

**Manuel d'Utilisation**  
**U4.0- booklet: Use of the orders**  
**Document: U4.01.03**

## Innovations and modifications of version 7

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### Summary:

The object of this document is to give a comprehensive view of the modifications of syntax and new opportunities of the orders of *Code\_Aster* intervened between each version since version 7.0. Index A of this document thus mentions changes introduced since **version 7.3** from April 2004 and valid for **version 7.4** from December 2004.

For more precise details, one will consult the documentation of the orders and the file `histor` under - corresponding version (e.g.: [7.3.12], section *Development* site `www.code-aster.org`). The impacted orders are listed alphabetically.

## 1 Innovations between 7.3 and 7.4

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### 1.1 Modifications of the environment

#### 1.1.1 Med

`Code_Aster` be pressed now on library MED 2.2. For reading files with the format med 2.1.5, they should be converted with the tool `med_import` (there do not exist tools in the opposite direction).

#### 1.1.2 Lobster

Following the change of version of med, `lobster` also evolved to support the same level of library. `lobster 7.1` also bring other innovations (cf [U7.03.xx]).

### 1.2 New orders

#### 1.2.1 CREA\_TABLE

This order makes it possible to create a table starting from a function or several lists of entreties, realities or character strings. One can create a full table or with holes by indicating the lines which one wishes to inform.

#### 1.2.2 DEFI\_COMPOR

This order makes it possible to define a single-crystal or polycrystalline behavior.

#### 1.2.3 DEFI\_PART\_FETI

This order makes it possible to create a partitioning under-fields for a resolution by the Feti method.

#### 1.2.4 IMPR\_FONCTION

This new order replaces `IMPR_COURBE`, and it treats only the functions (from where the name change), the tables being treated by `IMPR_TABLE` (cf [7.3.13]).

#### 1.2.5 MACR\_ECLA\_PG

This macro-order replace the options `ECLA_PG` of the two orders `CREA_MAILLAGE` and `CREA_RESU`. Coherence between the two orders is thus ensured.

#### 1.2.6 MODI\_MODELE\_XFEM

This order makes it possible to create finite elements with `ddl nouveau riches` necessary to method XFEM.

### 1.3 Reabsorbed orders

#### 1.3.1 DEFI\_VALEUR

Contents of the Python objects being saved (in the file `pick.1`) “at side” of the base Aster (file `glob.1`), it is not necessary any more to have a specific order to define a parameter.

For example (see also [U3.01.0x]):

```
deuxpi = 2.*pi
```

#### 1.3.2 IMPR\_COURBE

Replaced by IMPR\_FONCTION (cf [7.3.13]).

### 1.3.3 POST\_GOUJ2E

This order had not been reabsorbed at the same time as the associated macros MACR\_GOUJ2E\_MAIL/CALC. The method for calculation is preserved in the CAS-tests zzzz120a and zzzz120b (cf [7.2.14]).

## 1.4 Modifications common to several orders

### 1.4.1 Keywords **FILE** and **UNIT**

According to the type of order, one was to use is **UNIT** (reading commands) where a logical number of unit was expected, that is to say **FILE** (orders of postprocessing) behind which one not expected a file name but a “label” (ddname) which was associated with a unit logical by default or affected via the order **DEFI\_FICHER** (ex-DEFUFI).

The concept of label disappears; the orders function all with **UNIT** and, those which can use a true file name accept also the keyword **FILE**.

The risk of confusion is reduced: one provides to **UNIT** the logical unit well informed in **astk** and with **FILE** a file name complete Unix (see also the use of **REPE\_IN/REPE\_OUT** in the documentation of **astk** [U1.04.00]).

### 1.4.2 Orders of postprocessing **CALC\_ELEM**, **CALC\_NO**, **CALC\_G\_LOCAL\_T**, **CALC\_G\_THETA\_T**, **POST\_ELEM**

**MODEL**, **CHAM\_MATER**, **CARA\_ELEM**, **EXCIT** become optional:

- The structure of data result (exit of **STAT\_NON\_LINE**, **THER\_LINEAIRE**...) keep in memory these 4 parameters, it thus becomes optional to provide them to these operators of postprocessings. One can however inform these keywords in certain typical cases; it is checked whereas they are the same ones which was used for calculation, if it is not the case, one emits an alarm or one stops in error (case of **MODEL**) (cf [7.3.7], [7.3.24]).

## 1.5 Modified orders

### 1.5.1 **AFFE\_CARA\_ELEM**

**ANGL\_L**, **POUR\_CENT\_L**, **POUR\_CENT\_T** removed, **SECTION\_L** famous in **SECTION** :

- These keywords do not have any more interest since the introduction of new elements of grid membrane which make it possible to model the grids of reinforcement in a given direction, and which are usable jointly with a modeling 3D of the concrete. In the same way the elements roasts (usable with “hull” work from now on in only one direction. The orientation of the reinforcements is defined under **ANGL\_REP** (cf [7.3.10]).

**POUTRE/VARI\_SECT** modified:

- To guide the user among the possible choices, one chooses a value now for **SECTION**, then for **VARI\_SECT** (new choice: **CONSTANT** by default) what makes it possible to limit the list of possible for **CARA** (cf [7.3.23]).

**PREC\_AIRE**, **PREC\_INERTIE** new:

- One checks the coherence of the information (surface and inertia of the multifibre beams) provided under the keywords **BEAM** and **AFFE\_SECT** with the precision indicated by these keywords (cf [7.3.28]).

### 1.5.2 **AFFE\_CHAR\_MECA/AFFE\_CHAR\_MECA\_F**

**FORMULATION** new:

- At the time of the resolution of a problem of contact with the method continues, one has the choice between a formulation in displacement (value DEPL) or of speed (value QUICKLY, well adapted numerically to the treatment of the shocks) (cf [7.3.18]).

**TOLE\_PROJ replaced by TOLE\_PROJ\_EXT, TOLE\_PROJ\_INT new:**

- In the case of symmetrical pairing MAIT\_ESCL\_SYME, it is necessary to have a tolerance of projection for the detection of the worthless pivots (cf [7.3.23]).

**ITER\_MULT\_MAXI new:**

- ITER\_MULT\_MAXI multiplied by the number of nodes slaves gives the maximum number of iterations of contact (cf [7.3.23]).

**COEF\_MULT\_2 , VECT\_NORM\_2 , DIST\_1 , DIST\_2 replaced by COEF\_MULT\_ESCL , VECT\_NORM\_ESCL , DIST\_MAIT and DIST\_ESCL :**

- Homogenisation of the vocabulary following the renaming of GROUP\_MA\_1/2 in GROUP\_MA\_MAIT/ESCL (cf [7.3.24]).

**GRAPPE\_FLUIDE new keywords:**

- Several keywords making it possible to locate the forces according to their type and their zone application were added (APPL\_FORC\_XXXX, DIRE\_FORC\_FPLAQ, UNITE\_IMPR\_XXXX) (cf [7.3.23]).

**HARLEQUIN modifications:**

- Improvement of the method Harlequin (cf reference document) and addition of the keywords COND\_LIM, JOINING, POIDS\_GROSSIER, POIDS\_FIN (cf [7.3.28]).

### 1.5.3 AFFE\_MATERIAU

**SECH\_REF new:**

- Allows to inform the value of the drying of reference; with this concentration, the withdrawal of desiccation is null. The user must think of informing K\_DESSIC if its field of drying is variable (cf [7.3.2]).

### 1.5.4 CALC\_FATIGUE

**MODEL removed:**

- The keyword was not useful (cf [7.3.2]).

### 1.5.5 CALC\_FONCTION

**METHOD new:**

- Improvement of the calculation of the FFT by adding the method PROL\_ZERO in which one supplements the signal with zeros (cf [7.3.14]).

### 1.5.6 CALC\_G\_LOCAL\_T and CALC\_G\_THETA\_T

**EXCIT replace LOAD :**

- The multiplicative coefficient of the loads was not taken into account. It is now the case, LOAD, FONC\_MULT and TYPE\_CHARGE are added under EXCIT. Even modification in CALC\_G\_THETA\_T (cf [7.3.6]). By default, it is not necessary besides to provide EXCIT, which is stored in the SD result (cf [§1.4.2]).

**QUICKLY, ACCE new:**

- Allow to take into account the terms of inertia in the calculation of G (cf [7.3.4]).

### 1.5.7 CREA\_MALLAGE

**NOM\_CHAM new:**

- To burst the elements (ECLA\_PG), it is necessary to know the family of points of Gauss used. For that, one must provide the name of the field (cf [7.3.19]).

## 1.5.8 CREA\_RESU

**MODEL, CHAM\_MATER, CARA\_ELEM new:**

- Allow to create a result of the type `elas_mult` (MACRO\_ELAS\_MULT) (cf [7.3.7]).

## 1.5.9 BEGINNING

### **FORMAT\_HDF=' OUI ' / 'NOT' replace the keyword factor HDF :**

- The bases with format HDF (portable binary format between machines of different architectures) are now supported by askt, it is thus enough to specify if one wants to read a base with this format or not (cf [7.3.8]).

### **VISU\_EFICAS new:**

- Allows to indicate (in the CAS-tests) if a command file is readable in Eficas or not (cf [7.3.5]).

## 1.5.10DEFI\_FICHIER

### **FILE replace NOM\_SYSTEME :**

- In the idea of the simplification of the keywords UNIT and FILE (cf [7.3.14]).

### **Turn over a free logical unit (primarily for the macros) :**

- In order not to cause conflict by choosing a logical unit already used, DEFI\_FICHIER return a free number of unit (cf [7.3.23]).

## 1.5.11DEFI\_MATERIAU

### **LEMA\_SEUIL/\_FO new:**

- Introduction of a law of behavior derived from the law of Lemaître: below threshold the law is elastic, starting from the threshold, it behaves like a typical case of the law of Lemaître (cf [7.3.27]).

### **GRANGER\_FP\_INDT new:**

- It is about a law of Granger at a constant temperature (cf [7.3.24]).

### **ENDO\_ORTH\_BETON new:**

- Orthotropic law of behavior of the concrete with taking into account of the damage (cf [7.3.23]).

### **DRUCK\_PRAGER/\_FO new (old DRUCKER\_PRAGER) :**

- Addition of the possibility of calculating the sensitivity in 2D and 3D of the model of Drucker-Prager, the addition of \_FO obliged has famous the model to avoid the conflicts of name (cf [7.3.21]).

### **VISC\_SINH replace ROUSS\_VISC :**

- With the addition of the laws of viscoplastic behavior VISC\_ISOT\_TRAC and VISC\_ISOT\_LINE, the viscous model being that already used by ROUSS\_VISC, the keyword was famous to be more general (cf [7.3.19]).

### **JOINT\_BA new:**

- New law of behavior of steel-concrete connection in 2D (cf [7.3.8]).

### **BARCELONA - ALPHAB new:**

- If it is not provided, the parameter is calculated by the code (cf [7.3.6]).

**ECOUC\_VISCi, ECOUC\_ISOTi, ECOUC\_PLASi, ECOUC\_CINEi new:**

- Allow to define the parameters of the single-crystal behaviors (cf [7.3.1]).

## 1.5.12DEFI\_MODELE\_GENE

**OPTION=' REDUIT' new:**

- This option makes it possible to use the dynamic under-structuring by a method of modes of interface in order to reduce the size of the generalized modes, associated keywords: GROUP\_MA\_MAIT\_1/2, MAILLE\_MAIT\_1/2 (cf [7.3.18]).

## 1.5.13 TO DESTROY

### **ALARM new:**

- To use only in the macros-orders, this keyword makes it possible not to emit of alarm when one tries to remove a concept which does not exist (cf [7.3.27]).

### **CLASS new:**

- Allows to remove an Aster object on the volatile basis (cf [7.3.8]).

## 1.5.14 DYNA\_NON\_LINE

### **TETA\_METHODE new:**

- Introduction of a formulation of speed for integration of the contact in dynamics. The value of  $\theta$  (parameter of the diagram of integration in time) can be selected between 0.5 and 1. , this allows at the time of the resolution of a problem of contact with the method continues to vary dissipation during the phase of separation (cf [7.3.18], [7.3.22]).

### **REAC\_ITER\_ELAS new:**

- Parameter to control the frequency of reactualization of the secant matrix (cf [7.3.21]).

## 1.5.15 DYNA\_TRAN\_EXPLI

*It should be noted that this order will amalgamate with DYNA\_NON\_LINE in version 8.1.*

### **REAC\_ITER\_ELAS new:**

- Parameter to control the frequency of reactualization of the secant matrix (cf [7.3.21]).

## 1.5.16 END/CONTINUATION

### **FORMAT\_HDF=' OUI ' / 'NOT' replace the keyword factor HDF :**

- The bases with format HDF (portable binary format between machines of different architectures) are now supported by askt, it is thus enough to specify if one wants to or not read/write a base with this format (cf [7.3.8]).

## 1.5.17 FORMULA

### **NOM\_PARA, VALE new:**

- The formulas are now unspecified expressions Python (it is enough that one can evaluate them all the same!). The names of parameters and the expression are defined under these two distinct keywords (cf [7.3.21] and [U4.31.05]).

## 1.5.18 IMPR\_FICO\_HOMA

### **UNITE\_CONF, UNITE\_DONN replace FICHIER\_CONF, FICHIER\_DONN :**

- In the same spirit as in the paragraph [§1.4.1] (cf [7.3.23]).

### **MAJ\_CHAM becomes a keyword factor...**

- ... to offer more flexibility in the choice of the fields to be updated during an adaptation of grid (cf [7.3.20]).

## 1.5.19 IMPR\_FONCTION

*The order was completely rewritten (cf [7.3.13]).*

**FORMAT modified:**

- In a preoccupation with a homogenisation with the other orders, the format EXCEL becomes TABLE.
- Formats XMGRACE and AGRAF are dedicated to the tracers of the same name.
- Formats RESULT, ORDER and EARTHQUAKE are removed.

**PILOT new (if FORMAT=' XMGRACE '):**

- By default, one produces a file ready to be to visualize in `xmgrace`. One can also invite the various pilots available for `xmgrace` in order to produce a file ready to be introduced into a note of calculation like a file `POSTSCRIPT`, `PNG` or `JPEG`.

**STYLE, COLOR, MARKER modified:**

- These keywords make it possible to define the style of each curve, these are now entreties that it is necessary to provide.

**FREQ\_GRILLE\_X/Y replace GRILLE\_X/Y :**

- Because `agraf` a frequency of squaring waits and `xmgrace` a step of grid.

**FREQ\_MARQUEUR is moved under the keyword factor CURVE .****UNIT, UNITE\_DIGR modified:**

- `UNIT` the logical number of unit of the file contains in which one produces the curve (file `.dogr` with the format `AGRAF`). `UNITE_DIGR` allows to choose the logical unit associated with the file `.digr` with the format `AGRAF`.

**TITLE replace TITRE\_GRAPHIQUE, SOUS\_TITRE replace COMMENT.****TABLE removed:**

- It is the role of the order `IMPR_TABLE`.

**RECU\_GENE removed:**

- The order treats only the functions (or tablecloths). It is necessary to proceed in two times: to recover the values with `RECU_FONCTION`, then impression itself with `IMPR_FONCTION`.

## 1.5.20 IMPR\_RESU

**FILE, FORMAT moved:**

- These keywords are moved out of keyword factor `RESU` so that one cannot use only one any more `IMPR_RESU` to write in two different files (because the files were often incomplete) (cf [7.3.14]).

## 1.5.21 IMPR\_TABLE

*The order was completely rewritten (cf [7.3.27], [7.3.29]).*

**FORMAT modified:**

- In a preoccupation with a homogenisation with the other orders, the format `EXCEL` becomes `TABLE`, `TABLE` becomes `TABLEAU_CROISE` (a parameter function of 2 others).
- The format is added `XMGRACE` who produces a directly displayable file in `xmgrace`.
- Formats `ASTER` and `AGRAF` are unchanged (note: with the format `AGRAF`, the file `.digr` is not created).

- The format MOT\_CLE is removed.

**TOUT\_PARA removed:**

- It is enough to omit the keyword NOM\_PARA to select all the parameters of the table.

**SORTING modified:**

- One can sort according to NR parameters, in the event of equality on a parameter, one passes to the following; ORDER is worth GROWING or DECREASING.
- CRITERION and PRECISION are removed.

**PAGINATION modified:**

- The number of parameter is unlimited.

**TITLE** replace **TITRE\_TABLE**.

## 1.5.22 INFO\_EXEC\_ASTER

**LISTE\_INFO** new possibility: **ETAT\_UNITE**

- One can know if a file attached to a logical unit currently is opened or closed (cf [7.3.20]).

## 1.5.23 LIRE\_FONCTION

*The order was completely rewritten (cf [7.3.10], [7.3.21], [U4.32.02]).*

**INDIC\_xxxx**, **FORMAT**, **TYPE**, **SEPAR** new:

- Allow to build a real, complex function or a tablecloth starting from files whose format can slightly vary.

## 1.5.24 LIRE\_RESU

**NOM\_CHAM** removed:

- This keyword is useless out of specific blocks to each format (cf [7.3.28]).

## 1.5.25 MACR\_ADAP\_MAIL/MACR\_INFO\_MAIL

**NON\_SIMPLEXE** modified:

- Treatment of the quadrangular elements (cf [7.3.20]).

## 1.5.26 MACR\_FIAB\_IMPR

**PARA\_SENSI** new:

- Necessary to treat the case of the sensitivity (cf [7.3.24]).

## 1.5.27 MACRO\_MISS\_3D

**VERSION** new:

- Allows to specify the version of the Miss3D software used (cf [7.3.27]).

## 1.5.28 MECA\_STATIQUE

**METHODE=' FETI '** new:

- Introduction of a method of resolution by decomposition of fields of the Feti type. New keywords simple associates: **PARTITION**, **RENUM**, **RESI\_RELA**, **NMAX\_ITER**, **TYPE\_REORTHO\_DD**, **NB\_REORTHO\_DD**, **PRE\_COND**, **SCALING**, **VERIF\_SDFETI**, **TEST\_CONTINU** (cf [7.3.3]).

**INFO\_FETI** new:

- To modulate the amount of information to print at the time of a resolution by the method Feti (cf [7.3.27]).

## 1.5.29 `MODE_ITER_INV/MODE_ITER_SIMULT/NORM_MODE`

### **SENSITIVITY new:**

- Possibility of doing calculations of sensitivities for the generalized and quadratic problems (cf [7.3.15]).

## 1.5.30MODI\_MAILLAGE

### ORIE\_FISSURE replace ORIE\_CONTACT :

- This functionality is used for the joined elements (cf [7.3.20]).

## 1.5.31POST\_RCCM

### TABL\_SIGM\_THER new:

- Allows to calculate  $s_n^*$  starting from the statement of the constraints under thermal loading only (cf [7.3.6]).

## 1.5.32STAT\_NON\_LINE

### REAC\_ITER\_ELAS new:

- Parameter to control the frequency of reactualization of the secant matrix (cf [7.3.21]).

## 1.5.33TEST\_FICHER

### EXPR\_IGNORE new:

- Allows not to preserve certain lines of the file tested by using regular expressions (cf [7.3.22]).

## 2 Innovations between 7.2 and 7.3

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### 2.1 New orders

#### 2.1.1 MACR\_FIABILITE

This macro-order calculates the probability that a physical variable (displacement, forced,...) exceed a threshold defined by the user according to a certain number of parameters which will have been defined like sensitive by the user. These significant parameters can be Young, the Poisson's ratio modulus, a pressure, etc.

The macro-order calls on the software MEFISTO which is external with *Code\_Aster*, and which implements the method FORMS. (cf [7.2.11]).

#### 2.1.2 STANLEY

Stanley, tool for interactive postprocessing, was already present in version 7; this macro-order simplifies its call since one now launches it like an ordinary order. (cf [7.2.25]).

#### 2.1.3 TEST\_FICHER

This macro-order makes it possible to test to it not regression of the orders which produce files, for submission to the developers (cf [7.2.25]).

### 2.2 Reabsorbed orders

#### 2.2.1 FACT\_INTE\_SPEC

This order was amalgamated with GENE\_FONC\_ALEA (cf [7.2.3]).

#### 2.2.2 MACR\_GOUJ2E\_MAIL and MACR\_GOUJ2E\_CALC

These two macro-orders are reabsorbed. The method for calculation is preserved in the command files zzzz120a and zzzz120b who validated these features. (cf [7.2.14]).

### 2.3 Modified orders

#### 2.3.1 AFFE\_CARA\_ELEM

**RIGI\_MISS\_3D new:**

- Allows to affect the terms of a matrix of impedance of ground calculated by MISS3D for a frequency of extraction given (cf [7.2.2]).

#### 2.3.2 AFFE\_MODELE

**\*\_HH2D new modelings:**

- These modelings make it possible to take into account two phases in the two components; the dissolved air pressure is connected to the air pressure dryness by the law of Henry (cf [7.2.7]).

**GRILLE\_MEMBRANE new modeling:**

- It is about a new element of tablecloths of reinforcement which works only out of membrane, not of ddl of rotation (cf [7.2.21]).

## 2.3.3 AFFE\_CHAR\_MECA/AFFE\_CHAR\_MECA\_F

### **GRAPPE\_FLUIDE new:**

- Allows to take into account the fluid forces due with the displacement of the bunch in the fluid which bathes the internal elements of the heart. (cf [7.2.2]).

### **TOLE\_PROJ new:**

- Allows to adjust the projection of the nodes slaves towards the meshes Masters (cf [7.2.1]).

### **CONTACT famous keywords:**

- GROUP\_MA\_MAIT, MAILLE\_MAIT, GROUP\_MA\_ESCL, MAILLE\_ESCL replace respectively GROUP\_MA\_1, MAILLE\_1, GROUP\_MA\_2, MAILLE\_2 (cf [7.2.4]).

## 2.3.4 ASSE\_MALLAGE

### **OPERATION, MALLAGE\_1, GRID new:**

- Three types of operation are now available SOUS\_STR, SUPERIMPOSE, JOINING (cf. [7.2.4]).

## 2.3.5 CALC\_CHAM\_ELEM/CALC\_ELEM

### **Doubled bloom:**

- These two orders made doubled bloom on most calculated options, only some options persist in CALC\_CHAM\_ELEM (cf [7.2.17]).

## 2.3.6 CALC\_FATIGUE

### **TYPE\_CHARGE new:**

- The type of loading defines (periodic or not), under the keyword CRITERION, the choice is thus restricted according to the type of loading (cf [7.2.5]).

### **CRITERE=' DOMM\_MAXI ', PROJECTION, DELTA\_OSCI new:**

- These keyword are associated with the new criterion adapted to the nonperiodic loadings; it is about a criterion with variable amplitude based on a critical level selected according to the induced maximum damage (cf [7.2.5]).

### **CRITERE=' DANG\_VAN\_\_MODI\_AC ' / ' DANG\_VAN\_MODI\_AV ' new:**

- It is about a criterion with variable amplitude based on a critical level selected starting from the maximum damage. This criterion which is adapted if the loading is not periodical is an evolution of the criterion of original DANG VAN. 'AC' for constant amplitude, 'AV' for variable amplitude (cf [7.2.11]).

## 2.3.7 CALC\_G\_THETA\_T

### **New type for the field $\theta$ :**

- One can now provide a field  $\theta$  of type `cham_no_depl_r` (and to build it made-to-order!) instead of that provided by `CALC_THETA` (cf [7.2.8]).

## 2.3.8 CALC\_NO

**GROUP\_MA\_RESU, GROUP\_NO\_RESU, MAILLE\_RESU, NOEU\_RESU new:**

- Allow to specify the zone on which the field by element will be tiny room before calculating the values with the nodes because one could get incorrect results when a node is at the border of two modelings (cf [7.2.7]).

## 2.3.9 CREA\_MALLAGE /CREA\_RESU

### **ECLA\_PG new possibilities:**

- One can now burst a grid (by creating an element by point of Gauss) on a part only of one grid; and in 2D, to give a fictitious thickness to flattened elements.

### **Caution:**

*Parameters provided to CREA\_MALLAGE and CREA\_RESU must be coherent: same groups of meshes given in the same order (cf [7.2.25]).*

## 2.3.10DEFI\_FONCTION

### **NOM\_PARA new values:**

- Added names of parameter: NORM and DSP (cf [7.2.4]).

## 2.3.11DEFI\_GROUP

### **CREA\_GROUP\_NO / TOUT=' OUI ' limited to the option TUNNEL :**

- The use of TOUT=' OUI ' is not available for all the options, only for the option TUNNEL (cf [7.2.8]).

## 2.3.12DEFI\_MATERIAU

### **BARCELONA new behavior for KIT\_HHM and KIT\_THM :**

- Law of mechanical and hydrous behavior of the unsaturated grounds. This model utilizes two criteria, a mechanical criterion of plasticity which is that of CAM\_CLAY and another hydrous criterion controlled by suction (cf [7.2.21]).

### **GLRC/GLRC\_FO new behavior:**

- Law of behavior of the reinforced concrete plates written in generalized efforts; associated finite element DKTG (on meshes TRIA3 and QUAD4) (cf [7.2.4]).

### **CORR\_ACIER new:**

- Elastoplastic model endommageable of a steel in which the plastic deformation with rupture depends on the rate of corrosion (cf [7.2.23]).

### **VISC\_IRRA\_LOG new behavior:**

- Viscoelastic law of behaviour for the axial creep of the tubes guides under irradiation (cf [7.2.1]).

### **DRUCKER\_PRAGER new behavior:**

- Law of behavior for the soil mechanics (cf [7.2.7]).

### **LIQU\_AD\_GAZ\_VAPE new:**

- Mixing rate of the air dissolved for the THM (law of Henry) which connects the air pressure dissolved to the air pressure dryness (cf [7.2.7]).

### **DOMM\_A, DOMM\_B, COEF\_CISA\_TRAC new:**

- Associated with the criterion of tiredness DOMM\_MAXI of CALC\_FATIGUE (cf [7.2.5]).

**EPSP\_SEUIL, EXP\_S new:**

- Associated with the criterion of tiredness DOMMA\_LEMAITRE of CALC\_FATIGUE (cf [7.2.19]).

**LAMBDA and D\_LAMBDA\_TEMP removed under THM\_\*:**

- Thermal conductivity is now defined like the product of three functions of the temperature (LAMB\_T), saturation (LAMB\_S) and of porosity (LAMB\_PHI) more one constant (LAMB\_CT), as well as the three derivative of the functions (D\_LB\_T, D\_LB\_S, D\_LB\_PHI) (cf [7.2.10]).

In the thermal case, only LAMB\_T is obligatory, the other functions being then taken equal to one and their derivative worthless.

## 2.3.13 GENE\_FONC\_ALEA/GENE\_MATR\_ALEA/GENE\_VARI\_ALEA

- These orders were completely altered; FACT\_GENE\_ALEA was reabsorbed with the profit of GENE\_FONC\_ALEA. One will refer to documentations of the orders for the new syntax of use (cf [7.2.3]).

## 2.3.14 IMPR\_RESU

### **FORMAT=' GMSH ' /VERSION new defect:**

- The version of the file GMSH by default is now 1.2 (in which GMSH can post-treat the quadrangles): the quadrangles are not cut out in triangles (cf [7.2.9]).

## 2.3.15 INCLUDE\_MATERIAU

### **New materials available in the catalogue material:**

- Z3CN20-09M, Z6NCTDV25-15 (cf [7.2.10], to see on the Intranet *Code\_Aster* under Use/Materials).

## 2.3.16 MACR\_RECAL

### **WEIGHT new:**

- One can balance the various curves on which retiming (cf [7.2.4] is made).

## 2.3.17 MODI\_MAILLAGE

### **SYMMETRY new:**

- Allows to take the symmetrical one of a grid compared to a line or a plan according to dimension (cf [7.2.16]).

## 2.3.18 POST\_ELEM

### **New:**

- One can now use POST\_ELEM after a multiple resolution with MACRO\_ELAS\_MULT (cf [7.2.22]).

## 2.3.19 POST\_K1\_K2\_K3

### **ALL new:**

- Allows to calculate the stress intensity factors on all the nodes of the meshes composing the bottom of crack (cf [7.2.4]).

## 2.3.20 PROJ\_CHAMP

### **DISTANCE\_MAX new:**

- Allows to astutely project fields of a model A towards a model B. When nodes of the grid B are not in an element of grid A and that they are beyond a certain distance, the field is not project (cf [7.2.16]).

## **NUAG\_DEG\_\* removed methods:**

- These methods of projection of fields were removed, results vague (cf [7.2.22]).

## **2.3.21 POST\_RCCM**

### **TYPE\_RESU\_MECA new, modification of the options:**

- This keyword can take the values 'UNIT' or 'PIPING', OPTION=' FATIGUE ' replace B3200 and B3600... (cf [7.2.17]).

## 2.3.22MACRO\_CARA\_POUTRE

### **RT new result:**

- One can obtain under this keyword of ray of torsion of the section of a beam (cf [7.2.2]).

## 2.3.23STAT\_NON\_LINE/DYNA\_NON\_LINE

### **ALGO\_1D new:**

- One can thus use all the behaviors (small deformations) 3D in the elements of bar, grids, multifibre beams, one extended the method suggested by R. De Borst for the plane constraints to the behaviors 1D. That is translated, as for the plane constraints, by 4 internal variables (cf [7.2.18]).

**ETAT\_INIT obligatory in réentrant mode** (when the result is enriched) (cf [7.2.1]).

### **BARCELONA new:**

- Behavior of the grounds in medium unsaturated (cf [7.2.21]).

### **GLRC new:**

- Behavior of the reinforced concrete plates written in generalized efforts (cf [7.2.4]).

### **CORR\_ACIER, CORROSION new:**

- Allow to provide the parameters necessary to the elastoplastic model endommageable of a steel in which the plastic deformation with rupture depends on the rate of corrosion (cf [7.2.23]).

### **SOUS\_STRUC new:**

- Integration of the static macronutrients. The application concerned is to optimize the resolution of the problems of important size in which only a restricted part with a nonlinear behavior (cf. [7.2.23]).

### **THER\_HOMO, THER\_POLY removed:**

- Suppression of the thermal law of behavior under RELATION\_KIT in THM (cf. [7.2.16]).

## 2.3.24THER\_NON\_LINE\_MO

The order is not any more réentrante because only one moment is calculated (stationary calculation in pointer).

## 3 Innovations between 7.0 and 7.2

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One finds here the consecutive modifications of syntax to the evolutions introduced into versions 7.1 and 7.2 (version 7.0 being similar to the 6.4).

### 3.1 New orders

#### 3.1.1 CALC\_PRECONT

This order makes it possible to define and apply the prestressing of the cables of a structure out of reinforced concrete by taking into account various types of anchoring, and while making it possible to tighten individually each cable while respecting the standards of the BPEL (cf [7.0.14]).

#### 3.1.2 CREA\_TABLE

This order makes it possible to create a table starting from a function or of two lists (cf [7.1.17]).

#### 3.1.3 DYNA\_TRAN\_EXPLI

It is the first grinding of the explicit operator of dynamics into which all the possibilities were not introduced yet (master-slave contact for example) (cf [7.1.16]).

#### 3.1.4 EXTR\_TABLE

This order makes it possible to recover the contents of a cell of a table; only the type MATR\_ASSE\_GENE\_R is treated for the moment (cf [7.1.17]).

#### 3.1.5 MACR\_CABRI\_MAIL - MACR\_CABRI\_CALC

These orders make it possible to net supports automatically, and of launching calculations on these grids (cf [7.1.5]).

### 3.2 Reabsorbed orders

Orders MACRO\_CHAR\_F\_U and MACRO\_MADMACS were removed in version 7.1.

### 3.3 Famous orders

- MACR\_CARA\_POUTRE replace MACRO\_CARA\_POUTRE.

- DEFI\_FICHER replace DEFUFI and TO CLOSE (these last will be reabsorbed in version 7.3). Moreover, DEFI\_FICHER gives access a file by indicating its name system (and not only with its number of logical unit FORTRAN) (cf [7.1.16]).

## 3.4 Modifications common to several orders

### 3.4.1 FOND\_FISS replace BOTTOM, FOND\_3D

In the orders CALC\_G\_LOCAL\_T, CALC\_G\_THETA\_T, CALC\_THETA,  
POST\_K1\_K2\_K3

- Homogenisation of the vocabulary in breaking process (cf [7.0.9]).

## 3.4.2 Options of pre-packaging of the solver – keyword **PRE\_COND**

In the orders **CALC\_FORC\_AJOU**, **CALC\_MATR\_AJOU**, **DYNA\_NON\_LINE**, **MACR\_ASCOUF\_CALC**, **MACR\_ASPIC\_CALC**, **MACRO\_MATR\_AJOU**, **MECA\_STATIQUE**, **STAT\_NON\_LINE**, **THER\_LINEAIRE**, **THER\_NON\_LINE**, **THER\_NON\_LINE\_MO**

- The option **PRE\_COND='DIAG'** is removed, only remains the option **LDLT\_INC** (incomplete) (cf [7.0.14]).

## 3.5 Modified orders

### 3.5.1 **AFFE\_CARA\_ELEM**

**GROUP\_MA\_POI1** new:

- Keyword introduced to affect characteristics of **RIGI\_PARASOL** on elements of the type **POI1** (cf [7.0.14]).

### 3.5.2 **AFFE\_CHAR\_MECA**

**DDL\_POUTRE** new:

- Allows to impose boundary conditions in the local reference mark of a beam (cf [7.0.10]).

**CONNECTION** new:

- Under **DDL\_IMPO**, to block all displacements at a stretch (cf [7.1.5]).

**SIGM\_BPEL** value by default:

- The value by default is now **'NOT'**, the value **'YES'** is usually used only for the setting in prestressed cables (cf [7.0.13]).

### 3.5.3 **AFFE\_CHAR\_MECA\_C**

**CONNECTION** new:

- Under **DDL\_IMPO**, to block all displacements at a stretch (cf [7.1.5]).

### 3.5.4 **AFFE\_CHAR\_MECA\_F**

**CONNECTION** new:

- Under **DDL\_IMPO**, to block all displacements at a stretch (cf [7.1.5]).

**EFFET\_FOND** new:

- The taking into account of the basic effect according to time (cf [7.0.1] allows).

### 3.5.5 **AFFE\_MATERIAU**

**GROUP\_NO**, **NODE** removed:

- The assignment is not possible that on meshes (cf [7.1.8]).

### 3.5.6 AFFE\_MODELE

#### **SHB8 new modeling:**

- New element of hull under-integrated without mode of blocking (cf [7.1.18]).

#### **AFFE modification:**

- possibility of providing a list under AFFE, with rule of overload (cf [7.1.18]).

## 3.5.7 CALC\_ELEM

### **EQUI\_ELNO\_SIGM different method of calculating:**

Equivalent constraints (Von Mises, Tresca,...) were calculated starting from the constraints extrapolated with the nodes. One calculates from now on the equivalent constraints by extrapolation of the constraints equivalent calculated to the points of Gauss (as for the internal variables). The only stress fields provided are thus SIEF\_ELGA\_DEPL into linear and SIEF\_ELGA into nonlinear.

On the other hand for the elements of hulls, the way of calculating of the equivalent constraints did not change: the user must calculate the stress field in a point thickness (SIGM\_ELNO\_DEPL into linear and SIGM\_ELNO\_COQU into nonlinear), and the option EQUI\_ELNO\_SIGM calculate the invariant of this field to the nodes.

## 3.5.8 CALC\_FATIGUE

### **CRITERION new possibility:**

- Addition of the criterion of DANG\_VAN (cf [7.0.7]).

### **MODEL, GRID, GROUP\_MA, MESH, GROUP\_NO, NODE new:**

- Allow post-to treat with the nodes on part of the grid by using the method of plan critical (cf [7.1.7]).

## 3.5.9 CALC\_FONC\_INTERP

### **VALE\_PARA replace VALE\_R ;**

### **NOM\_PARA, NOM\_PARA\_FONC, VALE\_PARA\_FONC, LIST\_PARA\_FONC, INTERPOL\_FONC, PROL\_GAUCHE\_FONC, PROL\_DROITE\_FONC new:**

- Possibility of creating a tablecloth starting from a formula with two parameters (cf [7.0.14]).
- The order is not any more réentrante: it treats a function and produces a function or a tablecloth.

## 3.5.10 CALC\_FONCTION

### **ABS new:**

- Calculation the absolute value of a function (cf [7.0.14]).

### **OPPOSITE new:**

- Calculation the reverse of a function (cf [7.0.14]).

### **ECART\_TYPE new:**

- Calculation of the standard deviation of a function (cf [7.0.15]).

## 3.5.11 CALC\_G\_THETA\_T

## **CALC\_DG removed option:**

- The calculation of the derivative of G follows the standard formalism now (keyword SENSITIVITY) (cf [7.1.12]).

## **3.5.12 COMB\_SISM\_MODAL**

### **TYPE\_COMBI replace TYPE :**

- Under the keywords factors COMB\_MULT\_APPUI and COMB\_DEPL\_APPUI. The possible choices are 'QUAD' and 'LINE', 'ABS' was removed (cf [7.0.14]).

## 3.5.13 CREA\_CHAMP

### OPTION new:

- Allows to initialize a field as if it had been created by such option (cf [7.0.15]).

## 3.5.14 CREA\_MALLAGE

### COQU\_VOLU new:

- Create a voluminal grid starting from a surface grid and a thickness (cf [7.1.11]).

### LINE\_QUAD new:

- Create a quadratic grid starting from a grid made up of linear elements (cf [7.0.5]).

### QUAD\_TRIA3 new:

- Create triangular meshes with three nodes starting from quadrangles (cf [7.1.9]).

## 3.5.15 BEGINNING / CONTINUATION

### HDF new:

- To define the parameters for the reading of a base in format HDF (portable between machines) (cf [7.1.16]).

## 3.5.16 DEFI\_CABL\_BP

### CONE new:

- Allows to define a cone which will support the tension loads of the cable (cf [7.0.16]).

### Note:

| *It is now about an macro-order.*

## 3.5.17 DEFI\_GROUP

### APPUI\_LACHE new:

- The group of the meshes being based on a node or a group of nodes defines (releases: “containing at least a node of the group”) (cf [7.1.10]).

### TUNNEL new:

- The group of the nodes contained in a tunnel defines describes by its axis and its ray (cf [7.0.16]).

### ALARM new:

- Allows to disable the release of the alarms emitted normally by the order.

### Caution:

| *Must be used only by macro-orders which make sure in addition of the validity of the groups obtained.*

## 3.5.18 DEFI\_MATERIAU

### BETON\_ECRO\_LINE new:

- Taking into account of containment for the model ENDO\_ISOT\_BETON, one adds like parameter material SYC maximum constraint in simple compression (cf [7.0.17]).

**BETON\_UMLV\_FP new:**

- Addition of a relation of behavior for the taking into account of the clean creep of the concrete (cf [7.0.4]).

**BPEL\_ACIER / SY becomes F\_PRG :**

- F\_PRG is the guaranteed constraint of the maximum loading with rupture (cf [7.1.17]).

**COMP\_THM new:**

- Regrouping of the parameters required for a calculation THM according to the mixing rate used (cf [7.1.18]).

**DIS\_CONTACT / ANGLE\_i and MOMENT\_i :**

- For the connection grid-pencil, one introduces the angles and moments function of the temperature and the fluence (cf [7.1.7]).

**In fatigue:**

- Addition of CRITERION of DANG\_VAN (cf [7.0.7]).
- For the criterion MATAKE, ENDU\_FT is replaced by COEF\_FLEX\_TORS.

**3.5.19 TO DESTROY****OBJECT new:**

- Possibility of destroying objects associated with concepts inaccessible to the user (cf [7.1.9]).

**3.5.20 DYNA\_LINE\_TRAN and DYNA\_NON\_LINE****SENSITIVITY new:**

- Addition of the calculation of the derivative of the fields results compared to the data material or boundary conditions (cf [7.1.5] for DYNA\_LINE\_TRAN, [7.1.3] for DYNA\_NON\_LINE).

**3.5.21 END****HDF new:**

- To define the parameters for the writing of a base in format HDF (portable between machines) (cf [7.1.16]).

**3.5.22 FORMULA****ENTIRETY removed:**

- The whole formulas are henceforth prohibited (cf [7.0.17]).

**3.5.23 IMPR\_FICO\_HOMA**

There are changes of syntax in this procedure, called by MACR\_ADAP\_MAIL, which is thus not described here.

**3.5.24 IMPR\_RESU****VERSION new:**

- Allows to specify the level of version of the files to format GMSH. With version 1.2 (available in the recent versions of GMSH), the quadrangles are not cut out any more in triangle, GMSH knowing to treat all the linear elements (cf [7.0.3]).

## 3.5.25IMPR\_TABLE

### TITRE\_TABLE new:

- Possibility of defining a title during the impression of a table (cf [7.0.16]).

## 3.5.26INCLUDE\_MATERIAU

### UNITE\_LONGUEUR new:

- Allows to use the data of the catalogue material with the millimetre like unit of length (cf [7.0.14]).

## 3.5.27 LIRE\_CHAMP

### **INST new:**

- One can now locate it (S) field (S) with reading with the moment in a file with format MED (cf [7.1.10]).

## 3.5.28 LIRE\_RESU

### **FORMAT replace FORMAT\_IDEAS :**

- One specifies behind this keyword the format of reading: IDEAS or IDEAS\_DS58 (cf [7.0.13]).

## 3.5.29 MACR\_ADAP\_MAIL

### **NON\_SIMPLEXE new:**

- Acceptance of the quadrangular, hexahedral, pentaedric elements allows (which are not refined) in a grid subjected to Lobster (cf [7.1.10]).

### **MAILLAGE\_FRONTIERE new:**

- Possibility of providing a grid for the follow-up of border (cf [7.1.10]).

### **TYPE\_CHAM modification:**

- One now expects the same thing as in the order CREA\_CHAMP (cf [7.0.12]).

## 3.5.30 MACR\_INFO\_MAIL

### **NON\_SIMPLEXE and MAILLAGE\_FRONTIERE new:**

- See MACR\_ADAP\_MAIL.

## 3.5.31 MECA\_STATIQUE

### **INST\_FIN new:**

- The operator is now réentrant to be able to treat long transients (cf [7.1.8]).

## 3.5.32 MODE\_ITER\_SIMULT

### **APPROACH new possibility:**

- Addition of the approach 'COMPLEX' to deal with the quadratic problem with the eigenvalues, for the strongly deadened cases for example (cf [7.0.12]).

## 3.5.33 MODI\_MAILLAGE

### **ORIE\_SHB8 new:**

- Allows to direct the elements of hull SHB8 (cf [7.1.18]).

## 3.5.34 MODI\_OBSTACLE

**TUBE\_NEUF removed:**

- The keyword was moved in the order POST\_USURE (cf [7.0.2]).

**3.5.35MODI\_REPERE**

**GROUP\_MA, MESH, GROUP\_NO, NODE new:**

- Allows to restrict the change of reference mark to part of the grid (cf [7.0.9]).

## 3.5.36 PROJ\_CHAMP

### **SENSITIVITY new:**

- Allows to project fields derived from a grid on another (cf [7.1.10]).

## 3.5.37 POST\_USURE

### **TUBE\_NEUF new:**

- Allows to provide new values of wear (cf [7.0.2]).

## 3.5.38 POST\_RCCM

### **TYPE\_KE new**

- Offer two methods of calculating of That.

## 3.5.39 PRE\_GMSH

### **MODI\_QUAD removed:**

- This functionality is taken again in CREA\_MAILLAGE and applies to a grid *Aster* some is its origin (cf [7.0.6]).

### **Note:**

| *PRE\_GMSH is again a procedure.*

## 3.5.40 PRE\_IDEAS

### **CREA\_GROUP\_COUL new:**

- Allows to create or not the groups associated with the colors with IDEAS (cf [7.0.2]).

## 3.5.41 STAT\_NON\_LINE

### **RESI\_REFE\_RELA, SIGM\_REFE, EPSI\_REFE, FLUX\_THER\_REFE, FLUX\_HYD1\_REFE, FLUX\_HYD2\_REFE new:**

- New method for the test of convergence compared to a value of reference defined for each size (cf [7.0.16]).

### **SELECTION new:**

- Choice of parameter of piloting: NORM\_INCR\_DEPL, ANGL\_INCR\_DEPL, RESIDUE : one minimizes respectively the increment of displacement (defect), the angle between  $U^+$  and  $U^-$ , the residue (cf [7.0.9]).

### **ETA\_PILO\_R\_MAX, ETA\_PILO\_R\_MIN, PROJ\_BORNES new:**

- Allow to define the terminals of the interval of research (cf [7.0.9]).

### **PAS\_MIN\_CRIT, ITER\_LINE\_CRIT, RHO\_MAX, RHO\_MIN, RHO\_EXCL new:**

- Terminals of linear research in the event of piloting (cf [7.0.9]).

### **CRIT\_FLAMB new:**

- Research of the modes of buckling of a structure (cf [7.1.17]).

**SENSITIVITY new:**

- Introduction of calculations of sensitivity into nonlinear (cf [7.1.3]).

**3.5.42 TEST\_TABLE**

**SENSITIVITY new:**

- The test of the derived tables allows (cf [7.1.12]).

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