HCl in Flue Gas from Fuel Chlorine

HCl formed from the chlorine in a fuel (biomass, slop, coal) and its concentration in the flue gas, with the share of chlorine leaving as HCl rather than salts.

Method: Mass balance Cl → HCl (molar masses, IUPAC); ppm on the molar volume at 0 °C; 1 atm

Input parameters

Unit system: SI

Parameter	Value	Unit
Fuel fired	10.000	t/h
Chlorine in the fuel (as fired)	0.30000	%
Share of chlorine released as HCl The rest stays as KCl / NaCl in ash and deposits. It depends on the fuel's potassium, sodium and sulphur; 60 % is a FireCAD starting value. Use measured or published data for your fuel.	60.000	%
Flue gas flow (dry, normal)	100,000	Nm³/h

Calculated results

Parameter	Value	Unit
HCl formed	18.512	kg/h
HCl concentration (dry, normal)	185.12	mg/Nm³
HCl by volume (dry)	113.81	ppm

Notes for this case

- Chlorine also drives high-temperature corrosion of superheaters with potassium-rich ash.

Formula and method

$$\dot{m}_{HCl} = \dot{m}_f Cl\, f \frac{M_{HCl}}{M_{Cl}}, \quad c = \frac{\dot{m}_{HCl}}{\dot{V}_n}$$

Variables

$\dot{m}_f$	Fuel fired	kg/s
Cl	Chlorine in the fuel (as fired)	-
f	Share of chlorine released as HCl	-
$\dot{V}_n$	Flue gas flow (dry, normal)	Nm³/s
$\dot{m}_{HCl}$	HCl formed	kg/s
c_{HCl}	HCl concentration (dry, normal)	kg/m³
y_{HCl}	HCl by volume (dry)	-

Method and standards

Mass balance of chlorine: the share released as HCl is converted with the molar masses of HCl and Cl; the volume fraction uses the ideal-gas molar volume at 0 °C and 101.325 kPa.

Assumptions and limits

- Dry, normal basis, at the actual O_2 of the gas: not corrected to a reference O_2. Correct it with the emission O_2 correction calculator before comparing with a limit.
- The flue gas flow is your input and is not checked against the fuel fired; take it from the combustion calculator for the same fuel and excess air.
- The release share depends on the fuel; 60 % is a starting value, not a published figure.

References

- Mass balance Cl → HCl (molar masses, IUPAC); ppm on the molar volume at 0 °C

- 1 atm

Report details

Report reference	FCC-CK1R-0AB8 (the same inputs always give the same reference)
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Method last reviewed	13 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/boilers-power-plant/emissions-stacks/hcl-from-fuel-chlorine

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.