Liquidus Temperature of Low-Alloy Steel from Composition

Liquidus temperature of a low-alloy steel from carbon and alloy contents, with the delta-iron form below 0.5 % C and the austenite form from 0.5 to 1.0 % C.

Input parameters

Unit system: SI

Parameter	Value	Unit
Carbon	0.20000	%
Silicon	0.25000	%
Manganese	0.80000	%
Phosphorus	0.020000	%
Sulphur	0.010000	%
Chromium	0.10000	%
Nickel	0.10000	%
Molybdenum	0.020000	%
Vanadium	0	%
Aluminium	0.030000	%

Calculated results

Parameter	Value	Unit
Liquidus temperature	1,514.0	°C
Depression by alloying elements	-8.4250	K
Equation used (1: δ-iron, below 0.5 % C; 2: austenite, 0.5-1.0 % C)	1.0000	

Notes for this case

- The alloy coefficients (°C per %): Si −14, Mn −4, P −30, S −45, Cr −1.5, Ni −3.5, Mo −5, V −4, Al −2.5, assumed additive. Tapping and casting superheats are set above this liquidus.

Formula and method

$$T_L = 1537 - 73.1[\%C] + \sum a_i[\%X_i] \ (\%C < 0.5), \quad T_L = 1531 - 61.5[\%C] + \sum a_i[\%X_i] \ (0.5 \le \%C \le 1.0)$$

Variables

$[\%C]$	Carbon	-
$[\%Si]$	Silicon	-
$[\%Mn]$	Manganese	-
$[\%P]$	Phosphorus	-
$[\%S]$	Sulphur	-
$[\%Cr]$	Chromium	-
$[\%Ni]$	Nickel	-
$[\%Mo]$	Molybdenum	-
$[\%V]$	Vanadium	-
$[\%Al]$	Aluminium	-
T_L	Liquidus temperature	K
$\sum a_i[\%X_i]$	Depression by alloying elements	K

form	Equation used (1: δ-iron, below 0.5 % C; 2: austenite, 0.5-1.0 % C)	-

Method and standards

Additive liquidus depression from binary Fe-X systems.

Assumptions and limits

- Low-alloy steels; coefficients additive.

Report details

Report reference	FCC-8TZ7-XPQF (the same inputs always give the same reference)
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Release checks	3 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/steelmaking-foundry/steel-liquidus-temperature

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Reopens the calculator with the inputs of this report.