# Distillation Feed Condition (q) and q-Line Slope

Feed thermal condition q of a distillation column from the feed, saturated liquid and saturated vapour enthalpies, with the q-line slope and vaporised share.

**Method:** q = (H_V − h_F)/(H_V − h_L); q-line slope q/(q − 1) (McCabe–Thiele)

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Feed enthalpy | 150.00 | kJ/kg |
| Saturated liquid enthalpy at feed-plate pressure | 200.00 | kJ/kg |
| Saturated vapour enthalpy | 1,000.0 | kJ/kg |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Feed condition q | 1.0625 | |
| Share vaporised (0–1 for a two-phase feed) | -0.062500 | |
| q-line angle from the horizontal | 86.634 | ° |

**Notes for this case**

- Feed is sub-cooled liquid. The q-line passes through (x_F, x_F) with slope q/(q − 1).

## Formula and method

$$q = \frac{h_V - h_F}{h_V - h_L}, \quad \text{slope} = \frac{q}{q-1}, \quad \theta = \arctan(\text{slope}),\ 0 \le \theta < 180^\circ$$

### Variables

| | | |
|---|---|---|
| $h_F$ | Feed enthalpy | J/kg |
| $h_L$ | Saturated liquid enthalpy at feed-plate pressure | J/kg |
| $h_V$ | Saturated vapour enthalpy | J/kg |
| $q$ | Feed condition q | - |
| $1 - q$ | Share vaporised (0–1 for a two-phase feed) | - |
| $\theta$ | q-line angle from the horizontal | rad |

### Method and standards

Definition.

### Assumptions and limits

- Constant molal overflow.
- The angle is measured anticlockwise from the +x axis and given between 0° and 180°: a part-vaporised feed (0 < q < 1) has a q-line falling to the right, for example 135° at q = 0.5.

### References

- q = (H_V − h_F)/(H_V − h_L); q-line slope q/(q − 1) (McCabe–Thiele)

## Report details

| | |
|---|---|
| Report reference | FCC-F6BN-V6PH (the same inputs always give the same reference) |
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| Calculator | Distillation Feed Condition (q) and q-Line Slope |
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| Software release | FireCAD Calc, release of 17 November 2026 |
| 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/chemical/separation/distillation-q-line

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.