Component Molar and Mass Flows of a Stream

Total molar flow and each component's molar and mass flow for a stream of known mass flow and mole fractions (up to four components).

Method: ṅ = ṁ/M̄; M̄ = Σ y_i M_i

Input parameters

Unit system: SI

Parameter	Value	Unit
Total mass flow	5,000.0	kg/h
Component 1: mole fraction	75.000	%
Component 1: molar mass	2.0159	kg/kmol
Component 2: mole fraction	25.000	%
Component 2: molar mass	28.013	kg/kmol
Component 3: mole fraction	0	%
Component 3: molar mass	17.031	kg/kmol
Component 4: mole fraction	0	%
Component 4: molar mass	39.948	kg/kmol

Calculated results

Parameter	Value	Unit
Mean molar mass	8.5153	kg/kmol
Total molar flow	587.18	kmol/h
Component 1: molar flow	440.39	kmol/h
Component 1: mass flow	887.77	kg/h
Component 2: molar flow	146.80	kmol/h
Component 2: mass flow	4,112.2	kg/h
Component 3: molar flow	0	kmol/h
Component 3: mass flow	0	kg/h
Component 4: molar flow	0	kmol/h
Component 4: mass flow	0	kg/h

Formula and method

$$\bar{M} = \sum y_i M_i, \quad \dot{n} = \frac{\dot{m}}{\bar{M}}, \quad \dot{n}_i = y_i \dot{n}, \quad \dot{m}_i = \dot{n}_i M_i$$

Variables

$\dot{m}$	Total mass flow	kg/s
y_1	Component 1: mole fraction	-
M_1	Component 1: molar mass	kg/kmol
y_2	Component 2: mole fraction	-
M_2	Component 2: molar mass	kg/kmol
y_3	Component 3: mole fraction	-
M_3	Component 3: molar mass	kg/kmol
y_4	Component 4: mole fraction	-

M_4	Component 4: molar mass	kg/kmol
$\bar{M}$	Mean molar mass	kg/kmol
$\dot{n}$	Total molar flow	mol/s
$\dot{n}_1$	Component 1: molar flow	mol/s
$\dot{m}_1$	Component 1: mass flow	kg/s
$\dot{n}_2$	Component 2: molar flow	mol/s
$\dot{m}_2$	Component 2: mass flow	kg/s
$\dot{n}_3$	Component 3: molar flow	mol/s
$\dot{m}_3$	Component 3: mass flow	kg/s
$\dot{n}_4$	Component 4: molar flow	mol/s
$\dot{m}_4$	Component 4: mass flow	kg/s

Method and standards

Definitions.

Assumptions and limits

- Up to four components.

References

- ṅ = ṁ/M̄
- M̄ = Σ y_i M_i

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/chemical/gas-mixtures/molar-flow-components

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.