Larson–Miller Parameter: Creep Life and Temperature

Larson–Miller parameter from a temperature and time to rupture, the equivalent life at another temperature, and the temperature for a target creep life.

Method: Larson and Miller (1952)

Input parameters

Unit system: SI

Parameter	Value	Unit
Temperature of the known life	550.00	°C
Known time to rupture at T_1	100,000	h
Larson–Miller constant About 20 for most steels; fitted from creep data for a particular alloy.	20.000	
Another temperature	575.00	°C
Target life	200,000	h

Calculated results

Parameter	Value	Unit
Larson–Miller parameter (K, time in hours)	20,579	
Equivalent life at T_2 (same stress)	18,327	h
Temperature for the target life (same stress)	540.21	°C

Notes for this case

- Same stress at both temperatures; for remaining-life decisions use the material's creep-rupture data and an inspection-based assessment.

Formula and method

$$LMP = T(C + \log_{10} t_h)$$

$$t_2 = 10^{LMP/T_2 - C}$$

$$T_3 = \frac{LMP}{C + \log_{10} t_3}$$

Variables

T_1	temperature of the known life	K
t_1	known time to rupture	s
C	Larson–Miller constant	-
T_2	another temperature	K
t_3	target life	s
t_h	time in hours	h
T	absolute temperature	K
LMP	Larson–Miller parameter	K
t_2	equivalent life at T_2	s
T_3	temperature for the target life	K

Method and standards

The Larson–Miller parameter combines temperature and time to rupture at a given stress into one number: at constant stress, all combinations with the same LMP give rupture.

Assumptions and limits

- Same stress; C from material data; no oxidation or wall thinning.
- Stress is not an input and no safety factor is applied: the results compare temperature and time at one stress. They are not a remaining-life assessment of boiler tubes, which needs the material's creep-rupture data at the actual stress, wall thickness measurements and inspection.

References

- Larson and Miller (1952)

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/materials/properties/larson-miller-parameter

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.