
Operator CALC_FLUI_STRU

1 Drank

Compute the modal parameters of a structure subjected to a flow. Allows to take account of the forces fluid-elastics which are represented by a matrix of transfer complexes connecting them to modal displacements. For certain configurations, the matrix of transfer can be broken up into three real matrixes of coefficients of mass, damping and stiffness added.

The disturbances of the modal characteristics of structure depend on the rate of flow. Thus the terms of the matrix of transfer of the forces fluid-elastics depend on the velocity of the fluid and the frequency of motion by the biais of the parameter fallback speed $V_r = V(f.D)$.

The operator calculates a modal base modified by the coupling, for each mean velocity of the fluid studied. The product concept is of `melasflu_type`.

2 Syntax

```
melf [melasflu] = CALC_FLUI_STRU (
    ◇VITE_FLUI=_F (
        ◇VITE_MIN=vi , [R]
        ◇VITE_MAX=vm , [R]
        ◇ NB_POIN=np , [I]
    ),
    ◆BASE_MODELE=_F (
        ◆MODE_MECA=mode , [mode_meca]
        ◇ NUME_ORDRE=l_nuor , [l_I]
        ◇ /AMOR_REDUIT =l_amor , [l_R]
        /AMOR_UNIF =amor , [R]
        ◇AMOR_REDUIT_CONN=l_amor_c , [l_R]
    ),
    ◆TYPE_FLUI_STRU=typeflui ,
    [type_flui_stru]
    ◇IMPRESSION=_F (
        ◇PARA_COUPLAGE=/ "OUI" [DEFAULT]
        /"NON",
        ◇ DEFORMEE=/ "NON" [DEFAULT]
        /"OUI",
    ),
    ◇STOP_ERREUR=/ "OUI" [DEFAULT]
    / "NON",
);
```

3 Operands

3.1 Key word VITE_FLUI

◇VITE_FLUI

Key word factor which makes it possible to define the beach studied fluid velocities and discretization.

◇VITE_MIN=vi

First value the velocity for which the parameters of coupling are calculated.

◇VITE_MAX=vm

Last value the velocity for which the parameters of coupling are calculated.

◇NB_POIN=np

Defines the number of points of velocity (the step of discretization is constant).

3.2 Key word BASE_MODAL

◆BASE_MODAL

Factor key word which makes it possible to define the modal base of concept `mode_meca` for which parameters of coupling are calculated. The coupling modifies the eigenfrequencies and the values of the terms of reduced damping associated with each mode (key word AMOR_REDUIT or AMOR_UNIF).

◆MODE_MECA=mode

Modal base of the type of concept `mode_meca`.

◇NUMÉRIQUE_ORDRE=l_nuor

Makes it possible to select the modes of the modal base of the `mode_meca` type to be taken into account for the computation of the coupling.

◇/AMOR_REDUIT=l_amor

List of reduced dampings (percentage of critical damping) the corresponding to each mode of structure.

Note:

They must be of number identical to the number of modes taken into account (these modes are defined by key word `NUME_ORDRE`).

/AMOR_UNIF =amor

One applies to all the modes of modal base same reduced damping.

◇AMOR_REDUIT_CONN=l_amor_c

List of reduced dampings (percentage of critical damping) the corresponding to each mode of structure for the method of Connors (see [R4.07.04]). In accordance with this documentation of reference, one provides two values of ratio of instability of Connors (including one known as "All components").

Note:

|As for key word *AMOR_REDUIT* , they must be of number identical to the number of
|modes taken into account.

3.3 Key word TYPE_FLUI_STRU

◆TYPE_FLUI_STRU = typeflui

Concept of the type_flui_stru type. It makes it possible to define the studied configuration, i.e. the coefficients of coupling used for the modelization of the forces fluid-elastics.

Note:

In the case of a configuration of standard "the tube bundle under axial flow" (factor key word FAISCEAU_AXIAL), the computation of the parameters of coupling of structure with the fluid in at-rest state, is taken into account. This computation is carried out whatever the beach fluid velocities that the user informed by the key word VITE_FLUI.

In this case of a fluid at rest, the matrix of transfer representing the fluid force - elastic exerted on the structure, is put in the shape of a damping matrix added.

3.4 Key word PRINTING

◇IMPRESSION

Factor key word allowing the user to choose information which it wishes to make write in the results file .

◇PARA_COUPLAGE = "OUI" or "NON"

By this key word, the user can ask for the printing of tables of results giving for each mode the evolutions fallback speed, frequency and modal reduced damping according to the rate of flow of the fluid. The default value is "OUI".

◇DEFORMEE = "OUI" or "NON"

By this key word the user can require the printing of format "RESULTAT" of the fields of displacements corresponding to the modal deformed shapes. The default value is "NON".

3.5 Operand STOP_ERREUR

◇STOP_ERREUR=stop

Key word which makes it possible to define the behavior of the code in the event of problem of convergence in the computation of the coefficients of coupling for a given velocity and a mode of structural deformation.

If STOP_ERREUR=' OUI ', the code stops in fatal error in the event of problem of convergence by notifying the user velocity concerned.

If STOP_ERREUR=' NON ', the code emits an alarm notifying the user of the problem of convergence (velocity and number of mode) and stores the last computed value for the coefficients of coupling.

4 Remarks

In the case of a configuration of the type "tube bundles under transverse flow", it is possible to define several zones of interaction between the fluid and structure, each one of these zones being able to be modelled independently others. The computation modal parameters of structure subjected to a flow then takes account of each one of these zones, defined explicitly in command DEFI_FLUI_STRU [U4.25.01].

The product concept by CALC_FLUI_STRU contains, in the form of array, the mass matrixes, of damping and stiffness for each velocity of fluid. The array, representing modified modal base, can be recovered by RECU_TABLE in order to be injected into a computation DYNA_TRAN_MODAL. This sequence of computation is put in work in the case test SDLL118A.