Sterilisation Value F_0 and Equivalent Time

Lethality F_0 (minutes at 121.1 °C) of a hold at temperature T for a z-value, and the time at T to reach a target F_0 (thermal process definition).

Method: Thermal process lethality: L = 10^((T − T_ref)/z); F = Σ L Δt; F_0 for z = 10 °C and T_ref = 121.1 °C

Input parameters

Unit system: SI

Parameter	Value	Unit
Process temperature	121.00	°C
Time at temperature	5.0000	min
z-value	10.000	K
Reference temperature	121.10	°C
Target F-value	3.0000	min

Calculated results

Parameter	Value	Unit
Lethal rate	0.97724	
Lethality delivered	4.8862	min
Time at T for the target	3.0699	min

Notes for this case

• Low-acid canned foods need F_0 ≥ 3 min (12 log reductions of C. botulinum); commercial processes often target 6–15. This is a screening figure for a constant temperature: a real process is set by a process authority from the measured cold-spot curve.

Formula and method

$$L = 10^{(T-T_{ref})/z}, \quad F = L\,t, \quad t^* = \frac{F^*}{L}$$

Variables

T	Process temperature	K
t	Time at temperature	s
z	z-value	K
T_{ref}	Reference temperature	K
F^*	Target F-value	s
L	Lethal rate	-
F	Lethality delivered	s
t^*	Time at T for the target	s

Method and standards

Thermal process lethality definition.

Assumptions and limits

- Constant temperature at the cold spot. A real retort process needs the general method, summing L Δt over the measured cold-spot heating and cooling curve.
- The F_0 ≥ 3 min figure is a regulatory minimum quoted for orientation; this calculator is a screening tool, not a process establishment.

References

• Thermal process lethality: L = 10^((T − T_ref)/z)
• F = Σ L Δt; F_0 for z = 10 °C and T_ref = 121.1 °C

Report details

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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/chemical/food-dairy/f0-lethality

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.