Pitting Factor and Extreme Pit Depth Extrapolation

Pitting factor from the deepest pit and average penetration, and the deepest pit expected over a larger structure area by Gumbel extreme-value scaling.

Method: Pitting factor (ASTM G46) and Gumbel extreme-value area scaling d_A = d_a + α ln(A/a) (Shibata; Jones, Principles and Prevention of Corrosion, 2nd ed. (Prentice Hall, 1996))

Input parameters

Unit system: SI

Parameter	Value	Unit
Deepest pit in the inspected sample	0.80000	mm
Average penetration (from weight loss)	0.10000	mm
Gumbel scale parameter of pit depths	0.12000	mm
Inspected sample area	0.010000	m²
Total structure area	100.00	m²
Wall thickness	6.0000	mm

Calculated results

Parameter	Value	Unit
Pitting factor	8.0000	
Expected deepest pit over A	1.9052	mm
Remaining wall at the deepest pit	4.0948	mm

Notes for this case

- Gumbel scale α is fitted from the deepest pits of several equal sample areas (ASTM G46 approach). Extrapolating far beyond the sampled area adds uncertainty. The deepest pit of one sample stands in for the fitted location parameter, and no confidence level is applied.

Formula and method

$$PF = \frac{p_{max}}{\bar{d}}, \quad d_A = p_{max} + \alpha \ln \frac{A}{a}$$

Variables

p_{max}	Deepest pit in the inspected sample	m
$\bar{d}$	Average penetration (from weight loss)	m
α	Gumbel scale parameter of pit depths	m
a	Inspected sample area	m²
A	Total structure area	m²
t	Wall thickness	m
PF	Pitting factor	-
d_A	Expected deepest pit over A	m
$t - d_A$	Remaining wall at the deepest pit	m

Method and standards

Extreme-value statistics.

Assumptions and limits

- Gumbel distribution of maximum pit depths.
- The deepest pit of one sample stands in for the Gumbel location parameter λ; the standard procedure fits λ and α from the deepest pits of several samples. The result is a best estimate with no confidence level: add a margin, or use the fitted λ, for an inspection decision.

References

• Pitting factor (ASTM G46) and Gumbel extreme-value area scaling d_A = d_a + α ln(A/a) (Shibata; Jones, Principles and Prevention of Corrosion, 2nd ed. (Prentice Hall, 1996))

Report details

Report reference	FCC-6DB6-0TMW (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Pitting Factor and Extreme Pit Depth Extrapolation
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/materials/corrosion/pitting-factor-extreme-depth

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.