

## Operator CALC\_TRANSFERT

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### 1 Goal

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This operator allows to calculate the matrix of transfer functions transfer dynamic of a linear mechanical system between two points of the digital model. The transfer transfer functions can be in acceleration, speed or displacement. One can treat the case of absolute or relative movements, due to one request of training.

It is also possible to obtain the answer in an unspecified point of the digital model according to an output signal indicated by the user.

This operator uses in data input the answers of the mechanical system to one-way requests, preferably of type white vibration.

It produces one or two structures of data of the type `table`, one for the matrix of transfer transfer functions, the other for the possible calculated signal.

## 2 Syntax

```
CALC_TRANSFERT (
  ♦ RESULTAT_X = resu_x , / [dyna_trans]
                          / [dyna_harmo]
                          / [harm_gene]
                          / [tran_gene]

  ♦ RESULTAT_Y = resu_y , / [dyna_trans]
                          / [dyna_harmo]
                          / [harm_gene]
                          / [tran_gene]

  ◊ RESULTAT_Z = resu_z, / [dyna_trans]
                          / [dyna_harmo]
                          / [harm_gene]
                          / [tran_gene]

  ♦ NOM_CHAM = / 'ACCE',
               / 'QUICKLY',
               / 'DEPL',

  ♦ ENTRY = _F (
  ♦ GROUP_NO = grno, [gr_noeud]
  ),

  ♦ EXIT = _F (
  ♦ GROUP_NO = grno, [gr_noeud]
  ),

  ◊ REFERENCE MARK = / 'ABSOLUTE' ,

                    / 'RELATIVE' , [DEFECT]
  ♦ TRAINING = _F (
  ♦ DX = entr_x, [function]
  ♦ DY = entr_y, [function]
  ◊ DZ = entr_z, [function]
  ),

  ◊ SIGNAL = _F (
  ♦ MESURE_X = f_x, [function]
  ♦ MESURE_Y = f_y, [function]
  ◊ MESURE_Z = f_z, [function]
  ♦ TABLE_RESU = CO ('table'), [table]
  ♦ TYPE_RESU = / 'TEMPORAL',
                / 'HARMONIC', [DEFECT]
```

### 3 Description of the macro order and preliminary stages

The operator `CALC_TRANSFERT` allows to calculate the matrix dynamic transfer function transfer between two points of the structure (entered => left). It also makes it possible to the user to determine the signal in a point of the structure (as starter) knowing the signal in another point of the structure (at exit).

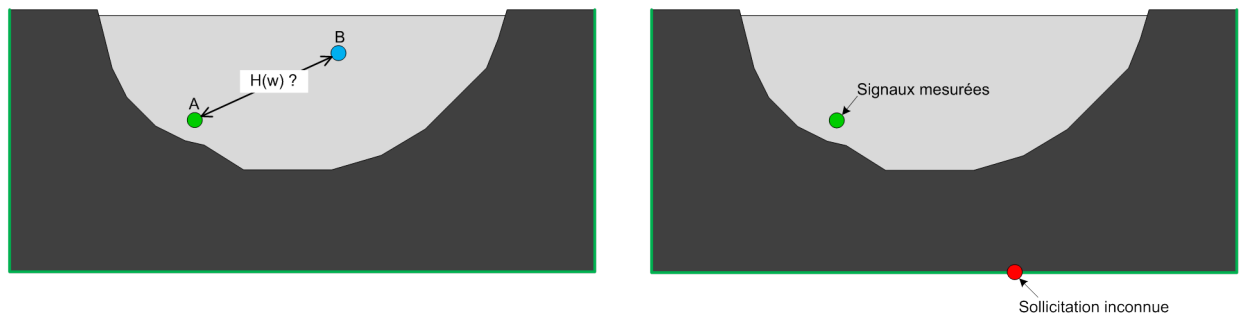


Figure 1 – Representation schematic of the use of the macro order

Prior to the use of the order, the user must carry out several linear dynamic calculations under one-way request. For example if the study is in 3D (resp. 2D), it must carry out 3 calculations (resp. 2 calculations) exciting one of the three (resp. 2) directions. It is preferable to carry out these dynamic calculations via a mono-directional white vibration.

Dynamic calculations must be carried out with the same list of frequencies if calculation is harmonic and with the same list of moments if calculation is transitory. For a transitory calculation, the user must take care to have a list of moments to constant step. In the contrary case an error message will be transmitted to him because the transform of Fourier necessary to various calculations requires a constant step.

Dynamic calculations will have to be in the same way standard, that is to say `tran_gene`, that is to say `harm_gene`, that is to say `dyna_trans` or `dyna_harmo`.

When the user must inform the functions of training and/or the signals measured, it is preferable that the latter are discretized on the same list of frequencies (case of a harmonic calculation) or on the same list of time (case of a transitory calculation).

## 4 Operands

### 4.1 ConceptS createdS by the order

This order creates at exit a concept of the type `table`. It is possible to also leave a second `table` containing the signals corresponding to dynamic stress (as starter) calculated using the measured signals (at exit).

The first concept produces whatever the use of the macro-order by the user is one `table` who contains the data of the matrix transfer functions transfer arranged as follows:

- The first column corresponds to the frequencies (`FREQ`);
- The following ones correspond to the components of the matrix arranged in the order by lines  $H_{xx}$ ,  $H_{xy}$ ,  $H_{xz}$ ,  $H_{yx}$ ,  $H_{yy}$ ,  $H_{yz}$ ,  $H_{zx}$ ,  $H_{zy}$  and  $H_{zz}$ . In the case 2D, one will have  $H_{xx}$ ,  $H_{xy}$ ,  $H_{yx}$  and  $H_{yy}$ .

$$\mathbf{H}(\omega) = \begin{pmatrix} H_{xx} & H_{xy} & H_{xz} \\ H_{yx} & H_{yy} & H_{yz} \\ H_{zx} & H_{zy} & H_{zz} \end{pmatrix}$$

## 4.2 Operands RESULTAT\_X, RESULTAT\_Y and RESULTAT\_Z

◆ RESULTAT\_X = resu\_x

Name of the concept of the type `Resultat` for which dynamic calculation linear was carried out with a request one-way according to `x`.

◆ RESULTAT\_Y = resu\_y

Name of the concept of the type `Resultat` for which linear dynamic calculation was carried out with an one-way request according to `y`.

◆ RESULTAT\_Z = resu\_z

Name of the concept of the type `Resultat` for which linear dynamic calculation was carried out with an one-way request according to `z`.

### Note:

*Only the structures result of the type `dyna_trans`, `dyna_harmo`, `tran_gene` and `harm_gene` can be well informed in these operands.*

*The calculations produced by the operators of dynamics and who are to be informed in the operands `RESULTAT_X`, `RESULTAT_Y` and `RESULTAT_Z` must be in the same way standard: `dyna_trans`, or `dyna_harmo` or `tran_gene` or `harm_gene`.*

## 4.3 Operand NOM\_CHAM

◆ NOM\_CHAM = nomcha

Reference symbol of the field which one wishes to extract from dynamic calculations linear realized as a preliminary by the user and informed in the operands `RESULTAT_X`, `RESULTAT_Y` and `RESULTAT_Z`.

The possible names of the field are: 'DEPL','QUICKLY'and'ACCE'.

### Note:

*Various functions indicated by the user such as the functions of training indicated in the word-key `TRAINING` or functions measured well informed in the keyword `SIGNAL` will have to be of the same type as **nomcha**.*

## 4.4 Operand REFERENCE MARK

◆ REFERENCE MARK = / 'ABSOLUTE'  
/ 'RELATIVE'

This obligatory operand makes it possible to inform the type of answer calculated by the dynamic operators. If the reference mark is `RELATIVE` (for one linear dynamic calculation moving relative), then the user must inform the signal of training in the keyword `TRAINING` (see paragraph 4.5).

## 4.5 Keyword factor TRAINING

The keyword factor `TRAINING` allows to inform the requests of training having been used to carry out various linear dynamic calculations moving relative.

**Note:**

Various functions of training indicated in the word-key `TRAINING` will have to be of the same type as **nomcha** ('DEPL','QUICKLY'or'ACCE').

## 4.5.1 Operands `DX`, `DY` and `DZ`

◆ `DX = entr_x`

This operand makes it possible to inform the one-way request (according to the direction `x`) used for pRdynamic emier calculation.

◆ `DY = entr_y`

This operand makes it possible to inform the one-way request (according to the direction `y`) used p our the second dynamic calculation.

◇ `DZ = entr_z`

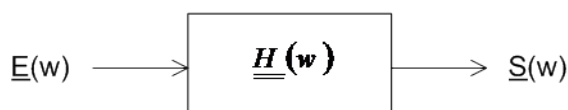
This operand makes it possible to inform the one-way request (according to the direction `z`) used for the third dynamic calculation.

## 4.6 Keywords factor `ENTRY` and `EXIT`

### 4.6.1 Operand `GROUP_NO`

◆ `GROUP_NO = grno`

The obligatory keywords factor `ENTRY` and `EXIT` allow to inform the name of a group of node (`grno`, container only one node) onSwichS carryNT the extraction of the field 'DEPL'or'QUICKLY'or'ACCE'.



## 4.7 Keyword factor `SIGNAL`

This keyword factor (optional) makes it possible to determine the dynamic stress (as starter) having led to the measured signals (at exit) indicated by the user in the keyword factor `SIGNAL`.

### 4.7.1 Operands `MESURE_X`, `MESURE_Y` and `MESURE_Z`

◆ `MESURE_X = f_x`

This operand makes it possible to inform the signal measured according to the direction `x`.

◆ `MESURE_Y = f_y`

This operand makes it possible to inform the signal measured according to the direction `y`.

◇ `MESURE_Z = f_z`

This operand makes it possible to inform the signal measured according to the direction `z`.

**Note:**

The signals must be in the same way standard than **nomcha** and must be discretized over the same list of frequencies or time.

## 4.7.2 Operand **TYPE\_RESU**

◆ TYPE\_RESU = / 'TEMPORAL',  
/ 'HARMONIC'

This operand makes it possible to inform the type of results wished at exit of `table`.

## 4.7.3 Operand **TABLE\_RESU**

◆ TABLE\_RESU = nom\_table

This operand makes it possible to inform the name of `table` in which will appear the calculated signals knowing the measured signals.

`table` will be made up of several columns arranged like such:

If TYPE\_RESU = 'TEMPORAL' :  
INST, FX, FY, FZ

If TYPE\_RESU = 'HARMONIC' :  
FREQ, Re\_FX, Im\_FX, Re\_FY, Im\_FY, Re\_FZ, Im\_FZ