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=====
MAIN INPUT DATA FILE : 2D CHANNEL FLOW WITH A CONSTRICTION (A
SQUARE BAR)

                                INCOMPRESSIBLE FLOW
                                ISOTHERM

DIMENSIONLESS LAYOUT :

    Length scale      : h (the channel height)
    Reynolds number    Re_h= rho_0.U_0.h/mu= 100

    dimensionless quantities :
        velocity U*      = U/U_0
        kinetic viscosity= 1/Re_h

    dimensionless domain : Lx/h= 10

    Initialisation = uniform velocity field
    inlet flowrate = uniform profil

INCOMPRESSIBLE DOWNSTEP FLOW

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      |  |
      |__|
---> inflow                outflow --->

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J
^
|
|
---->I
=====
=====
&Version File_Version="VERSION2.0"/
+++++
GENERAL LAYOUT
(DIMENSIONLESS)
+++++
&Fluid_Properties      Reference_Dynamic_Viscosity = 1.00D-02,
Reference_Density= 1.0 /

&Velocity_Initialization I_Velocity_Reference_Value = 1.0 ,
J_Velocity_Reference_Value = 0.0 , K_Velocity_Reference_Value = 0.0 /
=====
DOMAIN FEATURES
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## (DIMENSIONLESS)

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&Domain_Features Start_Coordinate_I_Direction= 0.00 ,
End_Coordinate_I_Direction= 10.00,
                Start_Coordinate_J_Direction= 0.00 ,
End_Coordinate_J_Direction= 1.00,
                Start_Coordinate_K_Direction= 0.00 ,
End_Coordinate_K_Direction= 0.00,
                Cells_Number_I_Direction= 256 ,Cells_Number_J_Direction= 64
,Cells_Number_K_Direction= 1,
                Regular_Mesh= .true. /
-----
```

## GEOMETRY OF THE IMMERSED BODIES

First (and unic) immersed body

```
&Polyhedral_Immersed_Bodies Xi_1= 4.5 , Xj_1= 0.5 ,Xk_1= 0.0 , Xi_2= 5.5
, Xj_2= 0.5 ,Xk_2= 0.0 ,
                Xi_3= 5.5 , Xj_3= 1.0 ,Xk_3= 0.0 , Xi_4= 4.5
, Xj_4= 1.0 ,Xk_4= 0.0 ,
                Wall_BC_DataSetName= "Set1"/
```

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## DEFINITION OF BOUNDARY CONDITIONS

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## WALL BOUNDARY CONDITION SETUP (DIMENSIONLESS)

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## DATA SET FOR THE WALL BOUNDARY CONDITIONS

first set of wall boundary condition  
(This set corresponds to the default wall boundary conditions for the velocity. It is just shown for example and could be removed)

```
&Velocity_Wall_Boundary_Condition_Setup
Wall_BC_DataSetName = "Set1",
West_Wall_Velocity_I= 0.0 , East_Wall_Velocity_I= 0.0 ,
Back_Wall_Velocity_I= 0.0 , Front_Wall_Velocity_I= 0.0 ,
South_Wall_Velocity_I= 0.0 , North_Wall_Velocity_I= 0.0 ,
West_Wall_Velocity_J= 0.0 , East_Wall_Velocity_J= 0.0 ,
Back_Wall_Velocity_J= 0.0 , Front_Wall_Velocity_J= 0.0 ,
South_Wall_Velocity_J= 0.0 , North_Wall_Velocity_J= 0.0 ,
West_Wall_Velocity_K= 0.0 , East_Wall_Velocity_K= 0.0 ,
Back_Wall_Velocity_K= 0.0 , Front_Wall_Velocity_K= 0.0 ,
```

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South_Wall_Velocity_K= 0.0      , North_Wall_Velocity_K= 0.0 /
=====
=
                INLET AND OUTLET  BOUNDARY CONDITIONS
                (DIMENSIONLESS)
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=
Keep in mind that the domain is enclosed by default.
Here the inlet and outlet conditions are located at the ends of the domain.
They replace the walls by default over the areas of interest.

Inlet : Uniform flowrate profil

&Inlet_Boundary_Conditions  Type_of_BC= "INLET", Direction_Normal_Plan= 1 ,
Flow_Direction= 1 ,
                        Plan_Location_Coordinate=  0.0      ,
                        Start_Coordinate_of_First_Span =  0.00  ,
End_Coordinate_of_First_Span = 1.00  ,
                        Start_Coordinate_of_Second_Span= 0.0    ,
End_Coordinate_of_Second_Span= 0.0   ,
                        Normal_Velocity_Reference_Value= 1.0   /

&Outlet_Boundary_Conditions  Type_of_BC= "OUTLET", Direction_Normal_Plan= 1
, Flow_Direction= 1 ,
                        Plan_Location_Coordinate=  10.0     ,
                        Start_Coordinate_of_First_Span =  0.00  ,
End_Coordinate_of_First_Span = 1.00  ,
                        Start_Coordinate_of_Second_Span= 0.0    ,
End_Coordinate_of_Second_Span= 0.0   /
=====
=
                BORDER BOUNDARY CONDITIONS
=====
=
!--- No new boundary conditions are defined at the ends of the domain :
walls by default are preserved, the inlet and outlet previously are defined
above)
!--- As "None" is the default setting for this namelist, it can be removed

&Border_Domain_Boundary_Conditions West_BC_Name= "None" , East_BC_Name=
"None" , Back_BC_Name= "None" , Front_BC_Name= "None" , North_BC_Name=
"None" , South_BC_Name= "None" /
+++++
++
                NUMERICAL METHODS
+++++
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&Numerical_Methods  NS_NumericalMethod= "BDF2-Scheme02"      ,
!--- BDF2 + 2nd order centered scheme
                MomentumConvection_Scheme="Centered-02-Conservative" ,
!--- conservative form for solving the velocity (momentum) equation

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Poisson_NumericalMethod="Home-Multigrid-
ConstantMatrixCoef" / !--- SOR + multigrid method (homemade release) for
solving the Poisson's equation with constant coefficient matrix

&HomeData_PoissonSolver SolverName="SOR" , !---
Successive Over-Relaxation (SOR) method based on the red-black algorithm
Relaxation_Coefficient= 1.7 , !---
Relaxation coefficient of the SOR method ( 1 <= Relaxation_Coefficient < 2)
Number_max_Grid= 4, !---
Number of grid levels
Number_max_Cycle= 10, !---
Number of multigrid cycles
Number_Iteration= 0, !---
Maximum number of SOR iterations method applied for any grid level, if 0 (or
removed) the 3 next data are considered
Number_Iteration_FineToCoarseGrid= 15, !---
number of SOR iterations applied on any grid level during the restriction
step (before the coarsest grid computation)
Number_Iteration_CoarseToFineGrid= 15, !---
number of SOR iterations applied on any grid level during the prolongation
step (after the Coarsest grid computation)
Number_Iteration_CoarsestGrid= 15 , !---
number of SOR iterations applied on the coarsest grid
Convergence_Criterion= 1.D-08 / !---
convergence tolerance on the residu of the Poisson's equation
+++++
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SIMULATION MANAGEMENT
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The numerical time step is imposed

&Simulation_Management Restart_Parameter= 0 ,
Steady_Flow_Stopping_Criterion_Enabled = .true. ,
Steady_Flow_Stopping_Criterion = 1.D-16,
Temporal_Iterations_Number = 100000
, Final_Time = 5.D+02 ,
TimeStep_Type = 0 ,
Timestep_Max = 1.D-03 ,
Simulation_Backup_Rate = 1000 ,
Simulation_Checking_Rate = 101 /
=====
=
PROBES MANAGEMENT
=====
=
Probes order U ,
V , W , T , P , RHO
&Probe_Quantities_Enabled Temporal_Series_For_Quantity_Enabled(:) = .true.,

```

```
.true., .false., .false., .true. , .false. /

&Probe_Location  Xi= 3.0 , Xj= 0.5 , Xk= 0.0  /
&Probe_Location  Xi= 6.0 , Xj= 0.5 , Xk= 0.0 , End_of_Data_Block= .true. /
&Simulation_Management  Probe_Recording_Rate = 10 /

=====
=
                FIELDS RECORDING DECLARATION
=====
=
&Field_Recording_Setup      Precision_On_Instantaneous_Fields= 2 /

!--- Snapshots

&Simulation_Management      Fields_Recording_Rate = 5.D+01  /
&Instantaneous_Fields_Listing  Name_of_Field = "U      " , Recording_Enabled
= .true. /      First velocity component
&Instantaneous_Fields_Listing  Name_of_Field = "V      " , Recording_Enabled
= .true. /      Second velocity component

!--- Statistics

&Simulation_Management      Start_Time_For_Statistics= 1.D+03      ,
Time_Range_Statistic_Calculation = 5.D+00  /

&Statistical_Fields_Listing  Name_of_Field = "<U>    " , Recording_Enabled =
.true. /
&Statistical_Fields_Listing  Name_of_Field = "<V>    " , Recording_Enabled =
.true. /
```

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