LMTD (Log Mean Temperature Difference)

Log mean temperature difference of a heat exchanger in counterflow or parallel flow from the four terminal temperatures, with the F correction factor.

Method: Incropera; Fundamentals of Heat and Mass Transfer; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Hot stream inlet	150.00	°C
Hot stream outlet	90.000	°C
Cold stream inlet	30.000	°C
Cold stream outlet	70.000	°C
Flow arrangement	Counterflow	
LMTD correction factor (1 for pure counterflow) For shell-and-tube exchangers with more than one tube pass, and for cross-flow, read F from the TEMA or textbook charts; 1 for true counterflow or a condensing or boiling stream.	1.0000	

Calculated results

Parameter	Value	Unit
Log mean temperature difference	69.521	K
Corrected mean temperature difference	69.521	K
Terminal difference at the hot inlet end	80.000	K
Terminal difference at the hot outlet end	60.000	K

Formula and method

$$\Delta T_{lm} = \frac{\Delta T_1 - \Delta T_2}{\ln(\Delta T_1 / \Delta T_2)} \qquad \text{corrected}: \; F\Delta T_{lm}$$

Variables

$T_{h,in}$	hot stream inlet temperature	K
$T_{h,out}$	hot stream outlet temperature	K
$T_{c,in}$	cold stream inlet temperature	K
$T_{c,out}$	cold stream outlet temperature	K
flow	counterflow or parallel flow	–
F	LMTD correction factor	–
ΔT_{lm}	log mean temperature difference	K
$F\Delta T_{lm}$	corrected mean temperature difference	K
ΔT_1	terminal difference at the hot inlet end	K
ΔT_2	terminal difference at the hot outlet end	K

Method and standards

The log mean temperature difference for counterflow and parallel-flow exchangers with constant specific heats and overall coefficient (Incropera, Fundamentals of Heat and Mass Transfer, ch. 11). Other arrangements use the counterflow LMTD times the correction factor F read from the charts for the exchanger type (TEMA, textbooks).

Assumptions and limits

- Constant specific heats and overall coefficient along the exchanger; no phase change with a change of temperature.
- When $\Delta T_1 = \Delta T_2$ the LMTD equals that difference.

- A temperature cross (a terminal difference of zero or less) is rejected for the arrangement chosen.
- F applies to the counterflow LMTD; F below 1 with parallel flow is flagged.

References

- Incropera
- Fundamentals of Heat and Mass Transfer
- ch. 11; TEMA (F factor charts)

Report details

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Release checks	4 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/mechanical/heat-transfer/lmtd

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Reopens the calculator with the inputs of this report.