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## Procedure IMPR\_RESU with formats "RESULTAT" and "ASTER"

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### 1 Drank

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Écrire the mesh or the results of a computation in a file with format "RESULTAT" or the mesh with format "ASTER".

Currently this procedure makes it possible to write with the choice:

- a mesh,
- fields with the nodes (of static displacements, temperatures, eigen modes, modes,...),
- fields by elements with the nodes or the GAUSS points (of stresses, generalized forces, intern variables...).

Procedure IMPR\_RESU also makes it possible to write a mesh and/or results on a file in sight, in particular of their graphic visualization (cf documents [U7.05.01] (format "IDEAS"), [U7.05.11] (format "CASTEM"), [U7.05.21] (format "MED") and [U7.05.31] (format "ENSIGHT")).

For the concepts of type `result`, one can print only part of information, by selecting the fields and the sequence numbers which one wishes to exploit.

For the printings with format "RESULTAT", it is possible to select the topological entities (nodes, meshes, nodes groups and mesh groups) on which one wants to print the results. One can also reduce the number of the information printed by asking for only the printing of certain components, values understood in an interval chosen by the user or of extreme values. One can combine all the possibilities, for example to obtain the maximum value of a component given, on a particular topological entity and in an interval of values chosen by the user.

Format "RESULTAT" should not be used as a basis to store or to exchange results, its format is not fixed.

## 2 Syntax

```

IMPR_RESU      (
  ◇  MODELE = Mo,                                [model]
  ◇  UNITE = links,                              [I]
  ◇  FORMAT   = / "RESULTAT",                    [DEFECT]
                / "ASTER",
  /RESU   = (_F (
    #Syntaxe   of procedure IMPR_RESU to format "RESULTAT"
    ◆ |  MESH = MY,                                [mesh]
        |  /          CHAM_GD=CH_GD,                [cham_gd]
          /RESULTAT   =RESU ,                      [result]

    # Extraction of a field of variables of resu
      ◇ /          TOUT_CHAM=  /"OUI",                [DEFECT]
                                /"NON",
          /NOM_CHAM          =L_NOMSYMB ,            [l_K16]
      ◇ /          TOUT_ORDRE=  'OUI',                [DEFAULT]
          /NUME_ORDRE        =LORDRE ,               [l_I]
          /LIST_ORDRE        =LENTI ,                [listis]
          /NUME_MODE          =LMODE ,                [l_I]
          /NOEUD_CMP          =LNOECMP ,              [l_K16]
          /NOM_CAS            =NCAS ,                 [l_K16]
          /ANGL               =LANGL ,                [l_K16]
          //FREQ              =LFREQ ,                [l_R]
          /LIST_FREQ          =LREEL ,                [listr8]
          /INST               =LINST ,                [l_R]
          /LIST_INST          =LREEL ,                [listr8]
          ◇ |  PRECISION=    / PREC,                 [R]
                                / 1.0D-3,            [DEFAULT]
          |  CRITERE         =  / "RELATIF",          [DEFECT]
                                / "ABSOLU",

    # Parameters
      ◇ /          TOUT_PARA=  /"OUI",                [DEFECT]
                                /"NON",
          /NOM_PARA          =L_NOMPARA ,            [l_K16]
      ◇  FORM_TABL=          /"OUI",
                                /"EXCEL",
                                /"NON",                [DEFAULT]

    # Sélection of the components
      ◇ /          TOUT_CMP=  'OUI',                [DEFAULT]
          /NOM_CMP          =L_NOMCMP ,              [l_K8]

    # Sélection of the topological entities
      ◇ /          TOUT=          'OUI',                [DEFAULT]
          / |  NOEUD=L_NOEUD ,                        [l_noeud]
            |  GROUP_NO=L_GRNO ,                      [l_gr_noeud]
            |  MAILLE=L_MAILLE ,                      [l_maille]
            |  GROUP_MA=L_GRMA ,                      [l_gr_maille]

    # Sélection on the values
      ◇VALE_MAX=          /"OUI",
                                /"NON",                [DEFAULT]
      ◇VALE_MIN=          /"OUI",

```

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```

                                /"NON",
                                [DEFAULT]
    ◇BORNE_SUP=VSUP              ,
                                [R]
    ◇BORNE_INF=VINP              ,
                                [R]

    # Printing of the coordinates
    ◇IMPR_COOR=                  /"OUI",
                                /"NON",
                                [DEFAULT]

    # Choix of the format of writing of the actual values
    ◇      FORMAT_R=            /  Forme,
                                /  "1PE21.14",
                                [DEFAULT]

    ◇SOUS_TITRE=L_ST            ,
                                [l_Kn]

    #Syntaxe of procedure IMPR_RESU to format "ASTER"

    ◆ |  MAILLAGE=MA            ,
                                /  [mesh]
                                /  [skeleton]
    ◇SOUS_TITRE=L_ST            ,
                                [l_Kn]

    ),

/CONCEPT = (_F (
    #Pour print some fields of "data":
    to #Voir the explanations in U7.05.21
    # (functions only for FORMAT='RESULTAT')

    /CHAM_MATER = chmat,
    /CARA_ELEM = caraele,
    ◇ REPERE_LOCAL = / "OUI" ,
                                / "NON",
                                [DEFAULT]

    # if REPERE_LOCAL = "OUI",
    ◆MODELE= Mo
                                [model]
    /CHARGE = load,
    ),
)
```

## 3 Typography in documentation IMPR\_RESU

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Pour to understand the documentation of IMPR\_RESU well, it should be noted that term "RESULTAT" gathers in Code\_Aster three rather different concepts:

- a kind of concept,
- a kind of file,
- a format of writing.

Indeed, on the one hand, one indicates by result, the quantities produced by an operator of Aster *computation* producing several fields (evolutionary computation, computation of eigen modes, etc...).

These data (results) are contained in a Aster *data structure* of the generic type said `result`. This generic type is declined under types, for example `mode_meca`, `evol_elas`, etc, whose mode of storage differs somewhat. A concept of type `result` has only one under type. In Aster *documentation* the names of the types of concept are in small letters Courier.

In addition, the results intended for the printing, in particular those resulting from IMPR\_RESU, are versed in a file indicated by file `RESULTAT` (associate with unit 8, standard `resu` in `astk`). The format of writing associated with this file intended for the printing is also baptized `RESULTAT`.

In short :

<code>result</code>	given resulting from the resolution of the system,
<code>designation</code>	generic result of the type of concept (of structure of data) which contains the result,
<code>evol_ther</code> <code>mode_meca</code>	name of under type of the result of type <code>result</code> ,
<code>FICHIER</code>	(without quote) designation of the file which contains the results, independently of the format of its contents,
"RESULTAT"	(with quotes) designation of the format (Aster) of the file which contains the results.

## 4 Operands FORMAT and UNITE

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procedure IMPR\_RESU makes it possible to write a mesh and/or values of results in various formats in sight, in particular, of a graphic visualization [U7.05.01], [U7.05.11], [U7.05.21] and [U7.05.31].

Operand `FORMAT` makes it possible to specify the format of printing of a result.

Format "RESULTAT" is taken by defect. It makes it possible to print the mesh and/or the results in form listing.

One specifies in which file the data will be written via key word `UNITE` (cf orders `DEFI_FICHIER`). By defect, `UNITE` = 8 with format "RESULTAT" and `UNITE` = 26 with format "ASTER".

## 5 Key word RESU

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This key word factor makes it possible to specify the results to print and the format according to which one wants to print them.

## 6 Operands CHAM\_GD and RESULTAT

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Les values of the computed fields are stored in data structures called fields of variables. These fields of variables can be directly accessible (concept `cham_gd`) or be in a data structure gathering several fields of variables (result concept ).

- a field of variables is a data structure which makes it possible to store fields defined in the nodes (`cham_no_*`) or fields defined by elements (`cham_elem_*`). For the fields by elements, one distinguishes the fields defined in the nodes from the elements and the fields defined in the GAUSS points of the elements,
- a result concept is composed of one or more fields of variables. For example, with each computation step one stores in the data structure `result`, the field of variables displacement. This structure is thus indexed by a matrix structure of order 2, whose index is, for example, the list of times of computation and the other all the computed fields (displacements, stresses, strains, ...).

One reaches in this case a field of variables by specifying the value of a variable of access (sequence number, time, frequency, number of mode...) and a field name ("DEPL", "SIGM\_ELNO", ...). There exist several types of result concept : `evol_elas`, `evol_noli`, `mode_meca`,.... A each one corresponds a list of fields and a list of licit variables of access.

In addition, with a result concept is also associated a certain number of complementary results (for example modal generalized mass or participation factors in a modal computation (result concept of the `mode_meca` type)), different for each value from the variable of access. These complementary results are called parameters.

Taking into account structure of data `result`, one understands easily that the possibilities of printing which one lays out are those of the fields of variables, supplemented by specific possibilities:

- information on data structure (for example: list variables of access, list of the actually computed fields,...),
- direct access to a field of variables (for example, printing of the field of displacements at time  $t=15.$  ),
- printing of the values of parameters.

Operand `RESULTAT` makes it possible to print the fields contained in a result concept . One can for example choose to print only certain fields (confer the following key word: `NOM_CHAM`) on certain components of certain nodes (cf `NOEUD_CMP`).

## 7 Extraction of a field of variables

### 7.1 Opérandes `TOUT_CHAM` / `NOM_CHAM`

Cf. document [U4.71.00].

### 7.2 Operands `TOUT_ORDRE` / `NUME_ORDRE` / `LIST_ORDRE` / `NUME_MODE` / `INST` / `LIST_INST` / `FREQ` / `LIST_FREQ` / `NOEUD_CMP` / `NOM_CAS` / `ANGL` / `PRECISION` / `CRITERE`

Cf. document [U4.71.00].

## 8 Paramètres

### 8.1 Opérande `TOUT_PARA`

This key word indicates if one wants or not to print all the values of the parameters attached to the concept of type `result`.

Example:

```
IMPR_RESU (RESU= (_F (RESULTAT= resu,      TOUT_PARA= "OUI", NUME_ORDRE=
3)))
```

One prints in file `RESULTAT` the values of all the parameters but only for the third computation step of a result concept of the mode\_meca type :

Printing of the parameters of the concept `resu` for sequence number 3:

```
NOM_MODE3
FREQ1.09787E+4
OMEGA24.75843          E+09
AMOR_REDUIT0.00000E+00
ERREUR2.76853E-10
MASS_GENE1.50009E-07
RIGI_GENE7.13806E+02
.....
.....
NORMESANS_CMP          : LAGR
```

## 8.2 Opérande **NOM\_PARA**

This key word makes it possible to choose a list of symbolic names of parameters among all the possible ones.

Key words `TOUT_PARA` and `NOM_PARA` cannot be used simultaneously.

Example:

```
IMPR_RESU (RESU= (_F ( RESULTAT= resu,
                        NOM_PARA= ("NORM"), NUME_ORDRE= 3)))
```

One prints in file `RESULTAT` the value of the parameter of name "NORMALIZES" but only for the third computation step of a result concept of the mode\_meca type:

Printing of the parameters of the concept `resu` for sequence number 3:

```
NORMESANS_CMP          : LAGR
```

## 8.3 Opérande **FORM\_TABL**

This key word makes it possible to choose the format of printing of the values of the parameters. Either in the form of a table whose each line is restricted with 80 characters (`FORM_TABL = "OUI"`), or in the form of a table whose each line can reach 2000 characters (`FORM_TABL = "EXCEL"`), or in the form of a list (a parameter by line) (`FORM_TABL = "NON"`).

By defaults the parameters are printed in the form of a table.

**Example :**

```
1/ FORM_TABL = "OUI"
```

```
NUME_ORDRE NUME_MODE ITER_Q RITER_BATHE
FREQ OMEGA 2 AMOR_REDUIT
MASS_GENE RIGI_GENE AMOR_GENE
MASS_EFFE_DY MASS_EFFE_DZ FACT_PARTICI_DX
FACT_PARTICI_DZ MASS_EFFE_UN_DX MASS_EFFE_UN_DY
NORM MEMETHODE
```

```
2/ FORM_TABL = "EXCEL"
```

```
NUME_ORDRE NUME_MODE ITER_Q RITER_BATHE ...
```

## 9 Selection on the components

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Une autre manner of reducing the volume of the printings is to print only the values of certain components (for example that displacement following axis  $x$  : component  $DX$ ).

### 9.1 Operand **TOUT\_CMP**

This key word makes it possible to indicate that one wishes to print all the components of the field.

### 9.2 Operand **NOM\_CMP**

This key word makes it possible to choose the list of the components of the `cham_gd` or all the fields of the result concept which one wishes to print.

Key words **TOUT\_CMP** and **NOM\_CMP** cannot be used simultaneously.

These components are described in the specific documentation of the elements.

## 10 Selection of the topological entities

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Afin de to reduce the volume of the printings, it is sometimes necessary to print only part of the result. With this intention one can print a field with the nodes only in certain nodes, or a field by element that in certain elements.

### 10.1 Operand **TOUT**

This key word indicates that one wishes to print the field on all the structure (all the nodes for a field with the nodes, all elements for a field by element).

### 10.2 Operand **NODE**

This key word makes it possible to indicate the list of the nodes on which one wishes to print a `cham_no`. If this key word is used in the case of the printing of a `cham_elem`, he is ignored, and the `cham_elem` is printed in all the meshes specified in addition.

### 10.3 Operand **GROUP\_NO**

This key word makes it possible to indicate the list of the nodes groups on which one wishes to print a `cham_no`. If this key word is used in the case of the printing of a `cham_elem`, he is ignored, and the `cham_elem` is printed in all the meshes, specified in addition.

### 10.4 Operand **NETS**

This key word makes it possible to indicate the list of the meshes on which one wishes to print a `cham_elem`. For a `cham_no`, it makes it possible to indicate the list of the nodes, tops of the meshes to which one wishes to print the `cham_no`.

### 10.5 Operand **GROUP\_MA**

This key word makes it possible to indicate the list of the mesh groups on which one wishes to print a `cham_elem`. For a `cham_no`, it makes it possible to indicate the list of the nodes, tops of the meshes to which one wishes to print the `cham_no`.

## 11 Selection on the values

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It is also interesting to print only the extreme values of all or certain components, on whole or part of structure.

### 11.1 Operand VALE\_MAX

This key word indicates that one wishes to print the maximum value of each component of the field, possibly in a given interval specified by arguments BORNE\_SUP and/or BORNE\_INF.

### 11.2 Operand VALE\_MIN

This key word indicates that one wishes to print the minimal value of each component of the field, possibly in a given interval specified by arguments BORNE\_SUP and/or BORNE\_INF.

### 11.3 Operand BORNE\_SUP

This key word indicates the higher limit of the interval on which one wishes to print the field. One prints all the values of the field lower than this higher limit.

### 11.4 Operand BORNE\_INF

This key word indicates the lower limit of the interval on which one wishes to print the field. One prints the values of the field higher than this lower limit.

## 12 Printing of the coordinates: operand IMPR\_COOR

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This key word makes it possible to specify if one wishes to print the coordinates of a node at the time of the writing of a cham\_no to format "RESULTAT".

## 13 Operand FORMAT\_R

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◇FORMAT\_R=                    /    Forme,  
                                 /    "1PE21.14"                    [DEFAULT]

Permet to specify the format of writing of the actual values to format "RESULTAT".

## 14 Notice

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Dans *Aster*, it exists `cham_elem` with under points (as well for `cham_elem` with the nodes as for `cham_elem` at the Gauss points). Format "RESULTAT", IMPR\_RESU allows the printing of the `cham_elem` with under points.

If same a `cham_elem` has under points on certain meshes and not on others, the printing of the `cham_elem` will be done in two times:

- initially printing of the `cham_elem` on all the meshes on which there is not under points,
- then printing of the `cham_elem` on all the meshes on which there is under points.

A specific format is used for each one of these printings.

## 15 Operand SOUS\_TITRE

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Cet argument makes it possible to print under title of comment, for more details to consult the document [U4.03.01].

The SOUS\_TITRE by defect is:

- for a champ\_gd
  - for a cham\_no  
SOUS\_TITRE = ("FIELD AUX NODES" )
  - for a cham\_elem  
SOUS\_TITRE = ("FIELD PAR ELEMENT &LOC (cham\_elem)" )

Example: "FIELD PAR ELEMENT AUX GAUSS points"

- for a result
  - for a cham\_no  
SOUS\_TITRE =  
( "FIELD AUX NODES",  
"OF Symbolic name &NOM\_SYMB (Resultat cham\_no) &RL",  
"NUMERO D'ORDER &NUM\_ORDRE (Resultat cham\_no)",  
"&ACCES (Resultat cham\_no)" )

Exemple of printing:

```
FIELD WITH THE NODES OF SYMBOLIC NAME DEPL  
SEQUENCE NUMBER: 2 NUME_MODE: 3  
FREQ: 5.52739E+00
```

- for a cham\_elem  
SOUS\_TITRE =  
( "FIELD PAR ELEMENT &LOC (Resultat cham\_elem)",  
"OF Symbolic name &NOM\_SYMB (Resultat cham\_elem) &RL",  
"NUMERO D'ORDER &NUM\_ORDRE (Resultat cham\_elem)",  
"&ACCES (Resultat cham\_elem)" )

Exemple of printing:

```
FIELD PAR ELEMENT WITH THE NODES OF SYMBOLIC NAME  
EPSI_ELNO SEQUENCE NUMBER: 1  
INST: 0.00000E+00
```

## 16 Printing of the mesh: operands MESH / MODELE

Cet argument makes it possible to print the mesh with FORMAT = "ASTER" and/or "RESULTAT". One then finds the format used for LIRE\_MALLAGE [U4.21.01] and defined in [U3.01.00].

By default, one prints all the mesh.

Concept of the model type is optional in the majority of the printings. However, it can be used in the case of the printing of a mesh to formats "ASTER" and/or "RESULTAT", in order to print only the part of the mesh whose meshes are affected in the model.

If one chooses format "ASTER", the mesh is written in a file of the .mail type which can then be read again by LIRE\_MALLAGE.

If one chooses format "RESULTAT", the mesh is written, by defect, in the file .resu and cannot be read again by LIRE\_MALLAGE such as it is because the file .resu contains titles in addition, under titles and possibly of other information.