot \frac{p_s}{p_m} (1 - B_{ws})$$

### Variables

| | | |
|---|---|---|
| $v_s$ | Stack gas velocity at the point | m/s |
| $d_n$ | Nozzle diameter | m |
| $T_s$ | Stack gas temperature | K |
| $p_s$ | Stack pressure (absolute) | Pa |
| $T_m$ | Gas meter temperature | K |
| $p_m$ | Gas meter pressure (absolute) | Pa |
| $B_{ws}$ | Stack moisture (removed before the meter) | - |
| $\dot{V}_t$ | Target meter flow (for nozzle choice) | m³/s |
| $\dot{V}_s$ | Sample flow at stack conditions | m³/s |
| $\dot{V}_m$ | Dry flow at the meter | m³/s |
| $d_t$ | Nozzle for the target meter flow | m |

### Method and standards

Continuity and ideal gas.

### Assumptions and limits

- Ideal gas.

### References

- Isokinetic condition and ideal-gas correction to meter conditions (EPA Method 5 principle; ISO 9096)

## Report details

| | |
|---|---|
| Report reference | FCC-RQ6N-Y39F (the same inputs always give the same reference) |
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| Calculator | Isokinetic Sampling: Nozzle Flow and Meter Reading |
| Method last reviewed | 12 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/environmental/air-pollution/isokinetic-sampling-flow

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.