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```
MAIN INPUT DATA FILE : 2D HEAT-DRIVEN CAVITY FLOW

                DIMENSIONLESS FORM  :
                                        Ra= 1.D+06
                                        Density scale   : rho_0 (fluid
density)
                                        Length scale  H : height of cavity
                                        Velocity scale ---> U0=
(k/H).Ra**0.25 (k thermal diffusivity)
                                        Temperature scale Th - Tc (Th= T hot
; Tc= T cold)
                                        Dimensionless Velocity    U*= U/U0
                                        Dimensionless Temperature T*= (T-
Tc)/(Th-Tc)
                                        dimensionless kinematic viscosity=
Pr/Ra**0.5
                                        dimensionless thermal diffusivity=
1/Ra**0.5
                                        dimensionless buoyancy term      =
Pr.T*
                                        dimensionless domain Lx/H= 1 , Ly/H=
1

                 Q0= 0 (adiabatic)
        ---------------------------------
        |                               |
        |                               |
        |                               |
        |                               |
        |                               |
   Th   |                               |  Tc
        |                               |
        |                               |
        |                               |
        |                               |
        |                               |
        |                               |
        ---------------------------------
                 Q0= 0 (adiabatic)
   J
   |
   |
   |
   ----> I
================================================================================
================================================================================
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GENERAL LAYOUT
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
&Version File_Version="VERSION2.0"/
================================================================================
                FLUID PROPERTIES
               (DIMENSIONLESS FORM)
================================================================================
&Fluid_Properties  Heat_Transfer_Flow = .true.  ,  Reference_Density= 1.0,
                   Reference_Temperature= 1.0   ,
Reference_Dynamic_Viscosity= 0.71D-03  ,
                   Prandtl = 0.71               ,
Thermal_Expansion_Coefficient= 1.0 /
================================================================================
   UNIFORM INITIALIZATION OF THE VELOCITY COMPONENTS AND TEMPERATURE
                  (DIMENSIONLESS FORM)
================================================================================
&Velocity_Initialization I_Velocity_Reference_Value          = 0.0  ,
J_Velocity_Reference_Value          = 0.0  , K_Velocity_Reference_Value
= 0.0 /
&Temperature_Initialization Temperature_Reference_Value      = 0.5 /
================================================================================
                        GRAVITY
                  (DIMENSIONLESS FORM)
================================================================================
&Gravity  Gravity_Enabled= .true. , Gravity_Angle_IJ= 90.0  ,
Gravity_Angle_IK= 90.0 , Reference_Gravity_Constant= 0.71/
================================================================================
                    DOMAIN FEATURES
================================================================================
&Domain_Features Start_Coordinate_I_Direction= 0.00 ,
End_Coordinate_I_Direction= 1.00,
                 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=256
,Cells_Number_K_Direction= 1,
                 Regular_Mesh= .true. /

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
DEFINITION OF BOUNDARY CONDITIONS
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
================================================================================
=
WALL BOUNDARY CONDITION SETUP
================================================================================
=
Keep in mind that the domain is enclosed by default.
No new boundary conditions are defined at the ends of the domain : the walls
by default are preserved
```

```
&Heat_Wall_Boundary_Condition_Setup
      Wall_BC_DataSetName ="Set1",
      West_Heat_BC_Option = 0    ,  East_Heat_BC_Option = 0  ,
Back_Heat_BC_Option = 1  ,  Front_Heat_BC_Option = 1  , South_Heat_BC_Option
= 0 , North_Heat_BC_Option = 0,
      West_Wall_BC_Value= 1.0    ,  East_Wall_BC_Value= 0.0  ,
Back_Wall_BC_Value= 0.0  ,  Front_Wall_BC_Value= 0.0  , South_Wall_BC_Value=
0.0 , North_Wall_BC_Value= 0.0 /
================================================================================
=
BORDER BOUNDARY CONDITIONS : The walls located by default at the ends of the
domain remain unchanged
================================================================================
=
!--- 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= 5,                    !---
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-10 /        !---
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 estimated by means of the CFL coefficient

&Simulation_Management    Restart_Parameter= 0 ,
                          Steady_Flow_Stopping_Criterion_Enabled = .true. ,
Steady_Flow_Stopping_Criterion = 1.D-16,
                          Temporal_Iterations_Number = 1000000
, Final_Time = 5.D+02  ,
                          TimeStep_Type = 0 ,
                             Timestep_Min = 1.D-03
, Timestep_Max = 1.D-03 ,
                             CFL_Min      = 0.5
, CFL_Max      = 0.5 ,
                            Iterations_For_Timestep_Linear_Progress= 1,
                            Simulation_Backup_Rate                 = 1000
, Simulation_Checking_Rate = 101 /

================================================================================
=
PROBES MANAGEMENT
================================================================================
=

     NO PROBE
================================================================================
=
FIELDS RECORDING DECLARATION
================================================================================
=
&Simulation_Management  Fields_Recording_Rate = 5.D+01 /
&Field_Recording_Setup     Check_Special_Features=
"Heat_Driven_Cavity_Flow",  Precision_On_Instantaneous_Fields= 2 /   Here, a
special variable devoted to results of heat driven cavity flows is active

&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
&Instantaneous_Fields_Listing  Name_of_Field = "T     " , Recording_Enabled
```

```
= .true.  /      Temperature
```

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