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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


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

-----------------------------------------
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
```

```
                     (DIMENSIONLESS)
================================================================================
&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"/
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
              DEFINITION OF BOUNDARY CONDITIONS
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
================================================================================
=
                 WALL BOUNDARY CONDITION SETUP
                     (DIMENSIONLESS)
================================================================================
=
------------------------------------------------
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    ,
```

```
South_Wall_Velocity_K= 0.0    , North_Wall_Velocity_K= 0.0 /
================================================================================
=
               INLET AND OUTLET  BOUNDARY CONDITIONS
                     (DIMENSIONLESS)
================================================================================
=
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
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
&Numerical_Methods  NS_NumericalMethod= "BDF2-SchemeO2"                    ,
!--- BDF2 + 2nd order centered scheme
                     MomentumConvection_Scheme="Centered-O2-Conservative"   ,
!--- conservative form for solving the velocity (momentum) equation
```

```
                    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
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
                  SIMULATION MANAGEMENT
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
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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