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input3d.dat

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====
  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

            DIMENSIONLESS LAYOUT :

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

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

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

                 dimensionless domain : Lx/h= 10

                 Initialisation = uniform velocity field
                 inlet flowrate = uniform profil

 Tc                Qo
------------------------------------------
                   |  |
                   |__|
---> inflow                     outflow --->
      (Tc)

------------------------------------------
 Tc

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

&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" /

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
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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" /

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+++++++
              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  /

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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 /

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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
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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  /

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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  /
=======================================================================
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                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" /
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+++++++
                   NUMERICAL METHODS
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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&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
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

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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 = 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>   "/
```

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