

## Operator DEFI\_NAPPE

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### 1 Drank

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To define a real function of two real variables. A three-dimensions function N defines functions for N values of a parameter.

This operator allows to define, for example, of the boundary conditions depending on a variable of space and time or two variables of space or data materials (for example of curves of tension function of the temperature).

The product concept by this operator is of standard `three-dimensions function`.

## 2 Syntax

```

nf [three-dimensions function] = DEFI_NAPPE

( ◆NOM_PARA =/np , [kN]

  ◇NOM_RESU = "TOUTRESU" , [DEFAULT]
              /nr , [K8]

  ◆PARA =lp , [l_R]

  ◇PROL_DROITE = "CONSTANT",
                 / "LINEAIRE",
                 / "EXCLUDED" ,
[DEFAULT]

  ◇PROL_GAUCHE = "CONSTANT",
                 / "LINEAIRE",
                 / "EXCLUDED" ,
[DEFAULT]

  ◇ INTERPOL = | ' LIN', [DEFAULT]
               | ' LOG',
               | ' NON',

  ◇INFO =/1 ,
[DEFAULT]
              /2 ,

  ◇VERIF = ' CROISSANT',

  ◆/FONCTION =lf
[l_fonction]

  /◆NOM_PARA_FONC=npf
  ◆DEFI_FONCTION=
    _F ( ◆VALE=lv [l_R]
        ◇PROL_DROITE = "CONSTANT",
                       / "LINEAIRE",
                       / "EXCLUDED" ,
[DEFAULT]

        ◇PROL_GAUCHE = "CONSTANT",
                       / "LINEAIRE",
                       / "EXCLUDED" ,
[DEFAULT]

        ◇ INTERPOL= | "LIN", [DEFAULT]
                    | ' LOG',
                    | ' NON',

        ) ,

  ◇TITER = Ti, [l_Kn]

)

```

## 3 Operands

### 3.1 Operand NOM\_PARA

◆NOM\_PARA = Np

Indicates the name of the parameter of the three-dimensions function (second variable) of example with [§4.1].

The authorized values are listed are the same ones as in DEFI\_FONCTION [U4.31.02].

### 3.2 Operand NOM\_RESU

◇NOM\_RESU = NR

Name of result, the values of the three-dimensions function. It must be identical to the NOM\_RESU of each function composing the three-dimensions function.

In fact, this operand is not used systematically for checks as coherence, in the execution of the code. These checks of coherence are made by the command CALC\_FONCTION [U4.32.04].

### 3.3 Operand PARA

◆PARA = LP

Lists values of the parameter characteristic of the three-dimensions function: para1, para2, ... the cardinal of this list must be equal to the number of functions defined then.

### 3.4 Operands PROL\_DROITE and PROL\_GAUCHE

◇PROL\_DROITE and PROL\_GAUCHE =

Define the type of prolongation on the right (on the left) of the field of definition of the variable:

- “CONSTANT” for a prolongation with the last (or first) value of the three-dimensions function,
- “LINEAIRE” for a prolongation along the first definite segment (PROL\_GAUCHE) or last definite segment (PROL\_DROITE), this prolongation does not take account of a possible interpolation logarithmic curve,
- “EXCLUDED” if the extrapolation of the values apart from the field of definition of the parameter Np is prohibited (in this case if a computation requires a value of the function out of field of definition, the code will stop in fatal error).

### 3.5 Operand INTERPOL

◇INTERPOL =

Standard of interpolation of the three-dimensions function: a type for the interpolation of the second variable and for the interpolation between two functions. This is obtained by providing a list of 2 texts among:

```
INTERPOL = ("LIN", "LOG")
```

“LIN” : linear,

“LOG” : logarithmic curve,

“NON” : one does not interpolate (and thus the program will stop if one asks for the value of the function for a value of the parameter where it was not defined).

**Note:**

*If only one value is specified, she is taken into account at the same time by the interpolation of the parameter and the function. INTERPOL = "LOG" is equivalent to ("LOG", "LOG").*

## 3.6 Operand INFO

◇INFO =

Specifies the options of printing on the message file (unit 6).

- 1: no the printing (option by default)
- 2: printing of the parameters plus the list of the first 10 values of each function in the order ascending of the first 10 parameter

## 3.7 Operand VERIF

◇VERIF =

operator DEFI\_THREE-DIMENSIONS FUNCTION reorders the values of the parameters  $N_p$  in the ascending order. If VERIF is worth "GROWING" the operator stops the execution if the values of the parameter  $N_p$  were not given in this order.

## 3.8 Definition of the functions of the three-dimensions function

Two modes of definition of the three-dimensions function are possible:

- from a list of existing functions [§3.8.1],
- by directly defining the various functions of the three-dimensions function [§3.8.2].

### 3.8.1 Operand FONCTION

FONCTION = lf

LISTE of concepts of the standard function created by commands DEFI\_FUNCTION [U4.31.02], CONSTANT DEFI\_ [U4.31.01], CALC\_FONC\_INTERP [U4.32.01],...

lf is the list of the names of concepts of the standard function corresponding to the values of the parameter.

All the functions of the list must have the same name of variable (NOM\_PARA of DEFI\_FONCTION, that we will call  $npf$ ) and to have the same name NR for name of result.

$nf$  is a three-dimensions function of the variable of name  $N_p$  and variable of name  $npf$  and whose value is of name NR.

### 3.8.2 Direct definition of the functions

#### 3.8.2.1 Operand NOM\_PARA\_FONC

◆NOM\_PARA\_FONC =npf

Name of the parameter characteristic of the functions constituting the three-dimensions function.

The authorized values are listed are the same ones as for NOM\_PARA.

#### 3.8.2.2 Key word DEFI\_FONCTION

DEFI\_FONCTION =

direct Definition of the functions constituting the three-dimensions function.

## 3.8.2.3 Operand VALE

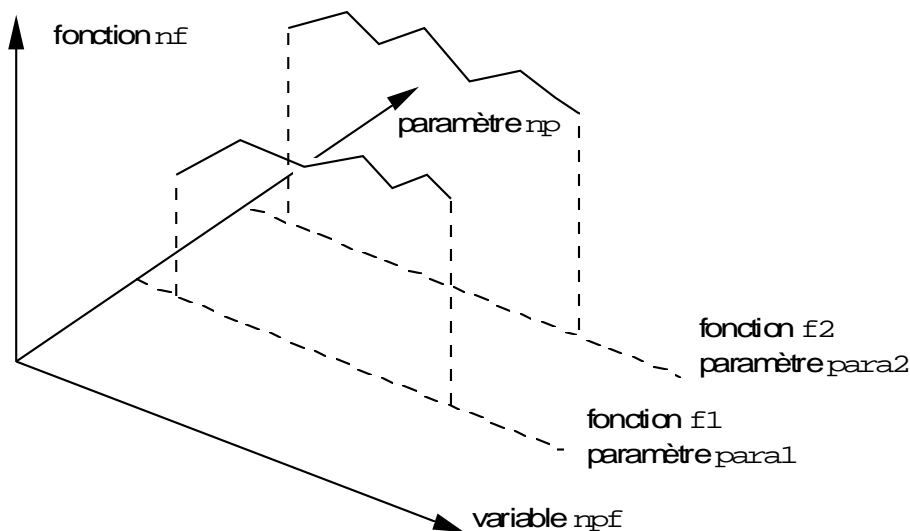
◆VALE = lv  
lv is the list of value (x1, y1, ..., xn, yn) with in the order:  
x1, y1 (the first value of the parameter and the corresponding value of result),  
...  
xn, yn (the last value of the parameter and the corresponding value of result).

## 3.8.2.4 Operands PROL\_DROITE and PROL\_GAUCHE

◇PROL\_DROITE and PROL\_GAUCHE =

Define the type of prolongation on the right (on the left) of the field of definition of the variable:

"CONSTANT" for a prolongation with the last (or first) value of the function,  
"LINEAIRE" for a prolongation along the first definite segment (PROL\_GAUCHE) or last definite segment (PROL\_DROITE),  
"EXCLUDED" if the extrapolation of the values apart from the field of definition of the parameter npf is prohibited (in this case if a computation requires a value of the function out of field of definition, the code will stop in fatal error).



## 3.8.2.5 Operand INTERPOL

◇INTERPOL =

Standard of interpolation of the function enters the values of the field of definition of the function: a type for the interpolation of the X-coordinates and for the interpolation of the Y-coordinates of the function. This is obtained by providing a list of texts among:

INTERPOL = ("LIN", "LOG")

"LIN" : linear,

"LOG" : logarithmic curve,

"NON" : one does not interpolate (and thus the program will stop if one asks for the value of the function for a value of the parameter where it was not defined).

### Note:

If only one value is specified, she is taken into account at the same time by the interpolation of the parameter and the function. INTERPOL = "LOG" is equivalent to ("LOG", "LOG").

## 3.9 Operand TITER

◇TITER = Ti

Titres attached to the product concept by this operator [U4.03.01].

## 3.10 Evaluating of a three-dimensions function

Is a three-dimensions function  $N$  whose parameter is  $NOM\_PARA = y$  and composed of functions of which  $NOM\_PARA\_FONC = x$ , of values  $NOM\_RESU = z = f(x)$ .

To evaluate  $N(x, y)$  :

- One seeks  $i$  such as  $y_i \leq y < y_{i+1}$ ,
- One evaluates the two functions  $f_i$  and  $f_{i+1}$  in  $x$ . For that, one uses the prolongations and the standard of interpolation of each function (defined in command DEFI\_FONCTION or under factor key word the DEFI\_FONCTION of DEFI\_NAPPE).
- One evaluates then  $N(x, y)$  while interpolating starting from the values  $(y_i, y_{i+1})$  and  $(f_i(x), f_{i+1}(x))$ . One then uses the prolongations and types of interpolation defined by key words simple PROL\_GAUCHE, PROL\_DROITE, INTERPOL of DEFI\_NAPPE.

One would write:

```
three-dimensions function = DEFI_NAPPE (  NOM_PARA = "there",
                                         NOM_RESU = "Z",
                                         NOM_PARA_FONC = "X",
                                         INTERPOL = (has, b),
                                         DEFI_FONCTION = (_F ( VALE=...,
                                                                INTERPOL = (C, d),),
                                                                other functions...),)
```

the types of interpolation used are:

- C between two values  $x$ ,
- D when the functions in  $X$  are evaluated,
- has between two values of there,
- B between two different functions (evaluated in  $x$ ).

## 4 Definition

### 4.1 examples of the three-dimensions function after definition of function

```
FCT2 =DEFI_FONCTION (NOM_PARA = "EPSI", PROL_DROITE = '
LINEAIRE',
                    PROL_GAUCHE = ' LINEAIRE',
                    VALE = (1.25E-5, 3.75, 3.75E-5, 7.5),)

FCT3 =DEFI_FONCTION (NOM_PARA = "EPSI", PROL_DROITE = '
LINEAIRE',
                    PROL_GAUCHE = ' LINEAIRE',
                    VALE = (1.25E-5, 2.50, 3.75E-5, 5.0),)

SIG =DEFI_NAPPE (NOM_PARA = "TEMP", PROL_DROITE = '
CONSTANT',
                PROL_GAUCHE = ' CONSTANT',
                PARA = (20.0, 30.0),
                FONCTION = (FCT3, FCT2),)
```

## 4.2 direct Definition of the three-dimensions function and the constitutive functions

```
FCT2 = DEFI_NAPPE ( NOM_PARA = "TEMP",          PROL_DROITE = '
CONSTANT',
                  PROL_GAUCHE = ' CONSTANT',
                  PARA = (20.0, 30.0, ),
                  NOM_PARA_FONC = "EPSI",
                  DEFI_FONCTION = (
                    _F (PROL_DROITE = ' LINEAIRE',
                        PROL_GAUCHE = ' LINEAIRE',
                        VALE = (1.25E-5, 3.75, 3.75E-5, 7.5, ),
                        ),
                    _F (PROL_DROITE = "LINEAIRE",
                        PROL_GAUCHE = "LINEAIRE",
                        VALE = (1.25E-5, 2.5, 3.75E-5, 5.0, ),
                        ),
                  ),
                )
```