

## Operator MODI\_MODELE\_XFEM

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### 1 Goal

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To modify a model by the introduction of specific finite elements which can be crossed by a crack of the type X-FEM.

This operator allows to modify certain classical finite elements in finite elements nouveau riches; the elements to be modified were as a preliminary given by the operator `DEFI_FISS_XFEM` [U4.82.08].

The new model thus defined could be used in the continuation of calculations like data as entry:

- with the operators `MECA_STATIQUE` [U4.51.01] or `STAT_NON_LINE` [U4.51.03] if the initial model is a mechanical model;
- with the operator `THER_LINEAIRE` [U4.54.01] if the initial model is a thermal model.

The operator produces a concept of the type `model`.

## 2 Syntax

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```
[model] = MODI_MODELE_XFEM (  
  
    ♦ MODELE_IN = Mo, [model]  
  
    ♦ / CRACK = ( fiss1, fiss2) [l_fiss_xfem]  
  
    / MODELE_THER = modxth, [modele_xfem]  
  
    ♦ CRITERION = / 1.68E-8, [DEFECT]  
                / crit, [R]  
  
    ♦ CONTACT = / 'WITHOUT', [DEFECT]  
                / 'STANDARD',  
                / 'MORTAR',  
  
    ♦ PRETREATMENTS = / 'CAR', [DEFECT]  
                      / 'WITHOUT',  
                      / 'FORCE',  
  
    ♦ DECOUPE_FACETTE = / 'DEFECT', [DEFECT]  
                       / 'SOUS_ELEMENTS',  
  
    ♦ INFORMATION = /1,  
[DEFECT]          /2,  
                )
```

## 3 Operands

### 3.1 Operand MODELE\_IN

◆ `MODELE_IN = Mo`

`Mo` : name of the initial model (also called “healthy model”) built on the grid which was used to define beforehand the crack by the operator `DEFI_FISS_XFEM` [U4.82.08].

This initial model, built with the operator `AFFE_MODELE` [U4.41.01], is used as a basis for creation of the new model. It is advised to choose a different name for the new model.

### 3.2 Operand CRACK

◆ `/ CRACK = ( fiss1,...)`

`(fiss1,...)` : list of the names of as a preliminary definite cracks by the operator `DEFI_FISS_XFEM` [U4.82.08]. The number of cracks in a model is not limited.

### 3.3 Operand MODELE\_THER

`/ MODELE_THER = modxth`

The use of this keyword has interest only in the typical case of thermomechanical calculations chained with X-FEM. In this case the following checks will be carried out by the operator:

- `modxth` must be thermal model X-FEM (already produced by the operator `MODI_MODELE_XFEM`, with the keyword `CRACK`) with which the linear problem of thermics is solved by the operator `THER_LINEAIRE` [U4.54.01];
- the healthy model `Mo` must be a mechanical model, and must have been defined on the same grid as the enriched thermal model `modxth`

The model produced by the operator is a mechanical model.

### 3.4 Operand CRITERION

◆ `CRITERION = crit`

`crit` : actual value of the criterion allowing the cancellation of the degrees of freedom nouveaux riches when the crack passes close to a node. When the crack cuts an element 3D in two volumes, the relationship between smallest volume and greatest volume should not exceed this criterion, if not, that can cause problems of conditioning in the matrix of rigidity, and lead to worthless pivots. Thus, if the criterion is exceeded, the degrees of freedom being able to lead to worthless pivots are eliminated automatically. The value by default of the criterion is based on simple tests [R7.02.12].

### 3.5 Operand CONTACT

◆ `CONTACT = / 'WITHOUT'`  
`/ 'STANDARD'`  
`/ 'MORTAR'`

This operand makes it possible to announce forces of interface so exist between the lips of the crack: they can be contact, or cohesive forces.

If it is the case, a load of contact or cohesive forces must be then introduced by the order `DEFI_CONTACT`. For all the formulations, it is the value `STANDARD` who must be well informed, put except for the cohesive law `CZM_LIN_MIX`, which is a mixed law cohesive adapted to the linear elements (see R5.03.55), for which one informs the value `MORTAR`. Indeed, the latter requires the addition of several fields of multipliers, this qu must thus be indicated during the modification of the model in order to créer the adequate éléments.

## 3.6 Operand PRETREATMENT

◆ PRETREATMENT S = / 'CAR'  
/ 'WITHOUT'  
/ 'FORCE'

This operand makes it possible to announce if the algorithms of algebraic prepacking must to be activated (modification of the matrix of rigidity). By default, the choice is automatic ('CAR'). One can is to disable them ('WITHOUT'), that is to say to force them ('FORCE').

**Notice** : I L there has quadratic elements in the model , the algorithms of prepacking will be activated.

## 3.7 Operand DECOUPE\_FACETTE

◆ DECOUPE\_FACETTE = / 'DEFECT'  
/ 'SOUS\_ELEMENTS'

This operand allows to activate an alternative process ('SOUS\_ELEMENTS') of construction of the facets of contact that by default ('DEFECT').

The alternative process in particular makes it possible to treat the case of the quadratic facets.

## 3.8 Operand INFORMATION

/ 1 : impression on the file 'MESSAGE'  
1) Stages of calculation  
2) Amongst finite elements of the model

/ 2 : even impression + impression for each mesh of the type of mesh enriched and its number of the type of finite element.

## 4 Example

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```
MOD_INIT = AFFE_MODELE (GRID = MY
                        .....
                        )

FISS_ELL = DEFI_FISS_XFEM ( GRID = MY,
                        .....
                        )

MOD_ENRI = MODI_MODELE_XFEM ( MODELE_IN = MOD_INIT,
                              CRACK = FISS_ELL,
                              INFORMATION = 2, )
```