Click here to come back to the previous page <file txt input3d.dat>
&Version File_Version="VERSION2.0" /
++

```
MAIN INPUT DATA FILE : 2D CHANNEL FLOW WITH A SQUARE BAR
                       INCOMPRESSIBLE FLOW
                       THERMALLY CONDUCTIVE SQUARE BAR WARMED FROM THE TOP
WALL
                       CHANNEL WALLS AT Tc EXCEPT OVER THE CONTACT AREA
(BAR-CHANNEL WALL) : A LOCAL HEAT FLUX IS IMPOSED
                       TEMPERATURE OF THE INFLOW : Tc
                       GRAVITY & BUOYANCY ARE NEGLECTED
```

GENERAL LAYOUT (DIMENSIONLESS)

+++ &Fluid_Properties Reference_Dynamic_Viscosity = 1.00D-02, Reference_Density= 1.0 ,

```
          DIMENSIONLESS LAYOUT :

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

```
Heat_Transfer_Flow = .true., Reference_Temperature= 1.0,
Prandtl = 0.71 /
```

&Velocity_Initialization I_Velocity_Reference_Value = 1.0 , J_Velocity_Reference_Value = 0.0 , K_Velocity_Reference_Value = 0.0 /

```
               dimensionless quantities :
                 velocity U*       = U/U_0
                 temperature T*= T/T0      with T0= Tc ---> Tc*= 1
                 kinetic viscosity= 1/Re_h

               Physical properties of the bar   Cp*= 1 , rho_solid*= 1 ,
lambda_solid*= 1 , heat flux from the wall Qo=1

               dimensionless domain : Lx/h= 10

               Initialization : uniform velocity field
               inlet flowrate = uniform profil
```

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. /
```

Tc Qo

———————————————————-

```
     GEOMETRY OF THE IMMERSED BODIES
```

———————————————————-

—> inflow outflow —>

First immersed body (thermally conductive material)

```
    (Tc)
```

&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 ="Set2" /
```

Tc

J

Second immersed body (body embedded in the front wall of the channel in order to define a local boundary condition at this place) Note : the low wall of the body (front wall) must fit the top wall of the domain (front wall)

```
     The coordinates of the top wall of the body must be located out of the
```

```
computational domain and out of the ghost-cells
```

&Polyhedral_Immersed_Bodies Xi_1= 4.5 , Xj_1= 1.0 ,Xk_1= 0.0 , Xi_2= 5.5 , Xj_2= 1.0 ,Xk_2= 0.0 ,

```
                           Xi_3= 5.5  , Xj_3= 2.0  ,Xk_3= 0.0 , Xi_4= 4.5  ,
Xj_4= 2.0  ,Xk_4= 0.0 ,
                           Wall_BC_DataSetName ="Set3" /
```

++

```
            DEFINITION OF BOUNDARY CONDITIONS
```

++

```
               WALL BOUNDARY CONDITION SETUP
                   (DIMENSIONLESS)
```

DATA SET FOR THE WALL BOUNDARY CONDITIONS

First set of wall boundary conditions (applied to the walls of the channel) :

```
                                      imposed temperature : Tc= 0
```

&Heat_Wall_Boundary_Condition_Setup

```
   Wall_BC_DataSetName ="Set1",
    West_Heat_BC_Option = 0   ,  East_Heat_BC_Option = 0  ,
Back_Heat_BC_Option = 0  ,  Front_Heat_BC_Option = 0  ,
    West_Wall_BC_Value= 0.0   ,  East_Wall_BC_Value= 0.0  ,
Back_Wall_BC_Value= 0.0  ,  Front_Wall_BC_Value= 0.0  /
```

Second set of wall boundary conditions (applied to the square bar) :

```
          Special case : the solid is thermally conductive
          Note : Every xxx_Heat_BC_Option must be set to 2
```

&Heat_Wall_Boundary_Condition_Setup

```
    Wall_BC_DataSetName ="Set2",
    West_Heat_BC_Option = 2   ,  East_Heat_BC_Option = 2  ,
Back_Heat_BC_Option = 2  ,  Front_Heat_BC_Option = 2  ,
```

```
    Material_Thermal_Conductivity= 1.00 , Material_Mass_Heat_Capacity= 1.00
, Material_Density= 1.00 /
```

Third set of wall boundary conditions (applied to the solid embedded in the front wall of the channel in order

```
                                     to define loccally an other boundary
condition : imposed Heat flux : Qc= -1.)
          Note : The flux is < 0 for heating the computational domain and >
0 for cooling it.
                 Only the front wall needs to be define as boundary
condition; Others walls do not adjoin the domain
```

&Heat_Wall_Boundary_Condition_Setup

```
   Wall_BC_DataSetName ="Set3",
    West_Heat_BC_Option =     ,  East_Heat_BC_Option = 0  ,
Back_Heat_BC_Option = 0  ,  Front_Heat_BC_Option = 1  ,
    West_Wall_BC_Value= 0.0   ,  East_Wall_BC_Value= 0.0  ,
Back_Wall_BC_Value= 0.0  ,  Front_Wall_BC_Value=-1.0  /
```

The usual wall boundary conditions for the velocity are used (no-slip and impermeability conditions). As they are the conditions by default, they are not explicitly written

```
             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 insterested areas.

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  ,
                          Temperature_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-SORMultigrid-
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 = 2.D+01  ,
                        TimeStep_Type = 1 ,
                        Timestep_Max = 5.D-03 ,
                        CFL_Max= 0.5 ,
                        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 / &Simulation_Management Probe_TimeIterationRecordingRate= 10 ,

```
                      Probe_StartTimeIterationRecording= 0  ,
                      Probe_RecordingReset=.false. /
```

```
         FIELDS RECORDING SETUP
```

&Field_Recording_Setup Precision_On_Instantaneous_Fields= 2 /

!— Snapshots

&Simulation_Management

```
  InstantaneousFields_RecordingReset=.false.     ,
  InstantaneousFields_TimeRecordingRate= 1.0E+00 ,
  InstantaneousFields_RecordingStartTime= 0.D-00  /
```

&Instantaneous_Fields_Listing Name_of_Field = “U ” / First velocity component
&Instantaneous_Fields_Listing Name_of_Field = “V ” / Second velocity component
&Instantaneous_Fields_Listing Name_of_Field = “T ” / Temperature

!— Statistics

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

&Statistical_Fields_Listing Name_of_Field = “<U> ”/ &Statistical_Fields_Listing Name_of_Field = “<V> ”/