$$\underbrace{\ca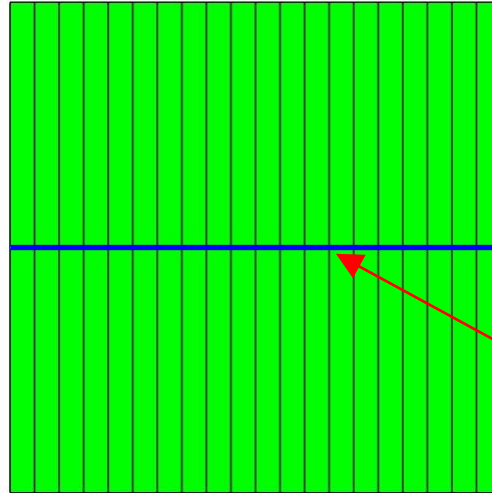ncel{\int_{V_P} \frac{\partial \rho\phi}{\partial t} dV}}_{\text{Temporal derivative}} + \underbrace{\int_{V_P} \nabla \cdot (\rho\mathbf{u}\phi)\, dV}_{\text{Convective term}} - \underbrace{\cancel{\int_{V_P} \nabla \cdot (\rho\Gamma_\phi \nabla\phi)\, dV}}_{\text{Diffusion term}} = \underbrace{\int_{V_P} S_\phi(\phi)\, dV}_{\text{Source term}}$$

$U = 1$

$\phi = 1$

Volumetric source term
In the whole domain

$\phi_{inlet} = 0$

$\dfrac{\partial \phi}{\partial x} = 0$

Sampling line

Note:
All dimensions are in
the SI system (MKS).

$x_{inlet} = 0$

$x_{outlet} = 1$

$$\frac{\partial \phi}{\partial x} = 1$$

$$\phi_x = x$$

Governing equation

Analytical solution