

# Inlet\_Boundary\_Condition

This data setup are used to define the inflow condition features. The inflow geometry is restricted to rectangular/line forms in 3D/2D configuration. In the particular case of cylindrical geometries, the inlets can be circular, annular or bowed rectangular. In fact, the geometry of the inlet fits the grid topology.

## Full data set of the namelist

```
&Inlet_Boundary_Conditions
  Type_of_BC= "INLET", Direction_Normal_Plan= 1 ,
  Plan_Location_Coordinate= -0.05 ,
  Start_Coordinate_of_First_Span = -0.01, End_Coordinate_of_First_Span =
0.01,
  Start_Coordinate_of_Second_Span= 0.0 , End_Coordinate_of_Second_Span=
0.0 ,
  Flow_Direction= 1 ,
  Normal_Velocity_Reference_Value= 1.5E-3 ,
  Temperature_Reference_Value= 293.0 ,
  Density_Reference_Value= 1.66328E-1,
  Define_Velocity_profile= 0 ,
  Species_Boundary_Condition_Type= 0 , Define_Mass_Fraction_profile= 0 ,
  Temporal_Variation_For_Each_Species= 0 ,
  Species_Reference_Value= 1.0 ,
  Time_Fct_Name= "Sinus" , Time_Fct_Threshold= 0.0 ,
  Time_Fct_Time_Scale= 1.0 , Time_Fct_Magnitude= 0.0 ,
  End_of_Data_Block= .true. /
```



- Whatever the grid topology, the orientation and the span of the inflow are defined by means of :
  - the normal vector of the inlet plane associated to a specific direction (I, J or K).
  - the coordinates associated to the position of the inlet sides along the two perpendicular directions to the normal vector (denoted the first and second span directions).
- When the normal vector is oriented along the I-direction, the first span direction is J and the second is K.
- When the the normal vector is oriented along the J-direction, the first span direction is I and the second is K.
- When the the normal vector is oriented along the K-direction, the first span direction is I and the second is J.
- When the inflow conditions are constant the time data can be omitted.
- Don't forget to set the boolean data "End\_of\_Data\_Block" at the end of the namelist. A ".true." value means the end of the data block when several namelists are used to create several inlets.



Find some examples [here](#) about inflow configurations.

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## Definition of the data set

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### Type\_of\_BC

- Type : String of 6 characters
- Name to define the inflow boundary conditions type. Only one kind of inlet boundary condition is defined at present (Dirichlet type) and the associated name is "INLET".

### Direction\_Normal\_Plan

- Type : integer value
- This data defines the orientation of the normal vector the inlet in respect with the grid {I,J,K}. The values 1, 2 or 3 point the I, J or K-direction, respectively.
- Default value : none

### Plan\_Location\_Coordinate

- Type: real value
- Coordinate of the position of the inlet plan along the normal direction previously defined.
- Default value : none

### Start\_Coordinate\_of\_First\_Span

- Type : real value
- This coordinate defines the lower side of the inlet plan span along "the first direction" (see the note above).
- Default value : none

### End\_Coordinate\_of\_First\_Span

- Type : real value
- This coordinate defines the upper side of the inlet plan span along "the first direction" (see the note above).

### Start\_Coordinate\_of\_Second\_Span

- Type : real value

- This coordinate defines the lower side of the inlet plan span along “the second direction” (see the note above).
- Default value : none

## End\_Coordinate\_of\_Second\_Span

- Type : real value
- This coordinate defines the upper side of the inlet plan span along “the second direction” (see the note above).
- Default value : none

## Flow\_Direction

- Type : integer value
- This value is set to 1 or -1. It indicates the presumed direction of the inflow in accordance to the position of the outlet. If the inflow is oriented along the increasing or decreasing index (for a given direction) the value is set to 1 or -1, respectively.
- Default value : none

## Normal\_Velocity\_Reference\_Value

- Type : real value
- Reference value of the normal component of the velocity. The other ones are automatically set to zero.
- Default value : none

## Define\_Velocity\_profile

- Type : Integer value
- Type of the velocity profile over the inlet :
  - 0 : Uniform profile
  - 1 : Parabolic profile along the first span direction (the mean velocity at the inlet is defined with the “Normal\_Velocity\_Reference\_Value”)
  - 2 : Parabolic profile along the second span direction (the mean velocity at the inlet is defined with the “Normal\_Velocity\_Reference\_Value”)
  - Default value : none

## Variable\_Flowrate

- Type : Integer value
- This data allows the user to define a time variation of the flowrate :
  - 0 : the flowrate is constant
  - 1 : the flowrate is variable in time. The time functions can be defined by the users in the specific module of the code named “module\_user\_defined\_temporal\_function.f90”. The parameters of the time-function can be read from the following variables :
    - Time\_Fct\_Name :character string bounded to the user's time function defined in the module “module\_user\_define\_temporal\_function.f90”. At present, two temporal

functions are available, The sinusoidal function (named "Sinus") and the linear-ramp function, (called " Linear\_Ramp").

- Time\_Fct\_Threshold : time from which the time function starts.
- Time\_Fct\_Time\_Scale : time scale of the function (i.e the period for the sinusoidal function, and the time range for the linear ramp function)
- Time\_Fct\_Magnitude : magnitude of the time function.
- Default value= 0

## Temperature\_Reference\_Value

- Type : real value
- Reference value of the temperature.
- Default value : none

## Density\_Reference\_Value

- Type : real value
- Reference value of the fluid density.

## Species\_Reference\_Value

- Type : array of real values (the size is determined by the species number considered)
- This data setup defines the reference value of mass fractions for each species
- Default value : none

## Species\_Boundary\_Condition\_Type

- Type : integer value ( **Not for the release SUNFLUIDH\_EDU** ).
- This option defines the inlet boundary
- condition type for the density of species
  - 0 : Dirichlet condition (the mass fraction value is imposed at the center of the ghost-cell).
  - 1 : The mass flux value is imposed on the inlet plan. This flux is defined as the product of the variables "Define\_Velocity\_profile", "Normal\_Velocity\_Reference\_Value" and "Species\_Reference\_Value" ( $\text{Rho} \cdot U \cdot Y_i$ ).
- Default value : none

## Define\_Mass\_Fraction\_profile

- Type : integer value ( **Not for the release SUNFLUIDH\_EDU** ).
- This data determines the distribution law on the first species mass fraction over the inlet (the complementary law is reported on the 2nd species by default):
  - 0 : Uniform profile
  - 1 : Heaviside profile centered on the inlet
- Default value : none

## Temporal\_Variation\_For\_Each\_Species

- Type : array of integer value (the size is determined by the species number considered. **Not for the release SUNFLUIDH\_EDU** ).
- This data setup defines time function used to define the temporal variation of species. The time functions can be programmed by the user in the fortran file named "module\_user\_define\_temporal\_functions.f90". Sinusoidal and linear ramp functions can be used by means of time parameters already described in the part "Variable\_Flowrate" .
- Default value : none

## End\_of\_Data\_Block

- Type : boolean value
- Specify the end of the namelist or a group of this type of namelist (if true).

From:

<https://sunfluidh.lisn.upsaclay.fr/> - Documentation du code de simulation numérique SUNFLUIDH

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Last update: 2016/11/28 17:48

